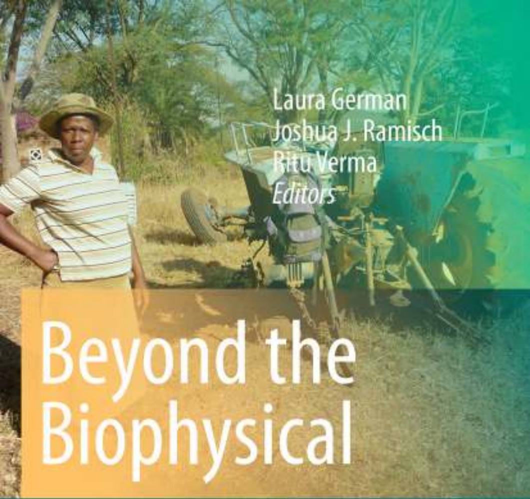

Laura German
Joshua J. Ramisch
Ritu Verma
Editors

Beyond the Biophysical

Knowledge, Culture, and Power in Agriculture and Natural Resource Management

uOttawa

OUT OF THE BOX
RESEARCH AND ACTION

Springer

Beyond the Biophysical

Beyond the Biophysical

Knowledge, Culture, and Power in Agriculture and Natural Resource Management

Edited by
Laura German • Joshua J. Ramisch
Ritu Verma

CIFOR
CENTER FOR INTERNATIONAL FORESTRY RESEARCH
uOttawa
OUT OF THE BOX
RESEARCH AND ACTION
CULTURE LAND ENVIRONMENT

Springer

Editors
Dr. Laura German
Center for International Forestry Research
(CIFOR)
Box 0113 BOCBD
Bogor 16000
Indonesia
l.german@cgiar.org

Dr. Ritu Verma
Out of the Box Research and Action
Cape Town
South Africa
rverma@out-ofthe-box.org
and
School of Global Studies
Department of Anthropology
University of Sussex
Arts C C128, Falmer
Brighton, BN1 9SJ
United Kingdom
rvermapuri@gmail.com

Dr. Joshua J. Ramisch
School of International Development
and Global Studies (SIDGS)
University of Ottawa
550 Cumberland Avenue
Ottawa, ON
K1N 6N5
Canada
Joshua.Ramisch@uOttawa.ca

ISBN 978-90-481-8825-3 e-ISBN 978-90-481-8826-0
DOI 10.1007/978-90-481-8826-0
Springer Dordrecht Heidelberg London New York

Library of Congress Control Number: 2010928328

Cover illustration: Verma 2009, farmer in front of broken tractor on her recently allocated commercial farm, Zimbabwe.

Cover design: eStudio Calamar S.L.

Printed on acid-free paper

Springer is part of Springer Science+Business Media (www.springer.com)

To Luis Navarro (1944–2007),
Scientist, provocateur, mentor, and friend
You are truly missed

Foreword

The history of development intervention is marked by multiple failures at dialogue between analysts and practitioners; an impasse caused in part by the failure to reconcile disparate professional languages. In Kenya, where critical thought for this book was generated, a *cause célèbre* in livestock intensification has been the ill-fated Maasai Project of the 1960s and 1970s. The wider East Africa region too is known for its repeated failures to sustain projects in agricultural extension, water management, and drought preparedness. It is against this backdrop, and the ever-increasing calls for better dialogue between analysts, practitioners, and indeed local people, that Nairobi hosted a workshop in 2003 on theoretical advances in ecological anthropology and related disciplines. Some contributions from that conference are included here, along with other, more case-study focused papers written in response to the conference's conclusion that analysts need to move from critique to application.

Although the attempted dialogue between development practitioners and social scientists has always been more prominent in the established fields of agriculture, natural resource management, and health, we have recently witnessed important attempts to extend the dialogue into new areas like architecture, mining, humanitarian aid, and conflict resolution, especially through the interest in "local knowledge" for development. But, and this is crucial, future progress in these newer areas hinges on new advances in cross-disciplinary and analyst–practitioner dialogue within the more established fields. With reference to the biophysical, this volume explores some fundamental themes in the dialogue – e.g. how to promote awareness of the political and cultural dimensions of assisted development? how to contextualize claims to "participatory development"? – but pushes through conventional boundaries by asking broad social science questions of highly specific interventions. Practitioners and social scientists new to the debate are thus invited to develop critical awareness, for example, of the politics of nutrient transfers, of forest management ideologies, or of the notion that soils can be read as cultural artefacts. Such concepts capture novel ways of framing common problems in biophysical science.

Aimed at development professionals in agriculture and natural resource management whose scholarship and practices can be enriched with recent insights from critical theory and sub-disciplines like ecological anthropology and the anthropology of development, the present collection meets the need for more inclusive, interdisciplinary perspectives. The broader approach brings in political and socio-cultural elements that habitually remain unacknowledged. That said, this edited collection also provides social scientists with some tried and trusted tools for learning more about the biophysical, thus making a major contribution to bridging the professional languages, divide.

There is, however, a double sense in which this volume moves beyond established frameworks and practices. Not only are readers invited to move "Beyond the Biophysical" through analytical fine-tuning, but they are also encouraged to become more responsible in their social and ecological interactions. The volume's recommendations for improved scholarship and practice include compelling arguments for a more politically engaged approach to assisted development. They set out ways in which the common experience of marginalized groups and individuals always losing out can be reversed.

With social analysts making practical suggestions useful to practitioners, I anticipate that this book will become an important step towards easing the discomfort that biophysical researchers and practitioners frequently feel when confronted with heavy social science critiques. That I think the book capable of cultivating a new awareness and attitude among *both* biophysical scientists and social science researchers has something to do with one of the book's most powerful underlying messages, namely that everyone – African farmer, development worker, and analyst alike – "manages" the natural world on the basis of their own particular knowledge. Despite imposed social hierarchies, no one stands out as intellectually above the rest. On the contrary, all concerned have the potential to subversively enrich debate and practice by breaking through conventional boundaries.

Research and research-informed policy debates must go beyond rhetoric in order to address issues of poverty, vulnerability, marginalization, and sustainability. Without devaluing the importance of the biophysical, but aware of its Western "ethnocentric" leanings, the collection makes a convincing case for expanding field-based enquiries to include that which lies beyond the biophysical: concerns about the construction of knowledge, power, culture, and social and gender relations. As this book shows, when properly investigated, these central concerns reveal ways in which the assumed beneficiaries of development can indeed challenge and transform the discourses and practices that shape their livelihoods.

I welcome this collection for its commitment to sound scholarship and ethics.

SOAS, University of London Johan Pottier
9 May 2009

Preface

The conversation that ultimately led to this volume began with a 2003 workshop on ecological anthropology at the World Agroforestry Center (ICRAF) in Nairobi, Kenya, which subsequently grew into discussions between the co-editors, and then led to invitations to a broader range of contributors. The one-day workshop highlighted theoretical advances from ecological anthropology and related disciplines that would be useful to the agricultural development and natural resource management (NRM) community in expanding the range and quality of research-for-development in the social and environmental sciences. Presentations covered several theoretical sub-fields in the social sciences (critical theory, ethnoecology, historical ecology, political ecology) and a wide range of methodological approaches aimed at expanding the repertoire of methods used to understand human–environmental interactions. An important cross-cutting theme was the need to move beyond a purely biophysical consideration of natural resource problems to encompass broader and often unacknowledged socio-cultural, political, and knowledge-based dimensions of development.

The bulk of the participants – biophysical researchers and development practitioners coming from a strong problem-solving orientation – felt some discomfort with the social scientific emphasis on "critique". Highlighting negative consequences of development practice – whether resulting from the failure to recognize the gender consequences of technological change, the micro-political implications of tree planting, or how we as scientists wield our knowledge – did little to make participants feel empowered by socially-informed approaches to agricultural research and development. Dr. Luis Navarro, long-time colleague and supporter working out of the International Development Research Centre's (IDRC) Nairobi office, thus concluded with a challenge to workshop organizers and the discipline more broadly: to move beyond "critique" to "application" by following up critical analyses of current approaches with concrete recommendations for research and practice.

The current volume finds its roots in these earlier debates and represents an effort to meet this challenge by clearly demonstrating the need to move beyond the conventional (biophysical) treatment of agriculture and natural resource management. Its contributors propose concrete recommendations for how researchers and practitioners can become more responsible in their interactions with local communities and the natural world. It also represents the efforts of the "next generation" of socio-cultural scientists who are working (or have worked) in the Consultative Group for International Agricultural Research (CGIAR) system and who are interested in making a critical yet practically useful contribution to applied social science and biophysical sciences in the context of development. Hence, although the volume has roots in the 2003 Nairobi workshop, it brings together the work of many scholars who were not present at that gathering, who have been inspired by, reflected upon, and responded to some of the issues and challenges it raised.

Having travelled such a long way from its roots, the volume therefore also reflects the collaborative efforts, support, and learning of many people and institutions. The editors in particular want to acknowledge the institutional and intellectual support of their current and previous institutions for this project: the World Agroforestry Centre (ICRAF) and the African Highlands Initiative (AHI), the Tropical Soil Biology and Fertility Institute (TSBF-CIAT) and the International Centre for Tropical Agriculture (CIAT), the Institute for Poverty, Land and Agrarian Studies at the University of the Western Cape, the Centre for International Forestry Research (CIFOR), Out of the Box Research and Action, the School of Global Studies and Department of Anthropology at the University of Sussex, and the School of International Development and Global Studies (SIDGS) at the University of Ottawa. Besides the impetus for this volume provided by the late Luis Navarro and the workshop organizers (Diane Russell, Peter Brosius, and Laura German), it is also worth acknowledging the role of key senior scientists within the CGIAR system in supporting critical thought and reflection on interdisciplinary research and practice: Joachim Voss, Sam Fujisaka, and the late Ann Stroud, to name only a few. The volume has also been enriched substantially by the dedication and rigour of our literally global network of anonymous reviewers, and by the patience and encouragement of our editors at Springer (Takeesha Moerland-Torpey, Marlies Vlot and Fritz Schmuhl). Finally, editors and authors alike would acknowledge that such a volume would not be possible without the friends, partners, and families who have sustained us through the long journey to this volume's completion.

Laura German
Joshua J. Ramisch
Ritu Verma

Contents

Contributors

Mani R. Banjade is the former Coordinator of ForestAction Nepal and currently works as a specialist in social learning and innovation systems in forestry and natural resources. He has over a decade of experience in research, publication and social mobilization working for government, bilateral projects and (I)NGOs. He has published peer reviewed articles in international journals such as International Forestry Review and Forestry Chronicle as well as in national journals such as Journal of Forest and Livelihood. In addition to these, he has written a number of chapters and contributed in editing of books and journals.

John Cameron is Associate Professor for Development Research at the Institute of Social Studies (ISS) in the Netherlands. He has been researching development for over 35 years in sub-Saharan Africa, South and West Asia, and Oceania. He has also worked as a consultant conducting impact evaluations using qualitative and quantitative techniques for UN agencies and NGOs in Ethiopia, Nepal, Pakistan, Palestine, South Africa, and Sudan. His present research focuses on capabilities' development, especially deliberative capabilities.

May Chazan is a Research Associate with the Health Economics and HIV/AIDS Research Division (HEARD) at the University of KwaZulu-Natal in Durban, South Africa, as well as a Ph.D. candidate at Carleton University in Ottawa, Canada. Her current research examines the intersections between international solidarity networks and women's mobilizations in South African communities. Over the last 6 years, she has worked extensively with urban, peri-urban, and rural communities in South Africa to understand the multiple and interacting stresses they face, with particular interest in participatory research processes and critical feminist methodologies.

Judith J. de Wolf is a social scientist who has worked extensively in research and development in West and southern Africa. She worked on rural–rural migration in Cameroon, as Associated Scientist at the World Agroforestry Centre (ICRAF) in Malawi, and as an independent consultant in southern Africa. Judith holds an M.Sc. in rural development sociology from Wageningen University in the Netherlands, and currently works as Program Coordinator for a Belgian NGO in Johannesburg, South Africa.

Stephan Dohrn is an independent consultant who helps organizations in building networks and partnerships to improve their social and environmental impact. In his work, Stephan explores the role social media, or web 2.0, can play in initiating and sustaining collective action to foster social change and overcome problems such as climate change and poverty. Previously, Stephan led the communications and outreach work of the CGIAR Systemwide Program on Collective Action and Property Rights (CAPRi). Find out more at http://sustainableteams.org/.

Andrew Fuys is a Program Officer for the Durable Solutions for Displaced Persons (DSDP) initiative of Church World Service. He previously worked with the International Land Coalition in support of communities organizing around land rights. He is an active advocate of immigrants' rights and humane immigration reform, with experience in international development programs of the United Nations, NGOs, and community-based organizations.

Laura German is a Senior Scientist at the Center for International Forestry Research in Bogor, Indonesia and Leader of CIFOR's research on "Managing Impacts of Globalised Trade and Investment on Forests and Forest Communities." Past work has included 5 years conducting action research on integrated natural resource management and landscape governance in eastern Africa, human ecological research in the Brazilian Amazon, and agricultural development in Honduras. She holds a Ph.D. in cultural and ecological anthropology.

Barun Gurung is an anthropologist who began his career working with indigenous groups in the Himalayan region. He served as the coordinator of the CGIAR systemwide program on Participatory Research and Gender Analysis (PRGA) until 2007. He is presently an Associate with Women Organizing for Change in Agriculture and NRM (WOCAN) and is involved in a research and training project on *Men and Gender Equality Through Exploration of Masculinities*.

Anne M. Larson is a Senior Research Associate with the Centre for International Forestry Research (CIFOR) and is based in Nicaragua. Her research has focused on conservation and development, decentralization, indigenous rights, and forest governance. She holds a Ph.D. in Wildland Resource Science from the University of California, Berkeley and a B.S. in Environmental Science from Stanford University.

Cynthia McDougall is a social scientist who focuses on issues of equity and social learning. She was the team leader for CIFOR's "adaptive collaborative management" research in community forestry in Nepal between 1999 and 2007. Her background also includes research and/or practice in food security, biodiversity, experiential education, and facilitation. Cynthia received her Masters degree from Cambridge University, UK. She is currently a Senior Associate with CIFOR's Governance Programme and an external Ph.D. student at the University of Wageningen, the Netherlands.

Michael Misiko is the Social Scientist for Learning and Innovation Systems at the Africa Rice Centre (WARDA) in Cotonou, Benin. Prior to joining WARDA, he worked in a similar capacity at CIAT, Nairobi. Misiko holds a Ph.D. in Agricultural

Anthropology from Wageningen University. He is involved in research and sustainable development among (sub-Saharan African) smallholders, with particular focus on soil fertility and seed systems.

Hemant R. Ojha is the founder and currently the Executive Coordinator of ForestAction Nepal. He is part of numerous civil society and policy advocacy networks in Asia. His ongoing research encompasses interactions between science and politics in natural resource governance, social inclusion and equity, deliberative policy processes, community-based natural resource governance, adaptive co-management of ecosystems, and social learning and participatory action research methodologies. His works interpret and enrich understanding of local level conflicts and collaboration in natural resource governance from critical social theory (such as Bourdieu and Habermas).

Laxmi P. Pant is an expert in international environment and development. His research interests include managing stakeholder interaction for innovation management, renewable natural resources conservation, and positive social change. He recently completed a Ph.D. from the University of Guelph (UoG), Canada. He also holds an M.Sc. from Noragric, Department of International Environment and Development Studies, Norwegian University of Life Sciences, Norway, and a B.Sc. from Tribhuban University, Nepal.

Naya S. Paudel is a Researcher and Activist at ForestAction Nepal. His research focuses on the political ecology of environmental governance and social movements. His research interests include decentralization of natural resources, community rights, conservation and livelihoods, equity and social inclusion, environmental policy processes, ecosystem services, and poverty. Currently, he is working on forest tenure reform, institutions, and markets.

Johan Pottier specializes in the social dynamics of food security, media representations of conflict, the culture and politics of humanitarian intervention, and the anthropology of development. Publications include *Re-Imagining Rwanda: Conflict, Survival and Disinformation in the late 20th Century* (Cambridge University Press, 2002); *Anthropology of Food: The Social Dynamics of Food Security* (Polity Press, 1999); *Migrants No More: Settlement and Survival in Mambwe Villages, Zambia* (Manchester University Press, 1988); and *Negotiating Local Knowledge: Power and Identity in Development* (co-ed., Pluto Press, 2003).

Joshua J. Ramisch is an Associate Professor at the School of International Development and Global Studies at the University of Ottawa. He holds a Ph.D. in International Development Studies from the University of East Anglia and from 2001–2006 was the Social Science Officer of the Tropical Soil Biology and Fertility (TSBF) Institute of CIAT. His research interests include the dynamics of “local” knowledge and its interactions with other global knowledges, political ecology and actor network theories, participatory and action research methodologies, food security and environmental justice in developing and North American contexts, and understanding and supporting local responses to climate change.

Diane Russell is a Biodiversity and Social Science Specialist at the US Agency for International Development (USAID). An anthropologist, Diane has worked on the interface of social science and natural resource management for over 20 years, mostly in Africa. She has been a team leader at the World Agroforestry Centre, Environment Advisor for USAID/Kinshasa, and Senior Program Officer in the World Wildlife Fund as part of the USAID funded Biodiversity Conservation Network. Her book, with Camilla Harshbarger, *Groundwork for Community-Based Conservation: Strategies for Social Research*, has been used in several University courses.

Patrick Sikana† was the Social Science Officer with the Tropical Soil Biology and Fertility Programme (TSBF) from 1998 until his death in 2000 in an airline crash off the coast of West Africa. An anthropologist with a Ph.D. from the School of Oriental and African Studies, he had worked extensively in Zambia with the Ministry of Agriculture's Adaptive Research Planning Teams (ARPT). His research addressed local knowledge, livestock systems, and the dynamics of development projects working with local communities.

Ritu Verma is a Senior Researcher with Out of the Box Research and Action and a Senior Visiting Fellow in the Department of Anthropology at the School of Global Studies, University of Sussex. Her research interests include socio-cultural, political-ecological and legal pluralistic aspects of access, control and rights over land and natural resources in southern and eastern Africa within the context of globalization, climate change and land grabs. Over the past ten years, she has coordinated regional action research on women's land rights in southern Africa and pastoral rights to land in Kenya, and multi-sited ethnography on the disconnects between development practitioners and rural farmers in Madagascar. She holds degrees in engineering, international development, and anthropology and has published Gender, Land and Livelihoods in East Africa: Through Farmers' Eyes (IDRC, 2001).

†Deceased.

List of Abbreviations

ABS	Access and benefit sharing
ACM	Adaptive collaborative management
AF	Agroforestry
ARPT	Adaptive Planning Research Team (Zambia)
ASEAN	Association of Southeast Asian Nations
CAPRi	CGIAR Systemwide Programme on Collective Action and Property Rights
CBD	Convention on Biological Diversity
CBR	Community biodiversity register
CCD	Convention on the Protection and Promotion of the Diversity of Cultural Expressions
CF	Community forestry
CFUG	Community forest users group
CGIAR	Consultative Group on International Agricultural Research
CIAT	International Centre for Tropical Agriculture (a CGIAR Centre)
CIFOR	Centre for International Forestry Research (a CGIAR Centre)
CIMMYT	International Maize and Wheat Improvement Centre (a CGIAR Centre)
CIPRES	Centre for Rural and Social Research, Promotion, and Development (Nicaragua)
DANIDA	Danish International Development Agency
DFO	District Forest Officer
FEI	Folk Ecology Initiative (Western Kenya)
FFS	Farmer field school(s)
FGD	Focus group discussion
FSR	Farming Systems Research
G&D	CGIAR Systemwide Programme on Gender and Diversity
HIV/AIDS	Human Immunosuppressive Virus / Acquired Immune Deficiency Syndrome
HYV	High-yielding variety
ICRAF	World Agroforestry Centre (a CGIAR Centre)
IDB	Inter American Development Bank
IDRC	International Development Research Centre

ILC	International Land Coalition
IPR	Intellectual property rights
IPRA	Indigenous Peoples Rights Act (Philippines)
ISFM	Integrated soil fertility management
ITMB	Informal Traders Management Board (Warwick Junction, South Africa)
iTrump	Inner Thekwini Renewal and Urban Management Programme (Warwick Junction, South Africa)
LMS	Local management structure
NRM	Natural resource management
NGO	Nongovernmental organisation
OP	Operational plan
PPB	Participatory plant breeding
PR	Participatory research
PRA	Participatory rural (or rapid) appraisal
RG	Research Group
SEWU	Self Employed Women's Union (Warwick Junction, South Africa)
SSA	Sub-Saharan Africa
TRIPS	Trade Related Aspects of Intellectual Property Rights
TSBF	Tropical Soil Biology and Fertility Institute of CIAT (a CGIAR Centre)
UPOV	International Union for the Protection of New Varieties of Plants
WJURP	Warwick Junction Urban Renewal Project (Durban, South Africa)
WTO	World Trade Organisation

Chapter 1
Agriculture, Natural Resource Management, and "Development" Beyond the Biophysical

Laura German, Ritu Verma, and Joshua J. Ramisch

Abstract Knowledge, culture, and relations of power shape the institutionalized discourses, ideologies, and practices of "development" as well as the everyday natural resource management practices of women and men around the world. As a result, a broader and interdisciplinary perspective on agriculture, natural resource management, and development practice beyond purely biophysical approaches is urgently needed. This chapter – like the volume it introduces – offers insights into the socio-cultural, political-economic, and environmental effects of development (and their very real implications for women and men in the global South), highlighting the challenges and "mis-adventures" associated with past and current development approaches and practices. It also presents strands of theory that can help to make sense of these realities, and provides concrete recommendations for moving beyond them. The volume's case studies, introduced in this chapter, demonstrate the possibility and necessity of reaching out beyond the borders of anthropological and social scientific disciplines in ways that are meaningful and valuable to others. The case studies also articulate the challenges faced by sociocultural scientists working in arenas dominated by other disciplines. The chapter argues for the importance of rigorous social science, and for understanding the dynamics of knowledge, culture, and power in diverse contexts. At the same time, it highlights

L. German (✉)
Centre for International Forestry Research (CIFOR), Box 0113 BOCBD,
Bogor 16000, Indonesia
e-mail: l.german@cgiar.org

R. Verma
Out-of-the-Box Research and Action,
and
Department of Anthropology, School of Global Studies, University of Sussex,
Arts C C128, Falmer, Brighton, BN1 9SJ, England
e-mail: rvermapuri@gmail.com

J.J. Ramisch
School of International Development and Global Studies (SIDGS), University of Ottawa,
Tabaret Hall (Rm 328), 550 Cumberland Avenue, Ottawa, Ontario K1N 6N5, Canada
e-mail: joshua.ramisch@uottawa.ca

L. German et al. (eds.), *Beyond the Biophysical: Knowledge, Culture, and Power in Agriculture and Natural Resource Management*,
DOI 10.1007/978-90-481-8826-0_1, © Springer Science+Business Media B.V. 2010

the need to move beyond critique of interdisciplinary ventures towards constructive engagement with other disciplines, and makes a case for the unique contributions social science can make to agriculture makes natural resource management.

Keywords Agricultural research • Interdisciplinarity • International development • Practice of science • Natural resource management (NRM) • Power • Knowledge • Culture • Social science • Anthropology

This volume is not intended as a critique of biophysical science and practice. Indeed without the disciplines of soil science, agronomy, animal husbandry, entomology, forestry, ecology, and other biophysical sciences, development actors would be poorly equipped in understanding some of the key constraints affecting farmers and undermining sustainable natural resource management efforts worldwide. Rather, it seeks to illustrate through conceptual arguments and case study documentation why a broader and interdisciplinary perspective on agriculture, natural resource management (NRM), and development practice beyond pure biophysical approaches is urgently needed. Thus, while useful as an overview for social scientists interested in learning more about agriculture and natural resource management in the context of development, it actively invites and welcomes readership from the biophysical and agro-ecological sciences.

The ultimate motivation for this volume lies in the countless failed development projects whose objectives are never met or whose unintended consequences are more damaging to local livelihoods and environments than the problems intended to be addressed (Ferguson 1994; Rocheleau and Edmunds 1997). As Williams argues, "by any criteria, successful projects have been the exception rather than the rule" (1981, p. 16–17). The reasons for these failures are many and sometimes lie far beyond the scope of scientists and practitioners. Indeed, "the most important political effects of a planned intervention may occur unconsciously, behind the backs or against the wills of 'planners' who may seem to be running the show" (Ferguson 1994, p. 20, citing Willis 1981).

To move toward a more politically and socially informed development professionalism, this volume offers insights into these political effects (and their very real implications for rural women and men), and a host of other, not yet visible perspectives in agriculture and natural resource management research and practice. While increased awareness of these forces and outcomes may not eliminate project failures or their negative effects, it can broaden the scope of what is visible, thereby helping to identify and mitigate negative effects while leveraging the real (as opposed to the assumed) benefits of development interventions. The goal is also to inform research and development approaches with the multiple voices and context-specific experiences of those that are the most marginalized and vulnerable: women and men in rural areas.

This chapter introduces the core themes that run through this volume (knowledge, culture, power, development), as a means to sketch the scope of these themes in the wider literature and to provide an introduction to key theories for those biophysical scientists and nonspecialists who have welcomed the opportunity to learn more about how factors that lie "beyond the biophysical" shape their practice. Following an introduction to these theoretical underpinnings, we provide an overview to the different sections of the book and to the unique contributions made by individual chapters.

Theoretical Considerations: The Critical Nexus of Knowledge, Culture, and Power in Development

Knowledge

The starting point for any "management" of natural resources is knowledge itself: the identification of problems and patterns, an understanding of processes and their outcomes, and the framework of theories, assumptions, definitions, and values that brings all of these together. It is worth emphasizing that *everyone* who "manages" or engages with natural resources does so on the basis of their own particular understanding of those resources and their rights or abilities to use or shape them. This is true whether that person be the woman hoeing her western Kenyan farm or gathering fuelwood in Nepal, the owner of a fleet of fishing boats, the district forest officer or agricultural extension agent, the provincial governor or national agriculture minister, the agronomy Ph.D. student conducting experimental trials, or the international research scientist, consultant, or NGO worker.

The biophysical sciences propose the most formalized types of NRM knowledge, generating and expanding that knowledge through the "scientific method" of hypothesis testing through quantitative statistical analysis and ensuring rigor and accountability through a culture of peer review and onerous academic instruction. This formal knowledge structure (and the intellectual, financial, and political capital that underpin it) has traditionally supported the biophysical sciences' claim to authority in matters of NRM, even though such knowledge is by no means homogenous across or even within disciplines or regions (Latour 1990), nor is it clearly the only domain of knowledge on offer.

The growth of participatory and ethnoscientific approaches has brought the marginalized and less widely known knowledges of "local" women and men into the discourse of development research and planning, to enrich, supplement, or indeed challenge the dominant biophysical knowledge bases (Chambers et al. 1989; Warren et al. 1995; Sillitoe 1998). Equity and efficiency arguments would justify that rural women and men are not only the best placed to know and define their problems, but that they must also be involved in creating or implementing any viable solutions (Chambers et al. 1989). Yet, while local people are indeed experts about their own environments and natural resources, local agroecological knowledge is often expressed in formats or settings that biophysical scientists find frustratingly difficult to accept as "data", even if they were professionally disposed to do so.

Local knowledge is often dispersed amongst many actors in a community or tied to specific times and places, making it hard to access, synthesize, or enter into a spreadsheet (Mackinson and Nottestad 1998).

This complexity makes efforts at documentation or codification potentially problematic on at least two counts. Inventories of local knowledge, usually collected in intensive bursts of interviews or participant observation, run the risk of portraying that knowledge as static, rather than considering the ways it changes and adapts to broader political-economic and physical circumstances. Greater risks surround the ethics of extracting local knowledge from its context: what credit or compensation is due to the women and men who have (or have not!) shared their knowledge with researchers and what are the consequences of presenting local knowledge in new forums, without its keepers? Indeed, scientific efforts to "validate" local knowledge in technical terms can often backfire by trivializing it, given the embedded and situated nature of such knowledge (Sikana 1993; Chapters 2, 5, and 13). Even well intentioned, "participatory" methods used to identify and evaluate local knowledge with a view towards integrating it with outsiders' scientific knowledge risk marginalizing these local knowledges merely as "starting points" for further work (Ramisch et al. 2006).

The use of the term "local" – while perhaps accurate for delimiting the culture(s) or geography of a given context – is now often contested for its tendency to imply knowledges or sets of practices that are minor or less comprehensive than some "global" science (Sillitoe 2000). If knowledge (however curiously fascinating to outsiders) is qualified as "local" or belonging to only select groups of people or livelihood practitioners, it can therefore be more easily dismissed as "not science" (Agrawal 1995).

Another widely used term, "indigenous" knowledge[1], has been important for empowering the voices and knowledges of ordinary and marginalized peoples within development discourse (Warren et al. 1995; De Walt 1994; Ellen et al. 2000). Yet "indigenous" is no less problematic or contested a term than "local", since it risks presenting or romanticizing such knowledges as relics of a traditional (or worse still, an unchanging, ahistorical) past. Indigenous and local women and men have reacted to these claims in various ways, for example resisting simplified and romanticized depictions (Cunningham 2001), or indeed insisting that labeling some knowledges as "local" is a (neo)colonial effort to find and enforce differences in knowledge when in fact commonalities might actually be more significant than differences (Amanor 1994).

Critics would assert that "global" science can also trace its origins to particular, "local" traditions and histories (Atran 1990; Watson-Verran and Turnbull 1995). Treating its products as "universal" or ahistorical is therefore as inappropriate (and dangerous) as essentializing "indigenous" or "traditional" knowledges (Latour

[1]Alternative labels, such as "folk" knowledge, are also used, usually to evoke an "everyday" opposition to the formally structured languages of science or philosophy (Ramisch et al. 2006; Chapter 6).

1990). We would argue that ultimately it is more useful to move beyond these terms and the dichotomies they imply and to consider instead the practices and the products of given knowledges (Agrawal 1995; Antweiler 1998; Purcell 1998; Chapter 5).

As the case studies in this volume show, knowledge is intimately associated with the positions of power of the people who know it (Chapter 12). Indeed, "local" knowledge is only identified as such (i.e. as a parochial "form" of knowledge rather than simply as "the" knowledge) because of an encounter with other, more powerful actors who claim their own knowledge to be "global" or "universal" (Pottier et al. 2003; Long and Long 1992, Chapter 6). The sociologist Bourdieu explains these claims as based upon "symbolic power", a power which literally "creat[es] things with words" (1998, p. 138), determining what can be said, how, and with legitimacy by whom. This symbolic force combines with the political and economic power of dominant groups to create and maintain the "naturalness" of a prevailing order (Hayward 2004; Chapter 8).

If biophysical science, therefore, has difficulty addressing or incorporating the products of "local" knowledges, these knowledges and the women and men who hold them are excluded from the scientific discourse of NRM and from shaping its outcomes. Because many "local" knowledges define NRM problems within broader livelihood contexts, it is often difficult for biophysical scientists to separate such "knowledge" from "skills" (Sillitoe 1998). As a consequence, local knowledge is reduced to only its utilitarian, most "biophysical-like" and quantifiable components, and divorced from its own consciousness and cosmologies (Amanor 1994). Furthermore, when the role of knowledge is defined by outsiders (to serve scientific or economic models or interests) and not by the knowledge producers themselves, that knowledge becomes subordinated to claims that "traditional" practices are no longer effective (e.g. able to maintain productivity in the face of changing political, cultural, or environmental conditions), or are otherwise in need of modernization and therefore technical solutions.

Moving beyond the simplistic and restrictive dichotomies of local/global or indigenous/scientific requires methodologies that enable effective communication between the diversity of knowledges found within local and scientific communities. The many "participatory" approaches to communication that are proposed to fit this bill are potentially important but are no panacea: it is important to acknowledge that they "can be done well or not, *and that it matters* [emphasis added]" (Rocheleau 2003, p. 170). For example, consultative fora may give voice to some marginalized people's perspectives at the information gathering or problem identification stages of a project, but on their own, do little to subvert the power relations that typically exclude local realities from decision-making (e.g. in planning, prioritizing, evaluating, or rechannelling actions and resources).

The differing ability of actors to successfully engage or reshape NRM discourse itself is both a political and a knowledge-communication challenge, which therefore requires more conscious dedication to iterative, broad-based, and institutionalized processes of change (Berkes et al. 2002). The social sciences are by no means alone in embracing the complex processes of multiple knowledges interacting, and it is worth noting that interest in complexity and network theories is currently flourishing in the ecological and computing sciences as well (Barabasi 2002; Rocheleau and Roth 2007). The case studies in this volume draw on (and critique) many of the methodologies that embody this dedication: "community based co-learning," "social learning," "participatory learning and action research," "adaptive collaborative management," "institutional analysis and change," to name only a few. They illustrate not only the complexity of the knowledges and the competing interests of the actors involved, but that it is nonetheless possible to navigate (and learn from) these challenges.

Culture

For the study and research of agriculture, natural resource management, or any other field of analysis, it is useful to begin by asking, why does culture matter? Agriculture and the management of natural resources do not exist in a vacuum. They are affected, impacted, and shaped by cultural norms, practices, and meanings. What natural resource management and agriculture mean and the way they are practiced are different in many aspects in Indonesia than they would be in Kenya or in Mozambique. Hence, not only are agriculture and natural resource management context specific, they are also culturally specific. There exists a great deal of cultural diversity across the world, in and within any country, and even within any specific location. There also exist varied cultural meanings of natural resources and the environment – from the productive to the reproductive, spiritual, social, and experiential past, future, present, etc. Moreover, "culture" is not stable; it is continuously being practiced, interpreted, reinterpreted, and transformed in response to a multitude of external and internal changes. All of this must be made sense of within the context of agriculture and natural resource management as practiced at any given time.

One of the foremost strengths of the sociocultural sciences is their ability to study, describe, and analyze "culture" and social and gender relations. Whether it is culture within agriculture (Mackenzie 1995a; Schroeder 1995) or natural resource management (Gezon and Paulson 2005; Moore 1993; Carney and Watts 1990), culture in its own right (Chagnon 1966; Evans-Pritchard 1940; Mead 1949), or the culture of scientists and development practitioners and its impacts on development projects (Cernea and Kassam 2006; Cernea 2005; Hindman 2002; Mosse 2005; Verma 2009, Chapter 6, 10, 12 and 13), the world of farmers and resource users cannot be understood in an in-depth manner without theorizing or analyzing it. Because of the centrality of this concept to agriculture and natural resource management, it is worth reviewing some of the central concepts and debates, and what implications they may have on the biophysical sciences and the goal of interdisciplinary research.

To study "culture" within any field of research, it is first important to problematize it. For many anthropologists and socio-cultural scientists, the notion of a "peoples and cultures" ideal and vision of the world carries less conviction today than ever before (Gupta and Ferguson 1997). What this means is that it is no longer acceptable to view "culture" as a discreet, bounded, territiorialized, internally homogenous, fixed, and static "natural fact" that is waiting out there to be explained (ibid.) and scientifically dissected. In conceiving "culture" it is important to recognize human agency, where "culture" is embodied in and actively produced through social practice (Nuijten 1992, p. 198) – in the way rural women and men resolve their livelihood problems and manage their resources by pursuing their own social projects and organizing their own patterns of social relations (Long 1989).

Abu-Lughod argues that researchers must be both cautious and reflexive about the politics of representing "others" (1993). Unless due attention is paid, she contends that what can be most troubling about certain scientific descriptions is that they are sometimes "trafficked in generalizations," which then has the effect of making "others" seem "simultaneously more coherent, self-contained, and different from ourselves than they might be" (ibid., p. 7):

> The effort to produce general ethnographic descriptions of people's beliefs or actions risks smoothing over contradictions, conflicts of interest, doubts, and arguments, not to mention changing motivations and historical circumstances. Besides being theoretically unsound, this erasure of time and conflict is misleading because it makes what is inside the external boundary set up by homogenization seem essential and fixed… like the "cultures" of "the Nuer," "the Balinese," or "the Awlad 'Ali Bedouin," populated by generic cultural beings who do this or that and believe in such-and-such (ibid., p. 9).

A more useful way of considering different "cultures" may be to regard them as what Knorr-Cetina (1981) refers to as "epistemic communities" or "epistemic cultures" – namely, communities composed of persons who share roughly similar sources and modes of knowledge. And although there may be a dominant understanding of "culture", it is not homogenous and there are those who resist and contest certain aspects of it. As discussed above, concepts of resistance, contestation, and hidden "off-stage" actions, speeches, and practices become centrally important in confirming, contradicting, and inflecting dominant power and gender relations (Scott 1985, 1990). For instance, agricultural practices and technologies often disadvantage vulnerable sectors of society such as women or migrant communities or push for productivity gains at the expense of intensifying their labour burdens (Schroeder 1995; Mackenzie 1995a; Moore 1993; Carney and Watts 1990; Verma 2009; 2001). Rather than open revolt and outright resistance, women may resist in more subtle and "backdoor" ways (Abwunza 1997) such as withdrawing their labour (which is critical, given that the majority of agricultural labour in Africa and Asia is provided by women). In other instances, they may put up a facade of deference to patriarchal discourses and practices through what Kandiyoti calls a "patriarchal bargain" in order to buy room to maneuver and carry out their own projects (1988).

Given the discussion so far, it is possible to surmise that the micropolitics of natural resource management, agriculture, and livelihoods are mediated by a complex interplay of political-economic, historical, and cultural realities (Mosse 2005; Long 2001; Long and Long 1992; Carney and Watts 1990; Ferguson 1994; Fairhead and Leach 1996, 1995; Moore 1993; Schroeder 1995, 1993; Verma 2009, 2001). Different women and men invest differently and strategically in various cultural meanings, and “struggles over meaning are as much part of resource relations, as are struggles over surplus or the labour process and property relations” (Moore 1993, p. 383). Hence, culture plays a critical role in shaping farmers’ and natural resources users’ values, preferences, gender roles, responsibilities, decision making, division of labour, access to resources, etc., and the meaning that they attribute to them.

Similarly, culture plays an important role in shaping the way that science and development are practiced in different institutional contexts. In ground-breaking work, Latour studied the culture of scientists in various contexts ranging from laboratories to offices and projects (1987, 1996; Latour and Woolgar 1979). Anthropologists of science argue that the production of scientific “facts” is as much a result of social relations and culture as it is about “pure and scientific” research. Latour argues that scientists and researchers tend to depoliticize processes and lived realities, and view facts as if they were “out there,” waiting to be discovered (1979). They often distinguish the world between what they see as “social” and “technical” factors (ibid.), and this is considered outside of “culture” and social relations. When controversies or contradictions are encountered about what they perceive as “facts”, they attempt to close them by “black-boxing” uncertainties away from scrutiny, while universalizing locally specific knowledge by enlisting and rallying the support of institutionalized knowledge networks and allies, as well as convincing nonscientists of the relevance of their work (Latour 1987; Latour and Woolgar 1979; Keeley and Scoones 1999; Verma 2009). Therefore, although scientific research is portrayed as a “black box,” it is actually much more complex – and inseparable from culture, social and gender relations, and power differentials. This has the result of privileging certain types of knowledge as “science”, and perpetuating sectoral approaches and disciplinary differences and the power relations between them (Verma 2009; Chapters 2, 3, 10, and 12).

The analysis of these various lenses on “culture” is critically important for a nuanced and in-depth understanding of complex realities. The anthropologist or sociocultural scientist plays a vital role in studying, analyzing, and elucidating the significance of these relationships. However, this must be done in a way that embraces equitable team work and collaboration. In order to embrace more nuanced and rigorous analyses of “culture”, it is important to engage not just in multidisciplinary (multiple disciplines), interdisciplinary (various disciplines working together in a collaborative manner), or transdisciplinary research (where researchers attain both biophysical and sociocultural training and apply them), but to ensure that the knowledge and expertise of sociocultural researchers is given equal weight in the processes of research design, implementation, analysis, write-up, and dissemination.

Power

Although power is fluid, dynamic, and difficult to measure, nearly every aspect of development and natural resource management is shaped by relations of power and authority, as well as resistance to them. Such aspects include project conceptualization, design and deployment; the sharing of knowledge; everyday behavior in rural landscapes (i.e. tree planting, nutrient transfers, project participation and nonparticipation, etc.); and the way farmers struggle to make room for their own priorities through negotiation, contestation, and struggle against development interventions (Villareal 1992). Hence, power is complex, and is as much about those dominant individuals and institutions that drive development agendas and projects, as those who contest, resist, and transform them according to their own requirements and lived realities (see Chapters 3, 6, 13).

Power dynamics shape agriculture and natural resource management at all levels. Intra- and intercommunity and household power relations are shaped by customary norms and practices broken down along gender, caste, class, age, ethnicity, marital status and other axes of difference. Power may be leveraged over any number of biophysical processes. These include tree planting, a highly symbolic act conferring ownership over a piece of property or privileging certain groups at the expense of others (German et al. in press a; Rocheleau and Edmunds 1997); grazing, where livestock numbers and land ownership shape interests, powers and privileges (Goldman 2003; Thébaud and Batterbury 2001); and agrobiodiversity management, where crop or varietal selection is a value and politically-laden act (Zimmerer 1997; Carney 1991; Shiva 1992; Chapter 4).

The intervention by development and natural resource management projects is known to shape these local dynamics in powerful but sometimes unanticipated ways, leading to a host of unintended (and often undesirable) consequences. By bringing in novel resources or creating an alternative discursive space for renegotiating existing rules and patterns of resource access, development projects shape positions of privilege and enable entrenchment of existing power relations. Results may include disenfranchisement of women or the economically poor from resources over which they had customary control or informal access (Verma, 2009, 2010; Schroeder 1993; German et al. in press b; Rocheleau and Edmunds 1997), intrafamily or intraethnic conflict (Hlambela and Kozanayi 2005; Munk Ravnborg and Ashby 1996; Thébaud and Batterbury 2001) and, at times, social protest against the development intervention (Casson 1997).

The interface between communities and development agents, researchers, and government actors is also a nexus where power dynamics play out – either through intertwined battles over resources, meanings, and institutional legitimacy and control (Long 2001, Chapter 6); negotiation, contestation, and struggle over which knowledge is considered legitimate and who is qualified to know (Pottier et al. 2003); or management of public resources (Brockington 2007). These power dynamics may be direct – enacted through the contact between social actors (e.g. verbal and nonverbal communication between scientists and farmers), or indirect – leveraged through discursive struggles that define which land use practices are unjustly demonized (Dove 1993, 1983; Kull 2004; Chapters 3, 5, and 8). They may also be both overt – as in the social protest leveraged against the active promotion of Eucalyptus trees (Casson 1997) or the selective use of fire as a tool of resistance against state domination (in addition to its use as a locally appropriate tool for resource management) (Kull 2004) – or indirect, as in the tendency for less powerful actors to openly acquiesce to dominant wishes while secretly protesting against them (Scott 1990, Mackenzie, 1995a; Verma, 2001). The literature on decentralized natural resource management is one of the most fertile areas of scholarship on the interface between communities and government actors – illustrating the way in which powerful actors (governments and development organisations) take advantage of the ambiguities in powers associated with governance reforms, resist actions beneficial to the rural poor, and channel reforms to serve the ends of the state and political elites rather than local people (Bigombé Logo 2003; Colfer and Capistrano 2005; Oyono et al. 2006; Ribot 2009; Wittman and Geisler 2005).

Finally, power dynamics may play out at more "macro" levels in the form of more lasting or "structural" political-economic and governance conditions that enable or constrain human behavior. This may include institutionalized rules, beliefs, and practices; public policies; or discursive battles that deeply entrench certain (often unjust and unwarranted) views about rural people and land management practices in the public imagination (see Chapter 3). For instance, James Ferguson (1994) presents a detailed account of how and why a particular development discourse about Lesotho – patently false by any historical or scholarly metric – was promoted, shaped the actions and investments by outside development agencies and the government, and led to unanticipated development outcomes. By presenting Lesotho as something it was not – as a traditional subsistence peasant economy untouched by modern economic development, exporting labour due to a recent decline in agricultural productivity – development organisations were able to justify Lesotho as a perfect candidate for the technical solutions that outside development agencies could provide. This portrayal, however, obscured the political nature of the underlying problems (Lesotho's colonial creation as a labour reserve for neighbouring South Africa), and the cultural rationales for current productive practices (namely the role of livestock as a store of wealth for migrant miners rather than a productive economic sector of its own).

Mosse (2005) has taken a close look at aid policy not for its *instrumental* value (i.e. as a rational tool for problem solving), but for its *political* function – namely, a rationalizing discourse that conceals hidden purposes of bureaucratic power and dominance. Other authors illustrate how powerful discourses have shaped and entrenched negative perceptions about local resource users degrading the environment (Dove 1983; Fairhead and Leach 1996; Hecht and Cockburn 1989; Kull 2004; Niamir-Fuller 1999; Chapter 3). These discourses have either served as a smokescreen for promoting the interests of more powerful actors or helped to promote a particular (and dominant) developmentalist agenda, often to the detriment of local livelihoods. Yet as Ferguson (1994) and Scott (1998) point out, some of the most far-reaching and harmful forms of power have been perpetrated by those in positions of authority who have been motivated by a genuine desire to improve the human condition, but unwittingly have created the conditions for their own failure or harmful social and environmental outcomes for rural farmers and resource users. In the same vein, it is also important to recognize that by limiting knowledge and practice to conventional and biophysically dominant approaches to development, the most marginalized sectors of society lose out. That is, many of the discourses and practices of development also tend to be gender-blind, and therefore the everyday lives of women – already at the periphery of many development interventions and research endeavors – lose out to more powerful actors who dominate in development encounters and practices.

Two sets of theoretical subfields are particularly useful for the study and understanding of power dynamics in development. The first is that of political ecology, a subdiscipline of the social sciences that pays close attention to questions of gender, power, and the social agency of actors in the practices and outcomes of development and natural resource management (Robbins 2004; Zimmerer and Bassett 2003; Rocheleau et al. 1996; Schroeder 1993). Gezon and Paulson (2005) explain:

> In efforts to work more closely with political, economic and ecological concerns and phenomena, political ecologists have pursued several promising paths: they have looked beyond the local community to explain natural resource use, explored power dynamics in everyday interactions and formal policy arenas, and paid increasing attention to the environmental interests, knowledge, and practices of social groups differentiated by race, ethnicity, gender, or other factors (p. 1).

They have also enabled the rewriting of entrenched environmental histories that have done an injustice to local people (for example, see Fairhead and Leach 1996, 1995).

The second body of literature is the interdisciplinary field of Science and Technology Studies (STS), which applies the sociology, philosophy, and anthropologies of science to critically examine scientific practices as sociopolitical-cultural constructs in their own right (Latour and Woolgar 1979; Clark and Fujimura 1992; Pickering 1999; Law and Mol 2002). For example, the methodologies of anthropology, traditionally applied to the study of other cultures, are here turned inward to the study of scientists, development practitioners, and the development establishment (Latour 1990; Long 2001; Mosse 2005; Verma 2007, 2009, 2010; Chapter 12). This has shed light on the political interests and subjectivities behind what was earlier assumed to be a neutral brand of discipline and professionalism, generating greater understanding of the role of the "neutral observer" in advancing or silencing certain perspectives, and shaping development philosophies, policies, interventions and, ultimately, "culture".

International Development: A Case for Questioning Dominant Narratives and Practices

Aside from the importance of integrating, supporting, and valuing cutting edge sociocultural and interdisciplinary approaches that go beyond pure biophysical science, it is also important to consider the broader development establishment as a whole. A review of the history of development interventions reveals that there have been and continue to be multiple ideologies and approaches to development (and indeed, the study of development) that vary in terms of perceptions of the root causes of underdevelopment (technological, economic, political, etc.) and the technical, administrative, and political apparatus employed to address them. The very concept of "development" is therefore subjective and in flux, yet at any given time contributes to narrowing the spaces of acceptable understandings and interventions.

Here, we argue for the necessity of moving beyond conventional approaches to development that view development problems as being primarily technical in nature, and therefore resolvable by technical solutions alone. While it is difficult to define development, it is the one theme that ties all of the case studies and threads of the arguments in this volume together. Ferguson (1994) suggests that development is arguably one of the most dominant organizing concepts of our time and it can be viewed as:

> … a dominant problematic or interpretive grid through which the impoverished regions of the world are known to us. Within this grid, a host of everyday observations are rendered intelligible and meaningful. Poor countries are by definition "less developed", and the poverty and powerlessness of the people who live in such countries are only the external signs of this underlying condition. ... Within this problematic, it appears self-evident that debtor Third World nation-states and starving peasants share a common "problem", that both lack a single "thing": "development" (p. xiii).

Based on this view, discourses, practices, and policies are constructed and implemented on behalf of economically poor and marginalized "peoples" of the world. Often, dominant development discourses portray rural farmers as "ignorant and unscientific exploiters" of their natural resources (Mackenzie 1995b, p. 101). Based on these portrayals, local knowledge is disqualified and disadvantaged in the face of "ethnocentrism" of Western scientific knowledge, scholarship, and privileged claims to know (Mudimbe 1988, p. 15).

There are several problems with such an approach. First, it is based on the assumption that those actors who see themselves as "developed" act to deploy development for those deemed "less-developed," despite a problematic track record of failed development projects (Cowan and Shenton 1995, p. 28). Second, it presupposes and conflates notions of "development" and scientific "progress". "Development" may not mean the same thing for scientists as it does for rural farmers. The latter not only manage their natural resources and agriculture by engaging context-specific knowledge and spatially organizing and working their physical environments, but they also engage in other realms of reality which are equally and sometimes more greatly valued. For instance, in Bali, irrigation and rice cultivation is carried out by farmers in a way that is inextricably tied to a system of "water temples," where they are regulated and managed as part of a complex set of "factors" made up of ritual, religion, and social and political relations (Lansing 1991, 1987). This complex set of realities is ignored and rendered invisible to engineers, biophysical scientists, development consultants, and state agents who consider irrigation as a "technical" and "scientific" issue alone (ibid.). Hence, important knowledge, experience and meaning – not to mention opportunities for dialogue and interaction with rural farmers – are missed out to the detriment of development efforts (Chapters 6, 10 and 13).

It is important for researchers and scientists working on agriculture and natural resource management in the context of development to remember that we are in fact working *on development* with a view of tackling some of the problems of economic poverty, sustainability, and marginalization. In this sphere, research and science for the sake of research and science alone is not tenable or professionally, politically, or socially acceptable. Research must address issues of poverty, vulnerability, marginalization, and sustainability – and it must do so in a way that is not only respectful, but also in ways that engage the meaningful participation of, give ownership to, and respect the worldviews, preferences, and "epistemic cultures" of rural farmers and resource users.

As we have argued, "culture" is not homogenous and power relations and knowledge vary among different farmers and resource users (whether they are women, men, elite, economically poor, etc.). Therefore, it is also important to be aware of who we work with, and who we work for. While we may work for a particular institution, organization, or university, our *real* directors are in fact economically poor and marginal farmers and resource users. We must measure our performance against their accountability standards and ask ourselves if we have made a positive difference in their lives. If our stated goal is to address vulnerability, marginalization, and economic poverty, we must address those sectors of society that are more disadvantaged compared to others. In other words, we cannot assume all farmers and resource users are the same, nor can we ethically focus solely on "progressive" or "model" farmers who by their relative positions of privilege embrace external visions of development. Nor can we take for granted that our interventions are not reinforcing or entrenching power relations that actually make rural women and men even more marginal and vulnerable than before, or lead to negative, unintended consequences that we are not aware of.

In order to achieve this reorientation, the skills, expertise, and knowledge of sociocultural scientists are critical. The way we conceptualize agricultural and natural resource management research for development must be changed and practiced in fundamentally different ways from the past – in ways that not only value indigenous knowledge, practices, and ways of knowing, but also sociocultural realities. Sociocultural science and anthropology hold the key for achieving this (Chapter 12). This volume aims to demonstrate the importance of investigating and analyzing what lies beyond the biophysical. It argues, along with biophysical properties and analysis, that knowledge, power, culture, and social and gender relations are key elements in the study of agriculture and natural resource management.

Essays in This Volume

This book is organized into three main sections. Part I, *Beyond Biophysical Assumptions*, aims to highlight some of the weaknesses of using a biophysical lens alone through which to view and understand agricultural systems and landscapes, and exposes some of the weaknesses of common assumptions within the "scientific" establishment. Part II, *Power Dynamics at the "Development Interface"*, highlights the ways in which development projects both mobilize and entrench existing power relations, and generate new forms of political, economic, social, and ideological struggle, shedding light on the need to anticipate and monitor biophysical and sociopolitical, intended and unintended, consequences of any intervention. Part III, *Institutional Disjunctures and Innovations*, explores how institutionalized attitudes and practices shape not only positions of privilege within research and development agencies, but also the perspectives which are heard and silenced in everyday settings where "development" plays out – exposing institutional practice not as objective but derived from particular political, social, and ideological milieux. Most chapters in this volume further illustrate the complex relationship between knowledge, culture, and power in development discourse and practice.

Part I begins with a chapter by Joshua Ramisch that explores the limitations of scientific measures of sustainability – namely, soil nutrient balances – for explaining the complexity of food insecurity and agricultural resilience actually lived by African smallholders. These techniques create a false sense of precision about the sustainability of local practices in the southern Malian study area by making certain pedological phenomena "visible" and excluding multiple other "invisible" environmental and livelihood factors. Even when farmers did not refute findings from such analyses, they found them of lesser importance than other determinants of farm yields or largely irrelevant to the household's livelihood portfolio. This analysis is critical, given the explanatory power leveraged by these soil nutrient balances for regional narratives on environmental degradation. The following chapter by Anne Larson uses a political ecology approach to bring multiple points of view into account in the analysis of migration into the rainforest frontier in the San Juan Province of Nicaragua, and the reasons for the recent demonization of people once considered pioneers. The chapter argues that it is only through the *failure* to recognize power (manifested most clearly in historical shifts in the public imagination) and scale-specificities that it becomes possible to blame poor peasants for deforestation. The chapter by Laxmi Pant and Joshua Ramisch explores the role of culture in agricultural biodiversity management in Nepal, and the preference for local cultivars despite the availability of purportedly superior "improved" or high-yielding crop varieties. Detailed case study material demonstrates a host of social and cultural factors behind food preference: the role of different foods in the ritual life of different castes, the role played by wealth in the frequency with which crops thought to be prestigious or inferior are consumed by different households, and the landraces preferred to prepare foods with different social and symbolic values. This analysis illustrates the degree to which culture has a bearing on the creation, management, and conservation of agrobiodiversity. Finally, using several case studies that focus on shifting agriculture, watershed function, and complex ecological processes, the chapter by Laura German argues that understandings of local knowledge are divided between those that validate and value local knowledge, and those that critique it against scientific principles and knowledge. She further argues that it is possible to problematize scientific knowledge by exposing its subjectivities and the way that it is shaped by perceptual and political biases. Moving beyond value judgements of each form of knowledge, she argues for a level playing field where both might be valued on equal terms.

Part II starts off with a chapter on "opting out" of participatory research, where Michael Misiko explores the politics of research and the perceptions of farmers towards soil scientists and researchers in western Kenya. Farmers routinely opt out of technical development interventions, based on different social and cultural meanings attributed to soil technologies, relations with field agents, and differing perceptions about the ultimate benefits. What is most interesting is the way research unleashes a series of social processes and local understandings that are at odds with what is intended by the technologies, including the perception of soil interventions are associated with witchcraft or cult practices. While natural resource management is often implicitly assumed to refer only to rural contexts, the next chapter by May Chazan applies feminist political ecology to ethnographic research with urban traders in Durban, South Africa. This analysis illustrates the complex heterogeneities within the street trading "community", some rooted in gender, age, and traditional hierarchies linked to rural areas, and others emerging within the process of a "participatory" urban renewal project itself. The political, economic, social, and ideological struggles for resources (in this case, access to trading space, infrastructure, and services) show that even "successful" community-based management can result in an uneven distribution of benefits.

The next two chapters illustrate power dynamics at the interface between local actors and the broader political and institutional contexts in which they are embedded. Hemant Ohja and coauthors Naya Paudel, Mani Banjade, Cynthia McDougall, and John Cameron challenge the dominance of biophysical sciences as the basis for policy formulation in forestry by presenting case study material from work with Nepal's community forests. Their analysis, based on the sociology of power and concepts of deliberative governance, offers insights into the ways that forest-dependent people can successfully contest and reshape the discourse of forest science to improve not only forest governance but ultimately the practice of biophysical scientists themselves. The next chapter by Andrew Fuys and Stephan Dohrn explores the critical importance of property rights as one of the most fundamental institutional determinants of natural resource management behavior and outcomes. Following a basic introduction to property rights theory for nonspecialists, they utilize empirical results from 41 case studies from around the world and diverse livelihood systems (forests, rangelands, fisheries) to take a deeper look into rights to "the commons." They explore diverse sources of authority over the management of resources as commons and the allocation of access rights therein. They find diverse sources of authority play a role in legitimizing rights to the commons – from membership of a group to state action, informal community action, and projects – with customary law and practice continuing to be the most common source of legitimacy. They also illustrate some of the negative consequences of the closure of the commons and of the imposition of statutory laws which discredit customary practices.

The opening chapter in Part III, by Judith de Wolf, focuses on agroforestry research in Malawi. The author argues that although there has been a significant recognition of farmer driven research over the years, this has often been at the level of rhetoric, with the predominant approach remaining "technical".

Farmers' practices, experimentation, knowledge, and interests are neither analyzed nor taken seriously. The next chapter, by Barun Gurung, explores how deeply ingrained attitudes of scientists about themselves and others shape research practice. He uses a set of logical arguments and examples to illustrate how researchers construct and actively legitimate particular sets of beliefs about the world, which in turn shape the ways in which social and technological phenomena are articulated and hence addressed. This chapter questions the basic assumption that research is an objective process, and argues instead that deeply embedded attitudes or "social realities" of research practice powerfully determine the process and outcomes of research. The chapter by Ritu Verma, Diane Russell, and Laura German highlights the struggle faced by social scientists in institutions dominated by biophysical researchers and perspectives, through a detailed analysis of the status and practice of social science in the Consultative Group on International Agricultural Research (CGIAR). In describing the history and power struggles associated with genuine interdisciplinary collaboration, they highlight the critical importance of ensuring that diverse disciplines have equal power to define the problems of development and their solutions. Faced with battles over what qualifies as "science", whose interpretations count, and what resources get allocated to what area of research, they illustrate the power relations and ideological assumptions underpinning science and scientific practice. The final chapter in the volume, by the late Patrick Sikana, uses Zambia's experience with the institutionalization of farming systems research to explore the individual, institutional, and political limitations to participatory research. By demonstrating various ways in which the development agenda is predetermined by other, more powerful interest groups, he illustrates that participation is often a smokescreen to lend legitimacy to external interventions, where the primary concern of local people is how to access resources from the project.

Concluding Remarks: Towards Interdisciplinary Perspectives in Research and Development

This volume seeks to highlight the myriad ways in which knowledge, culture, and relations of power shape the institutionalized discourses, ideologies, and practice of "development", as well as the everyday natural resource management practices of local women and men. By profiling some of the challenges and "mis-adventures" associated with past and current development approaches and practice, presenting strands of theory that can help to make sense of these realities, and then providing concrete recommendations for moving beyond them – we hope to reach out beyond the borders of our discipline(s) in a way that is meaningful and valuable to others. In particular, we hope to make social science theory, the challenges faced by sociocultural scientists working in arenas dominated by other disciplines, and the potentially unique contributions social science can make to agriculture and natural resource management more intelligible to biophysical scientists, development practitioners and those exploring the sociocultural sciences as a possible career path. Our ultimate objective is to strengthen the role that social science can play in putting development more in the hands of the people it is intended to serve by supporting more constructive and fruitful multidisciplinary and multiactor collaboration, and a more rigorous engagement with cutting edge science in our own fields.

Rising food and fuel prices, rapid globalization, climate change, and increasing competition between local people and corporate actors over critical (and increasingly scarce) resources and agricultural land are a few of the many urgent challenges facing farmers and other resource users in developing countries. Critiques of failed development approaches and projects of the past illustrate both the subjective nature of development approaches and the profound, unintended, and often negative ways in which development interventions affect women, men, and children. Thus, the international development establishment is faced with two significant challenges – redressing the institutionalized weaknesses of (agricultural) research and development, and meeting the increasingly complex challenges of our times. As is both argued and illustrated in the chapters in this volume, meaningful funding and institutionalized support for sociocultural sciences and multidisciplinary teams is a fundamental step in efforts to help identify the most pressing constraints faced by poor rural women and men, the limitations of different development approaches in addressing those constraints, and opportunities for leveraging more meaningful (and equitable) returns from development investments. In order to do so, the proponents of and actors in agriculture and natural resource management initiatives must look beyond approaches heavily dominated by "the biophysical" to integrate questions of culture, knowledge, and power into their thinking and practice. This will enable the development community to better understand people's everyday constraints and needs – and ultimately, to make a difference in the lives of the most vulnerable and marginal individuals, communities and the environments on which they often strongly depend.

References

Abu-Lughod, L. (1993). *Writing women's worlds: Bedouin stories*. Berkeley and Los Angeles, CA: University of California Press.

Abwunza, J. M. (1997). *Women's voices, women's power: Dialogues of resistance from East Africa*. Peterborough: Broadview Press.

Agrawal, A. (1995). Dismantling the divide between indigenous and scientific knowledge. *Development and Change, 26*, 413–439.

Amanor, K. S. (1994). *The new frontier: farmers' response to land degradation: A West African study*. London: Zed Books.

Antweiler, C. (1998). Local knowledge and local knowing: An anthropological analysis of contested 'cultural products' in the context of development. *Anthropos, 93*, 469–494.

Atran, S. (1990). *The cognitive foundations of natural history: Towards an anthropology of science*. Cambridge: Cambridge University Press.

Barabasi, A. L. (2002). *Linked: The new science of networks*. Cambridge: Perseus.

Berkes, F., Colding, J., & Folke, C. (2002). *Navigating social–ecological systems: Building resilience for complexity and change*. Cambridge: Cambridge University Press.

Bigombé Logo, P. (2003). The decentralized forestry taxation system in cameroon: local management and state logic. *Environmental governance in Africa working paper No. 10*. Washington, DC: WRI.

Bourdieu, P. (1998). *Practical reason: On the theory of action*. Cambridge, MA: Polity.

Brockington, D. (2007). Forests, community conservation, and local government performance: The village forest reserves of Tanzania. *Society and Natural Resources, 20*, 835–848.

Carney, J. (1991). *Black rice: The African origin of rice cultivation in the Americas*. Cambridge, MA: Harvard University Press.

Carney, J., & Watts, M. (1990). Manufacturing dissent: Work, gender and the politics of meaning in a peasant society. *Africa, 60*(2), 207–241.

Casson, A. (1997). The controversy surrounding eucalypts in social forestry programs of Asia. *Resource management in Asia-Pacific working paper No. 3*. Canberra: Research School for Pacific and Asian Studies, The Australian National University.

Cernea, M. M. (2005). Studying the culture of agriculture: An uphill battle for social research in the CGIAR. *Culture and Agriculture, 27*(2), 73–87.

Cernea, M. M., & Kassam, A. H. (Eds.). (2006). *Researching the culture in agri-culture: Social research for international development*. Wallingford: CABI.

Chagnon, N.A. (1966). *Yanomamö warfare, social organization and marriage alliances.* Ph.D. Dissertation. Ann Arbor, MI: Department of Anthropology, University of Michigan.

Chambers, R., Pacey, A., & Thrupp, L. A. (1989). *Farmer first: Farmer innovation and agricultural research*. London: Intermediate Technology Publications.

Clark, A. E., & Fujimura, J. H. (Eds.). (1992). *The right tools for the job: At work in the twentieth-century life sciences*. Princeton, NJ: Princeton University Press.

Colfer, C. J. P., & Capistrano, D. (Eds.). (2005). *The politics of decentralization: Forests, power and people*. London: Earthscan.

Cowan, M., & Shenton, R. (1995). *Doctrines of development*. London and New York, NY: Routledge.

Cunningham, A. B. (2001). *Applied ethnobotany: People, wild plant uses, and conservation*. London: Earthscan.

De Walt, B. R. (1994). Using indigenous knowledge to improve agriculture and natural resource management. *Human Organization, 53*(2), 123–131.

Dove, M. (1983). Theories of swidden agriculture and the political economy of ignorance. *Agroforestry Systems, 1*, 85–99.

Dove, M. (1993). A revisionist view of tropical deforestation and development. *Environmental Conservation, 20*(1), 17–25.

Ellen, R. F., Parkes, P., & Bicker, A. (Eds.). (2000). *Indigenous environmental knowledge and its transformations*. Amsterdam: Harwood Academic.

Evans-Pritchard, E. E. (1940). *The Nuer: A description of the modes of livelihood and political institutions of a nilotic people*. Oxford: Clarendon.

Fairhead, J., & Leach, M. (1995). False forest history, complicit social analysis: Rethinking some Western African environmental narratives. *World Development, 23*(6), 1023–1035.

Fairhead, J., & Leach, M. (1996). *Misreading the African landscape*. Cambridge: Cambridge University Press.

Ferguson, J. (1994). *The anti-politics machine: "Development", depoliticization, and bureaucratic power in Lesotho*. Minneapolis, MN/London: University of Minnesota Press.

German, L., Charamila, S., Tesema, T. (in press a). Managing trade-offs in agroforestry: from conflict to collaboration in natural resource management. In: S. Klappa & D. Russell (eds.), *Transformations in agroforestry systems*. Oxford/New York: Berghahn Books.

German, L.A., Ruhweza, A. Mwesigwa, R. (in press b). Social and environmental footprints of carbon payments: a case study from Uganda. In: L. Tacconi, S. Mahanty and H. Suich (eds.) Livelihoods in the REDD?: Payments for Environmental Services, Forest Conservation and Climate Change. Cheltenham: Edward Elgar.

Gezon, L.L. and S. Paulson (2001) Place, Power, Difference: Multiscale Research at the Dawn of the Twenty-first Century. In: S. Paulson and L.L. Gezon (eds.), *Political Ecology Across Spaces, Scales and Social Groups*, pp. 1–16. New Brunswick: Rutgers University Press.

Goldman, M. (2003). Partitioned nature, privileged knowledge: Community-based conservation in Tanzania. *Development and Change, 34*(5), 833–862.

Gupta, A., & Ferguson, J. (1997). Culture, power, place: Ethnography at the end of an era. In A. Gupta & J. Ferguson (Eds.), *Culture, power, place: Explorations in critical anthropology* (pp. 1–29). Durham, NC: Duke University Press.

Hayward, C. R. (2004). *Doxa* and deliberation. *Critical Review of International Social and Political Philosophy, 7*(1), 1–24.

Hecht, S., & Cockburn, A. (1989). *The fate of the forest: Developers, destroyers and defenders of the Amazon*. London: Verso.

Hindman, H. (2002). The everyday life of American development in Nepal. *Studies in Nepali History and Society, 7*(1), 99–136.

Hlambela, S., & Kozanayi, W. (2005). Decentralized natural resources management in the Chiredzi district of Zimbabwe: Voices from the ground. In C. J. P. Colfer & D. Capistrano (Eds.), *The politics of decentralization: forests, power and people* (pp. 255–268). London: Earthscan.

Kandiyoti, D. (1988). Bargaining with patriarchy. *Gender and Society, 2*(3), 271–290.

Keeley, J., Scoones, I. (1999). Understanding environmental policy processes: a review. *IDS Working Paper 89*. Brighton: Institute of Development Studies.

Knorr-Cetina, K. (1981). *The manufacture of knowledge: an essay on the constructivist and contextual nature of science*. Oxford: Pergamon.

Kull, C. A. (2004). *Isle of fire: The political ecology of landscape burning in Madagascar*. Chicago, IL and London: The University of Chicago Press.

Lansing, S. (1987). Balinese "Water Temples" and the management of irrigation. *American Anthropologist, 89*(2), 326–341.

Lansing, S. (1991). *Priests and programmers technologies of power and the engineered landscape of Bali*. Princeton, NJ: Princeton University Press.

Latour, B. (1987). *Science in action: How to follow scientists and engineers through society*. Milton Keynes: Open University Press.

Latour, B. (1990). Postmodern? No, simply amodern! Steps towards an anthropology of science. *Studies in History and Philosophy of Science, 21*(1), 145–171.

Latour, B. (1996). *Aramis or the love of technology*. Cambridge and London: Harvard University Press.

Latour, B., & Woolgar, S. (1979). *Laboratory life: The social construction of scientific facts*. Princeton, NJ: Princeton University Press.

Law, J., & Mol, A. (Eds.). (2002). *Complexities: Social studies of knowledge practices*. Durham, NC: Duke University Press.

Long, N. (1989). *Encounters at the interface: A perspective on social discontinuities in rural development*. Wageningen: The Agricultural University.

Long, N. (2001). *Development sociology: Actor perspectives*. London and New York, NY: Routledge.

Long, N., & Long, A. (1992). *Battlefields of knowledge: The interlocking of theory and practice in social research and development*. London: Routledge.

Mackenzie, F. (1995a). "A farm is like a child who cannot be left unguarded": Gender, land and labour in central province, Kenya. *IDS Bulletin, 26*(1), 17–23.

Mackenzie, F. (1995b). Selective silence: A feminist encounter with environmental discourse in colonial Africa. In J. Crush (Ed.), *The power of development* (pp. 100–112). London and New York, NY: Routledge.

Mackinson, S., & Nottestad, L. (1998). Combining local and scientific knowledge. *Reviews in Fish Biology and Fisheries, 8*(4), 481–490.

Mead, M. (1949 [1928]). *Coming of age in Samoa: A psychological study of primitive youth for western civilisation*. New York, NY: Mentor Book.

Moore, D. (1993). Contesting Terrain in Zimbabwe's eastern highlands: Political ecology, ethnography and peasant resource struggles. *Economic Geography, 69*, 380–401.

Mosse, D. (2005). *Cultivating development: An ethnography of aid policy and practice*. London and Ann Arbor, MI: Pluto.

Mudimbe, V. (1988). *The invention of Africa: Gnosis, philosophy and the order of knowledge*. London: James Currey.

Munk Ravnborg, H., & Ashby, J. A. (1996). Organising for local-level watershed management: Lessons from Rio Cabuyal watershed, Colombia. *AgREN Network Paper, 65*, 1–14.
Niamir-Fuller, M. (Ed.). (1999). *Managing mobility in African rangelands: The legitimization of Transhumance*. London: Intermediate Technology Publications.
Nuijten, M. (1992). Local organization and organizing practices: Rethinking rural institutions. In N. Long & A. Long (Eds.), *Battlefields of knowledge: The interlocking of theory and practice in social research and development* (pp. 189–207). London: Routledge.
Oyono, P.R., Ribot, J.C., Larson, A.M. (2006). Green and black gold in rural cameroon: natural resources for local governance, justice and sustainability. *Environmental Governance in Africa working papers No. 22*. Washington, DC and Bogor: WRI and CIFOR.
Pickering, A. (1999). *The mangle of practice: Agency and emergence in the sociology of science*. New York, NY: Routledge.
Pottier, J., Bicker, A., & Sillitoe, P. (2003). *Negotiating local knowledge: Power and identity in development*. London: Pluto.
Purcell, T. W. (1998). Indigenous knowledge and applied anthropology: Questions of definition and direction. *Human Organization, 57*(3), 258–272.
Ramisch, J. J., Misiko, M. T., Ekise, I. E., & Mukalama, J. B. (2006). Strengthening 'folk ecology': Community-based learning for integrated soil fertility management, western Kenya. *International Journal of Agricultural Sustainability, 4*(2), 154–168.
Ribot, J. (2009). Forestry and democratic decentralization in Africa: a rough review. In: L. German, A. Karsenty and A.-M. Tiani (eds.), *Governing Africa's forests in a globalized world*, pp. 29–55. London: Earthscan.
Robbins, P. (2004). *Political ecology: A critical introduction*. Oxford and Cambridge: Blackwell.
Rocheleau, D. (2003). Participation in context: What's past, what's present, and what's next. In B. Pound, S. Snapp, C. McDougall, & A. Braun (Eds.), *Managing natural resources for sustainable livelihoods: Uniting science and participation* (pp. 169–183). London: Earthscan.
Rocheleau, D., & Edmunds, D. (1997). Women, men and trees: Gender, power and property in forest and agrarian landscapes. *World Development, 25*(8), 1351–1371.
Rocheleau, D., & Roth, R. (2007). Rooted networks, relational webs and powers of connection: Rethinking human and political ecologies. *Geoforum, 38*, 433–437.
Rocheleau, D., Thomas-Slayter, B., & Wangari, E. (1996). *Feminist political ecology: Global issues and local experiences*. London and New York, NY: Routledge.
Schroeder, R. A. (1993). Shady practice: Gender and the political ecology of resource stabilization in gambian garden/orchards. *Economic Geography, 69*(4), 349–365.
Schroeder, R. A. (1995). "Gone to their second husbands": Marital metaphors and conjugal contracts in the Gambia's female garden sector. *Canadian Journal of African Studies, 30*(1), 69–87.
Scott, J. C. (1985). *Weapons of the weak and everyday forms of peasant resistance*. New Haven, CT and London: Yale University Press.
Scott, J. C. (1990). *Domination and the arts of resistance: Hidden transcripts*. New Haven, CT: Yale University Press.
Scott, J. (1998). *Seeing like a state: How certain schemes to improve the human condition have failed*. New Haven, CT: Yale University Press.
Shiva, V. (Ed.). (1992). *Biodiversity: Social and ecological perspectives*. London: Zed Books.
Sikana, P. (1993). Mismatched models: How farmers and scientist see soils. *ILEIA Newsletter, 9*(1), 15–16.
Sillitoe, P. (1998). The development of indigenous knowledge: A new applied anthropology. *Current Anthropology, 39*(2), 223–252.
Sillitoe, P. (2000). Let them eat cake: Indigenous knowledge, science, and the 'poorest of the poor'. *Anthropology Today, 16*(6), 3–7.
Thébaud, B., & Batterbury, S. (2001). Sahel pastoralists: Opportunism, struggle, conflict and negotiation. *Global Environmental Change, 11*(1), 69–78.

Verma, R. (2001). *Gender, land and livelihoods: Through farmers' eyes*. Ottawa: IDRC.
Verma, R. (2007). At work and at play in the 'fish bowl': gender relations and social reproduction among development expatriates in Madagascar. In A. Coles & A. M. Fechter (Eds.), *Beyond the incorporated wife: Gender and social reproduction among mobile professionals* (pp. 171–192). London and New York, NY: Routledge.
Verma, R. (2009). *Culture, power, and development disconnect in the central highlands of Madagascar.* Unpublished Ph.D. Thesis, London: SOAS.
Verma, R. (2010). Intercultural Encounters, Colonial Discontinuities and Contemporary Disconnects in Rural Aid: An Ethnography of Development Practitioners in Madagascar. In A.M. Fechter and H. Hindman (Eds.), *Living in 'Aidland': The Development System and the Everyday Lives of Aid Workers*. Bloomfield: Kumarian Press.
Villareal, M. (1992). The poverty of practice: Power, gender and intervention from an actor-oriented perspective. In N. Long & A. Long (Eds.), *Battlefields of knowledge: The interlocking theory and practice in social research and development* (pp. 247–267). London: Routledge.
Warren, D. M., Slikkerveer, L. J., & Brokensha, D. (Eds.). (1995). *The cultural dimensions of development: Indigenous knowledge systems*. London: Intermediate Technology Publications.
Watson-Verran, H., & Turnbull, D. (1995). Science and other indigenous knowledge systems. In S. Jasanoff, G. E. Markle, J. C. Peterson, & T. J. Pinch (Eds.), *Handbook of science and technology studies* (pp. 115–139). London: Sage Publications.
Williams, G. (1981). The world bank and the peasant problem. In J. Heyer, P. Roberts, & G. Williams (Eds.), *Rural Development in Tropical Africa*. London: Macmillan.
Willis, P. (1981). *Learning to labour: How working class kids get working class jobs*. New York, NY: Columbia University Press.
Wittman, H., & Geisler, C. (2005). Negotiating locality: Decentralization and communal forest management in the Guatemalan Highlands. *Human Organization, 64*(1), 62–74.
Zimmerer, K. (1997). *Changing fortunes: Biodiversity and peasant livelihood in the Peruvian Andes*. Berkeley, CA: University of California Press.

Part I
Beyond Biophysical Assumptions

Chapter 2
Beyond the Invisible: Finding the Social Relevance of Soil Nutrient Balances in Southern Mali

Joshua J. Ramisch

Abstract The cotton-centered farming system of southern Mali has gained a reputation both as a paragon of successful, cash-crop led development and also as an example of serious soil nutrient depletion ("soil mining"). This chapter engages and critiques the social and developmental implications of the soil mining narrative and the language and methodology of soil nutrient balances that underpins it. By deploying the language of crisis in an "invisible" realm, soil scientists and development practitioners assert claims to control and knowledge of productive resources that would otherwise be the objects of intense social negotiation. The data-intensive calculation process also creates a false sense of precision about the "invisible" world of soil nutrients whose relationship to a social context is unknown or only implied. Examples from field work at the southern frontier of the cotton zone illustrate the partiality of the knowledge conveyed by nutrient balances and reveal the importance of multiple other "invisible" phenomena that were excluded from or could not be easily incorporated into the nutrient balance methodology. In the highly contested terrain of agro-pastoralism, migration, and mobility, these phenomena would include the constantly renegotiated access arrangements to land, labor, and livestock. The social relevance of nutrient balances can therefore only be improved by situating soil fertility within a broader context of environmental and livelihood factors, visible and invisible.

Keywords Soil nutrient balances • Agro-pastoralism • Farmers' knowledge • Livelihoods • Mali • Cotton

---

J.J. Ramisch (✉)
School of International Development and Global Studies (SIDGS), University of Ottawa, Tabaret Hall (Rm 328), 550 Cumberland Avenue, Ottawa, Ontario K1N 6N5, Canada
e-mail: joshua.ramisch@uottawa.ca

L. German et al. (eds.), *Beyond the Biophysical: Knowledge, Culture, and Power in Agriculture and Natural Resource Management*,
DOI 10.1007/978-90-481-8826-0_2, © Springer Science+Business Media B.V. 2010

> How can I know what DT really thinks about his soil? I'm at his place nearly every day and the old man is happy to sit and swap stories about any topic under the moon well after evening prayer, poking at the smouldering fire. But it is as if the two worlds of my waking life are distinct, not only to him but to me: everyone knows I am here to learn about 'our way of life', especially all the networks of borrowing of labour and livestock, and so we talk about the weather, the crops and the [cotton] season and the cattle nearly no matter where we meet … but all these field measurements, these soil and plant samples seem almost *invisible* to someone like D, just my 'dirty little secret': They are constantly dismissed as "le travail des petits enfants", a game that must amuse dear Ziè and Maïga [the author and his Malian counterpart] as much as the kids who always join us, but not something that seems even remotely interesting to the men or their wives and therefore not even worthy of a joke or a sigh.
>
> – Author's journal entry (May 16, 1996)

Introduction: What Soil Fertility Crisis?

Soil science and agronomy have improved understanding of soil fertility by quantifying and rendering "visible" the previously elusive world of soil nutrients as they flow or are deliberately transferred into and out of soils. But choosing to make certain phenomena "visible", through new techniques or research energy, implies that other components within the complex system of soils and agriculture are excluded or simplified by design, dismissed as irrelevant, or overlooked completely. There is nothing automatic about which phenomena are made or are left "invisible": such decisions are the result of the socio-political process by which scientific problems are identified as "do-able". This chapter explores how soil nutrient balances present a particular version of the "sustainability" of soil management practices, and the implications of privileging the biophysical world of soil nutrients over those aspects of soil fertility that are kept "invisible" within nutrient balance calculations. To do so it revisits case study material gathered during the year (1996–1997) that the author spent in a southern Malian community studying agro-pastoral livelihoods, interhousehold exchanges relating to livestock and land management, and their implications for soil fertility.

The soils of southern Mali in the mid-1990s played an important role (for Malian and international researchers) in presenting an apparently looming crisis of "soil nutrient mining": the unsustainable depletion of African soil fertility. Cotton production was booming and cash-crop led development was expanding in Mali beyond its historic home, making cotton the "success story of agricultural and rural development in Mali" (Bingen 1998, p. 271). But critics of this cotton-led development provided compelling, biophysical evidence that its prosperity was built on shaky foundations. Soil nutrient balances, calculated from the total inputs and outputs of both farmer-managed and natural biophysical processes, showed that despite its economic success, Mali's cotton zone as a whole was actually running a substantial deficit of crucial nutrients (van der Pol 1992). Similar, contemporary efforts to quantify the flows of nutrients into and out of African farming systems at the local, regional, and continental levels presented equally gloomy evidence of unsustainable exploitation of African soils (c.f. most notably Stoorvogel and Smaling 1990; Smaling 1993). Such balances are typically derived from data collected in farm or village-level case study areas (Kanté 2001; Smaling 1993; van der Pol 1992; Pieri 1992), reporting nutrient losses that range from just a few kilograms (of nitrogen, for example) per hectare to over a hundred kilograms per hectare. Such analyses have continued to be refined since that time with increasingly sophisticated models, which have attempted to incorporate not only better understanding of biophysical parameters but also to acknowledge the social complexity of agricultural systems (e.g. Rowe et al. 2006).

Soil nutrient studies bolstered the image that agriculture in most developing regions relies heavily on unsustainable "soil mining" practices. This literature forms, in the sense that the term was used by Roe (1991), a powerful development "narrative" that persuasively unites and explains various environmental degradation phenomena using seemingly exhaustive budgets of nutrient inputs and outputs for farming systems. Consequently many articles about African soils begin by citing statements like that of Sanchez et al. (1997, p. 1): "soil fertility depletion in smallholder farms is the fundamental biophysical root cause for declining per capita food production in sub-Saharan Africa". This oft-repeated line presents not only a correlation between negative nutrient balances, soil nutrient depletion, and declining per capita productivity, but also advances a claim that soil depletion and food insecurity are causally linked to declining soil fertility. These claims prioritize certain forms of knowledge – using the detailed analysis of nutrient flows to identify sites of nutrient depletion, for one – and necessarily omit or neglect other forms of knowledge that might impact soil fertility change, crop productivity, or food security. Yet reviews of nutrient balance studies emphasize that rigorous outcomes can be assured by paying sufficient attention to the details of calculations within the balances, believing that social and other sources of complexity have now been mastered by the modeling exercise (Hartemink 2006; Sheldrick and Lingard 2004; Smaling et al. 2002).

There are, of course, numerous critics of nutrient balances and the soil mining narrative they appear to support. Biophysical critics point to the problems of extrapolating from plot-level to regional and continental scales (de Ridder et al. 2004) or the heavy use of regression equations whose validity has still not been tested against empirical measures of actual losses (Færge and Magid 2004). Others bemoan the frequency with which a nutrient budget's quantification of an otherwise complex soil fertility problem is presented as a single, elegant number out of context, divorced from all the uncertainties, parameters, and errors that led to that number (Vanlauwe and Giller 2006; Kanté 2001). Social scientific critiques point out that most nutrient balances fail to account for the diversity of smallholder practices or the myriad ecosystem interactions on typical farms (Scoones 2001; Hilhorst et al. 2000). As a result, nutrient balances are often shown to be of limited social relevance in explaining the complexity of food insecurity and agricultural resilience actually lived by African smallholders (Ramisch 2005; Mortimore and Adams 2001; Mazzucato and Niemeijer 2001; Scoones and Toulmin 1998).

This chapter suggests ways in which the social relevance of nutrient balances can be improved, by situating soil fertility within a broader context of environmental and livelihood factors, visible and invisible. Otherwise, as is the case now, nutrient balances are essentially used as descriptive tools, either to depict the apparent severity of a "soil mining" crisis (Smaling et al. 2002; Gruhn et al. 2000) or to suggest the scale with which this crisis must be resolved through the necessary application of external inputs (Sheldrick and Lingard 2004; Sanchez et al. 1997). This is particularly relevant in the current context of major initiatives, like the Alliance for a Green Revolution for Africa (agra-alliance.org) or the UN Millennium Project, which still rely heavily on a fundamentally biophysical conceptualization and analysis of soil fertility.

We begin with the theory and practice of nutrient budgets as a background to how soil science has constructed and claimed rights over the interpretation of certain "invisible" aspects of the soil. This is followed by a brief overview of the research setting as a context for the methods and the data employed. The heart of the chapter then discusses the visible and invisible aspects of soil fertility knowledge with implications for nutrient balance calculations and illustrates social dimensions of soil fertility that remain "invisible" within, or entirely outside of, the conventional soil science approaches. It concludes with suggestions on how best to reconcile or incorporate the visible and invisible realms.

Making the Invisible Visible

The Theory and Practice of Nutrient Balances

Most of the nutrient balance work on West African and sub-Saharan farming systems has used the model developed by Stoorvogel and Smaling (1990). This model determines net surpluses or deficits of nutrients by measuring and summing all of the "imports" and "exports" of resources from a given plot.[1] This accounting model has obvious parallels with economics, which are invoked by Sanchez et al. (1997, p. 11) who claim an "exact congruence" between the soil science and economic concepts of "capital stocks" and the comprehensive accounting of "service flows" (nutrient fluxes during the growing season).

Ideally the identification of negative nutrient balances should localize farming systems or cropping practices that are "at risk" or indeed already unsustainably in decline. The continental and national level nutrient balances for sub-Saharan Africa (Sheldrick and Lingard 2004; Henao and Baanante 1999; Stoorvogel and Smaling 1990) all deploy their data with an advocacy agenda. Within the economic conceptualization of soil fertility, it appears self-evident that if nutrient exports exceed inputs there will be negative consequences for

[1]A list of flows is discussed below in Table 2.3.

current and future agricultural productivity in the same way that running a budget deficit must negatively impact on the finances of a firm or a nation. African farming systems are observed to be functioning at low levels of productivity, or are suffering declining yields, and the nutrient budgets further demonstrate that these systems are functioning in states of constant nutrient deficits (Henao and Baanante 2006; Pieri 1992).

Knowing the scale of the soil fertility reserves that the systems operate on, these models may estimate a time-frame beyond which present production will cease to be viable, having exhausted the soil resource (van der Pol 1992; Elwell and Stocking 1982). The conclusion is often that these alarming nutrient deficits must be redressed: through massive investments in inorganic fertilizers (World Bank 1996), through more efficient use of local resources, such as livestock (McIntire and Powell 1995), or through combining organic and inorganic approaches (Vanlauwe et al. 2006).

However, for reasons that are explored below, nutrient deficits do not in fact relate strongly either to agronomic productivity or to soil fertility status. Given such weak relationships, attempts to relate negative nutrient balances to food security (as done by UN Millennium Project 2005 or Henao and Baanante 1999) are problematic. It is worth noting that van der Pol (1992), the principle critic of Mali's "unsustainable" cotton sector, points to no current productivity crisis but only the likely threat of a future one. Mali's total cotton production increased through the 1980s and 1990s but expansion of the cultivated area was responsible for roughly 80% of these increases versus 20% accountable to fertilizer use (Berckmoes et al. 1990; Moseley 2005). As we shall see below, the relationship between area expansion (extensification) and input use (intensification) is socially complex with ambiguous impacts on nutrient balances, but these findings led van der Pol to state: "such developments increase the risk of land degradation due to nutrient depletion" (1992, p. 11), representing "a loan [taken] on future production capacity" (1992, p. 23). The much-cited finding from this study was that if these soil nutrients were to be replaced with inorganic fertilizers (the only way they could be given economic value) such an investment would cost 40% of the total income that was then being generated by cotton farming (1992, p. 23).

At the same time, van der Pol was careful to note that a negative balance is "not an automatic recommendation for additional fertilizer" (1992, p. 19). Local crop varieties might not be able to take up increased fertilizer applications, but to the extent that they could, increased yields would in turn increase extraction of soil nutrients. Fertilizer not taken up by crops would likely increase losses to leaching and volatilization. As a result he concludes that "[n]utrient balances cannot be translated directly into practical solutions. Nevertheless, they may constitute an important diagnostic tool, with the power to demystify the consequences of farming for soils, by describing them in a transparent manner" (van der Pol 1992, p. 20). While it is arguable that nothing is actually "demystified" if neither food insecurity nor low per capita agricultural productivity can be meaningfully explained by negative nutrient balances, this has not impeded the drive to make the "soil nutrient mining" crisis visible.

Presenting a Soil Fertility Crisis as a "Do-Able" Problem

The international and national soil and agricultural research organizations that have promoted nutrient cycle and farming system modeling have mobilized support for the creation of a set of clear and fundamentally technical explanations of smallholder agricultural processes. Casting light upon the mechanisms operating within the previously impenetrable realm of soil fertility's organic and mineral processes creates a complex array of new questions that all demand answers, and which must come predominantly from within the biophysical sciences: the nature and (re)formation of soil organic matter, the scale of nutrient transfers within and between (among others) soils and fertilizers (organic and inorganic), crops and their residues, to name just a few (Vanlauwe et al. 2006).

Powerful enough technical tools to support nutrient balance calculations began to come together in the early 1990s: analytic techniques of soil science, but particularly improved computing power and graphical mapping techniques. As Fujimura (1987) notes, however, new technologies alone are not enough to make a problem attractive enough for scientists to consider it "do-able". This process requires the articulation of a clear and pressing problem and necessitates building the capacity and the support of larger networks of actors from the "laboratory" (research institution) level up through the broader, social world of scientific communities, civil society, and policy makers.

Latour (2001) describes such a process when considering the "Pasteur-isation" of France. For Latour, Pasteur's success lay in identifying and promoting the role of invisible "microbes" as the actors behind seemingly unpredictable disease phenomena in the rural world. The "creation" of microbes as a concept – but also their literal culturing from spores in the laboratory setting – gave Pasteur the power to "translate" the previously disparate interests, knowledges, and disease vocabularies of farmers and veterinarians into the common language of a new, laboratory-based science. While this translation did hold a certain power – based on rendering visible for the first time the putative actors behind the most pernicious diseases of rural France – the knowledges and language of these different actors could nonetheless have coexisted without obvious hierarchy, each explaining different components of the world of rural diseases in ways potentially appropriate to the different actors. However, the power of the laboratory was assured when Pasteur was able to deploy the knowledge of microbes to visibly create and control diseases such as anthrax or chicken cholera that had previously eluded effective control by farmers or veterinarians.

A similar process explains how the soil fertility "crisis" in Sub-Saharan Africa was made "visible" by two continent-wide analyses of nutrient depletion (Stoorvogel and Smaling 1990) and land degradation (Oldeman et al. 1991). These studies were heavily cited as national and international actors built the case for "soil fertility" as a "do-able" challenge and helped unite two previously distinct narratives about African soils that had endured since colonial times. On the one hand, the "food-gap" narrative uses scenario models to contrast present trends of consumption based on population, economic, and agricultural production growth to show the future likelihood (taken as inevitability) of significant food deficits. The projections are used to justify further research into improved agricultural productivity per capita or per unit area to avoid this "gap" (Pinstrup-Andersen et al. 1999). On the other hand, the "poverty-degradation" narrative describes a negative, self-reinforcing "nexus" of population growth, poverty, and environmental degradation (Cleaver and Shreiber 1994). The growth rate of Africa's population is here not only leading towards an eventual food gap, but also the driving force behind shortened agricultural fallows, expansion of farming into "marginal areas", which will leave "its agricultural land … increasingly degraded" (Henao and Baanante 1999, p. 1). Together, such ideas reached their greatest expression in the World Bank's 1996 proposal for a Soil Fertility Initiative (SFI) in Africa: "Without restoration of soil fertility, Africa faces the prospect of serious food imbalances and widespread malnutrition and likelihood of eventual famine" (World Bank 1996, p. 1).

Situating the Research

Location and Farming Systems

Lanfiéla was selected as a representative agro-pastoral community of southern Mali for an in-depth study of farmer-herder relations and agroecology. The study area included 89 households and close to 1,500 individuals. A 50% sample was selected (44 households), stratified by the different ethnic sub-regions (Bambara, Minianka, or Fulani) and on the basis of equipment ownership and use (Ramisch 2005). In this chapter, respondents are referred to only by their two- or three-letter initials (e.g. "DT", "BST", etc.).

Cotton was first grown as a cash crop by prominent village families in the early 1960s. The parastatal Compagnie Malienne de Développement des Textiles (CMDT), which organizes input and output supply chains for cotton, expanded its presence in Lanfiéla in the late 1980s in recognition of the crop's growing importance in the sub-humid regions bordering Côte d'Ivoire. In communities such as Lanfiéla, cotton was incorporated into the farming system by increased use of animal draft power (for ploughing, weeding, and drawing carts). Since livestock ownership is far from universal, inter- and intrahousehold exchanges of ploughs, carts, and manure are prevalent within these communities.

In the village and hamlet, the cotton-maize rotation received the bulk of organic and inorganic inputs. Maize-pearl millet intercrops were often interplanted with cowpea or sown in rotation with groundnuts if they did not receive manure inputs. The Fulani households were distinct from the other communities with significantly larger cattle herds (30–300) and smaller cultivated areas, planted largely with pure stands of maize or pearl millet. Since few planted cotton, their access to inorganic inputs was negligible.

Households negotiated with each other year-round to secure access to a range of key resources (Ramisch 1999b, 2005). The exchanges with greatest impact on soil fertility were those made in the dry season to obtain either manure or the means to transport it to household fields. Most documented exchanges were made between members of the same sub-region, although a few took place between ethnic communities. Wet season exchanges concentrated on obtaining ploughs for land preparation or for weeding. Because households negotiated access to equipment that they themselves did not own, the use of animal draft power for cultivation, weeding, and transportation was much greater than the relatively low ownership of ploughs (61%) or carts (25%) would suggest.

Methods and Data Employed

The case study material derives from ethnographic, participant observation of agro-pastoral life and iterative, semi-structured interviews, conducted by the author and a Bambara-speaking assistant over the year 1996–1997. Our work was affiliated with Mali's national agricultural research organization through the Sikasso-based Equipe Systèmes de Production et Gestion des Ressources Naturelles (ESPGRN). Besides the village-based components, data were collected from interviews with Malian and international research scientists.

The research relied on several theoretical strands that were crucial to framing the original research questions of the author's doctoral work in "human ecology", at the intersection of the social and natural sciences. These strands were woven together by the "grounded theory" approach (Glaser and Strauss 1967): an inductive, empirically-driven, and predominantly qualitative methodology that simultaneously proposes and tests its emerging theories. On the one hand, political ecology questions, in the tradition of Blaikie and Brookfield (1987), considered natural resource management within Lanfiéla's historical context of social and political opportunities and constraints. I wanted to disaggregate these contexts to see how they operated at the level of individual actors or groups of actors (Long and Long 1992). On the other hand, the agroecological dimensions of the research concentrated on assessing the nutrient balance impacts of different individual and household practices. These calculations were derived from the NUTMON methodology (Smaling and Fresco 1993) and used participatory resource mapping techniques (Lightfoot et al. 1992) for visually depicting crop and soil management. The pioneering work in Mali on this methodology of mapping and balance calculation (Defoer et al. 1995) was subsequently codified as the "participatory learning and action research" (PLAR) approach for soil fertility (Defoer et al. 2000).

Nutrient Balances and Soil Chemistry

The overall balance of soil nutrients for the study area in 1996–1997 was a moderate deficit (–9.2 kg N ha^{-1}, +0.8 kg P ha^{-1}, –3.4 kg K ha^{-1})[2] (Ramisch 2005, p. 361). Balances calculated at the household level covered a considerable range (+59.8 to

[2] To simplify presentation, only nitrogen balances are used hereafter. Nitrogen is the most limiting nutrient in the region, and the balances of the other nutrients roughly follow the same trends as are seen with nitrogen.

–37.8 kg N ha^{-1}) and varied substantially as a function of households' agronomic decisions – such as the use of soil inputs or the reallocation of crop residues through grazing, transporting, or burning – since these are all explicitly incorporated in the calculation of the balances. However, there were no significant relationships at the household or the field level between the nitrogen balances and any measure of agricultural productivity, whether crop yields or overall biomass production (crop harvests and residues) in the 1996–1997 season or subsequent 1997–1998 season.

Soil chemical analysis in 60 plots gave equally complex, ambiguous findings. Soil nutrient contents did not significantly differ amongst cultivated land of various ages and fallows of 5–20 years (Ramisch 1999a, p. 14). However, soil N was significantly higher on some "home" fields compared to the "bush" and "fallow" fields in the same soil types (Ramisch 2005, p. 363–4). Soil C and organic matter content gave contradictory signals: higher in some older fallows, but otherwise not significantly different across soil types and uses. Other studies in Southern Mali have also found only weak or ambiguous relationships between nutrient balances, cultivation history, and soil fertility status (Benjaminsen et al. forthcoming; Moseley 2005; Kanté 2001).

Entering the Invisible Realm: Soil Fertility, Nutrient Balances, and Decision-Making

Knowing Soil Fertility: The Visible and the Invisible

In Southern Mali, farmers know their soils and their characters viscerally, not just by colour but by their feel and the ease with which they can be worked. Throughout Mali, Bambara speakers distinguish coarse textured *cencen* ("desert sand") from finer textured *bogo* ("mud") soils. They may be white (*-je*), black (*-fin*), or red (*-bilen*). The two local names apparently unique to the study area are also based on soils' visible characters. *Belencongo* ("the trampled soil") refers to the lateritic (*bele-*), white loam surrounding the village itself, once a wide, open plain, whose soils were too heavy and sticky to be cultivated on a large scale until the advent of ox ploughs. The swampy, rice-growing soils are named *nanga bogo* ("the belly mud"), which links the soil's rich-smelling, fertility with the swelling belly of pregnancy.

Beyond these evocative names soil is also the meeting place of the visible and the invisible realm, not just for Malian farmers but for soil scientists. Table 2.1 provides a schema for organizing knowledge for a given group of actors (e.g. local communities or soil scientists) based on both the ease with which phenomena can be observed and as a function of their perceived importance. The harder phenomena are to observe, the more likely that the knowledge about them is more locally held or site specific, and consequently more likely to be disputed or to differ with the knowledge of others, even from within the same group of actors. Scholars of ethnobiology (Bentley and Rodriguez 2001) have used this typology to show that for

Table 2.1 A typology of knowledge for visible and invisible phenomena (Adapted from Bentley and Rodriguez (2001), p. 288 and Bentley and Baker (2005), p. 59)

	Not of perceived importance	Of perceived importance
Easy to observe (more widely held, agreed upon knowledge)	Shallow knowledge ("trivia")	Deep knowledge (complex, widely held or consensual knowledges)
Difficult to observe (more variable, disagreed knowledge)	Disputed, partial, or "erroneous" knowledges	Complex, very variable (site-specific or contested) knowledges
	"Absent" knowledge(s)?	

"important" phenomena, such as the ecology of crop pests, local knowledges and the knowledge of scientist outsiders are most likely to agree on the most easily observed elements (e.g. the visible parts of a pest's life cycle). For harder to observe phenomena, these knowledges are more likely to diverge, each providing frequently very precise and detailed but different explanations, for example, for dormant or migratory pests' behaviors.

In Lanfiéla, respondents made it clear that their knowledge about how to improve crop yields through the use of animal manures, household wastes, and crop residue management constituted both "important" subjects and ones that were predominantly "easy" to observe. Yet site-specific elements, or knowledge arising from personal or family experience, added complexity to even these apparently easily observed practices. For example, many respondents related that ever since their ancestors (of the last century) observed the improved yields on fields where cattle herds had been corralled, manure was known to be valuable but within limits. A middle-aged male respondent voiced the common reservation that "the manure from the large [Fulani] herds that graze in the bush – that is a mixed blessing since you know that the next season you will be busy weeding all those bush seedlings out of your field." The dry season camping of transhumant Fulani and their herds on the cleared village fields was certainly the most visible agro-pastoral arrangement but knowledge about managing such exchanges was monopolized by the most senior and socially influential village households whose fields all had wells where the Fulani would water their calves and draw household water.

For a given actor, or set of actors, the ability and interest invested in observing, developing, or applying knowledge is clearly going to influence and be influenced by the perceived importance, as suggested in Table 2.1. But perceptions of importance are themselves going to be "situated", to use Haraway's term (1991), in a context of an actor's economic and political ability to make use of a resource. Knowledge about the worth and use of the piles (*ton*) of household waste, for example, ranged from the dismissive to the detailed. In general, throughout southern Mali, farmers believe that household waste, composted plant material (such as the harvested residual stems, hay, and stover of various crops), and livestock manure are all equivalent in their fertilizing value, all being described as *nogo* ("manure").

Some households in the study area indeed invested a great deal of energy in treating their *nogoton* as a resource: separating types of "wastes" (food, animal or chicken dung, crop residues, etc.) and managing them to varying degrees (e.g. by digging a pit for them, heaping or turning the waste pile, or covering wastes with leaves). Others treated these wastes purely as "trash" (*nyama* or literally "nonsense") and professed no particular knowledge or interest in them except as a consequence of more or less fastidious cleaning of the home compound area and as a burden that needed occasionally to be removed.

That some households greatly value these household waste piles, and others want only to be rid of them fuelled a healthy trade in interhousehold manure exchange (c.f. Ramisch 1999b, 2005). The inequality that fuels this trade shapes the relative value of knowledge about household wastes and their management. Households without enough labor to move their own waste pile, or who lacked the equipment to do so (e.g. donkey carts), were less likely to invest energy in knowing or managing their waste piles. But just because the knowledge is considered "trivial" does not mean the resource itself is not valued. The most common dry season arrangement was for households borrowing a donkey cart to "pay" half of the transported manure to the cart owner's fields. Cart owners aggressively sought out households that had manure or household wastes to transport, to profit from such a deal. Similarly, households with large *nyamaton* often viewed this arrangement as a way to clear these piles, preferring to use part of this "waste" supply as payment in lieu of scarce cash. Unsurprisingly, the donkey cart was the most coveted asset for many of the smaller, labor-poor households. As one such farmer complained, "Without a cart, the work is harder, everyone is trying to exploit you, and the work is never finished on time!"

Staking a Claim on the Invisible: The Logic of Soil Nutrient Balances

The primary interest of the agroecological research in Lanfiéla was to focus on the lower left quadrant of Table 2.1: the apparently "invisible" realm of soil nutrient cycling that local communities cannot easily observe and, as a consequence, might be undervaluing. Comprehensive nutrient balances were calculated based on values originating from participatory mapping exercises conducted with each household: detailed diagrams of crop and soil management that visually presented the inputs and outputs from every plot and field (c.f. Defoer et al. 2000). The values generated in these exercises were then corroborated by field measurements (e.g. of organic inputs transported to fields or of residues grazed) and validation of harvested or transported amounts.

As Table 2.2 shows, the nutrient flows managed by farmers are predominantly "directly visible". However, the PLAR methodology employed assumes that farmers' management can be improved not only by having their own decisions' impacts made visible in the diagramming process, but also by including the flows that are

Table 2.2 The (in)visibility of nutrient flows influencing soil fertility (Derived from Smaling and Fresco 1993)

	Minor impact on agricultural production	Major impact on agricultural production
Directly visible	Crop residue removals (grazing, stocking, burning)	Inorganic fertilizer, manure, and household wastes (transported), crop rotation, intercropping
Indirectly visible	Legume nitrogen-fixation	Manure from grazing or corralled animals, soil erosion
Invisible	Sedimentation, dust inputs, parent material weathering	Leaching, gaseous losses

only "indirectly visible" (such as the contributions of soil erosion or symbiotic nitrogen fixation) or "invisible" (such as leaching and gaseous losses) (Defoer 2002; Smaling et al. 2002).

There is a powerful and absorbing logic behind these calculations: to accurately quantify crop yields, inorganic or organic inputs, or the fate of crop residues can easily become an all-consuming task given the scale and complexity of the data required to calculate a full balance. The data-intensive demands of nutrient budgeting commits a research team to a treadmill of obligations. The dedication to making each household's agricultural balance sheet of all the requisite variables "visible" (and within an acceptable margin of error) can easily eclipse all other concerns. As I remarked in field notes at the height of the cotton harvest (December 16, 2006), "this constant chase – learning today, while taking measures in MT's field that DS was also harvesting! – becomes so exhausting. It is easy to see why [the research team that had pioneered this technique further north in the cotton zone] had time for nothing else!" The very thorough and seemingly exhaustive list of variables can give the comforting sense that all the biophysical factors are and can be measured. At the same time, the fact that most of the directly visible flows can be decomposed into components that differ based on social groups or socially influenced activities can also provide the apparent sense that the nutrient balance model is sensitive to and can incorporate not just the biophysical but the social dimensions of soil fertility management.

Both the availability and the reliability of such data can be quite problematic, since units of measure are not necessarily standard between (or even within) households, and many of the resource flows are subject to considerable variation in both space and time. Table 2.3 shows that even in a carefully managed data collection exercise many of the potentially largest flows of nutrients in and out of a household's farming system are subject to multiple sources of uncertainty, only some of which can be seen or realistically compensated for. Even conducting regular, weekly interviews and using households' own record keeping would not eliminate the need to rely on recalled or estimated values. Many of the *in situ* observations, either of the fate of crop residues or the application of organic matter, rely on highly subjective assessments of proportions and resource quality. Erosion, another, potentially

Table 2.3 The magnitude, availability, and reliability of data collected for the nutrient balance calculations in Lanfiéla

Variable	Magnitude (kg ha^{-1})	Data Availability		Other considerations?
		Visible?	Reliable?	
OUT1: harvested crop	−27.6 (16–60)	Yes	***	Harvests were spread over extended periods and transported or stored in diverse manners
OUT2: crop residues	−15.7 (0–38)	Yes	**	Ratio of the "available" crop residues to the harvested crop was not necessarily a constant, needed validation
– OUT2a: stocked residues	−1.2 (0–10)	Yes	**	Residues stocked as animal feed were reasonably easily recalled, but local measures are by volume, not (dry) weight
– OUT2b: composted residues	−1.4 (0–15)	Yes	**	Residues transported to compost pits were reasonably easily recalled but local measures are by volume, not (dry) weight
– OUT2c: burnt residues	−9.3 (0–22)	Partial	*	Quantified *in situ* after burning, impact subject to major variability (early vs. late burning, incorporated at ploughing, etc.)
– OUT2d: grazed residues	−3.7 (0–20)	Partial	*	Observations usually inferred only from herd size, time of grazing rather than direct measures of removal, tramping
OUT3: leaching	−16.3 (4–47)	No	*	Potentially major output but only estimated by a "transfer" function
OUT4: gaseous losses	−21.7 (10–55)	No	*	Potentially major output but only estimated by a "transfer" function
OUT5: erosion	9.2 (0–37)	Possibly	*	Difficult to quantify without dedicated resources
IN0: residues incorporated	+16.4 (1–56)	Partial	*	A residual calculation of "available residues" minus OUT2
IN1: inorganic fertilizer	+36.1 (0–114)	Yes	****	As a purchased input, quantities are easily known, but application methods (broadcasting, pocket planting, etc.) have important impacts on plant uptake, leaching, gaseous losses
IN2: organic fertilizer	+20.7 (0–209)	Yes	**	Quantities of transported material relatively easily known, although local measures are by volume, not (dry) weight; resource quality will be highly variable (household waste, compost, fresh vs. dried manure, etc.); manure from corralled herds harder to assess
IN3: atmospheric deposition	+8.5	No	*	Calculated by "transfer" function (flat rate for entire study site)
IN4: symbiotic fixation	+2.2 (0–11)	No	*	Calculated by "transfer" function

"Magnitude": The average value of the given flux in 1996–1997 calculated at the household level, with the maximum and minimum household values given in brackets below.
"Reliability": A qualitative assessment from most "****" to least "*" reliable as a function of potential errors in data collection, validity of measures, quality of secondary data, or relevance of the regression equations used in the "transfer functions".

important loss of nutrients is complicated and site-specific enough to merit an all-consuming study of its own and in even the best nutrient balance calculations is typically estimated from fairly rough field observations and comparison with the few local or regional studies (if they exist at all). Finally, it is worth noting that two of the largest probable losses of nutrients, through leaching or gaseous means, are not only invisible but can be estimated only on the basis of predictive equations (so-called "transfer" functions). These functions are derived from a relatively limited number of small-scale, soil science studies under controlled conditions but represent the most tangible claim that soil scientific knowledge makes upon the invisible realm (Færge and Magid 2004).

"We Don't See What You See": Farmers Assess the Nutrient Balances

As Table 2.3 shows, the more invisible, "biophysical" transfers were on average at least as large a removal of nutrients as that represented by the visible, harvested products. They were also large enough to account for the overall negative nitrogen balance of the sample, as well as the negative balances of many individual fields and households (Ramisch 1999a, p. 13). In their absence, balances calculated using only the visible components of the system (so called "management-only" or "partial balances") would likely be positive. This has been the case with "partial balances" calculated by other authors elsewhere in southern Mali (Kanté 2001; Defoer et al. 1995). The "full" balance of the soil scientist's knowledge is therefore directly at odds with the visible, "management-only" balance, with all the presumptions of greater authority and more comprehensive knowledge that the term "full" entails.

Respondents were often perplexed during the feedback sessions to see the fields and the systems that they felt were the most productive being portrayed by the mapping and nutrient balance exercises as running the largest deficits. This included not only the most heavily fertilized or manured cotton fields, but also fields that been recently cleared from fallow and not manured, on the assumption that they were still "inherently" fertile (something which does not show up as in "input" in Table 2.3). While the relationship between system inputs and outputs might have been clear-cut under the conditions of a managed agronomic trial, in the actual farms fertilizer or manure inputs were no guarantee of improved yields or of a positive nutrient balance at the end of the season. Examples from the studied households show that a well-fertilized cotton field, planted at an appropriate time and weeded regularly would indeed often yield so prolifically that the nutrient exports far exceeded even the abundant inputs that were also applied (presumably exploiting reserves of soil nutrients). Other cases of strong, negative nutrient deficits could be found amongst unfertilized, unmanured maize or millet fields, whose residues were burned, grazed, or otherwise removed after the harvest (outputs > meagre inputs). By contrast, positive nutrient balances were ironically most evident in situations where manure or inorganic fertilizer was applied, but where prolific weeds, pests, or other factors led to low crop yields and consequently low nutrient exports (inputs > miserable outputs). Only a few fields showed positive nitrogen balances for the supposed “best practices” of input use, residue re-incorporation, and above average crop yields.

This led to many respondents laughing off the “lessons” about sustainability that the nutrient balances were expected to provide. “You are focussing on the wrong things,” said one farmer. The map had no way to depict what he perceived to be the important effects of intercropping maize, millet, and cowpea (“they all eat differently and they take turns growing with the rain”), as well as the residual effects of previous years’ manuring, cotton fertilizer, and even the still-decomposing tree stumps from land clearance. Another comment suggests that the productivity of a given field would never relate back to the nutrient balance of a particular year and had to be understood more broadly:

> “I will get a lot of maize here for a lot reasons. It is not just the soil – this [village soil] was already old soil when I inherited it, after all – or whether we can afford to put fertilizer. If my sons are all here, we catch the rains and we will work the land well. If they are not, and I am old, or tired, or sick, the work will obviously not go well. And some people just have better luck than others. There are just a lot of reasons.”

Which “Invisible” Realm? Soil Nutrients in a Social World

In effect, the participatory dialogue stemming from the nutrient balancing exercise revealed that while the nutrient balancing logic believed that we as researchers had cast light upon important but heretofore “invisible” phenomena, there were multiple dimensions of “soil fertility” (or even “agricultural sustainability”) that were important to our respondents but had remained invisible. Respondents had made decisions, for example, about intensifying their agricultural production (through greater labor or input use on a fixed area), or increasing their production by expanding their cultivated areas (through greater labor use or investment in animal traction). The nutrient balances (either “full” or “partial”) could allow some of the purely biophysical aspects of a single season’s decisions to be modelled, but not in the “right” or “enough” detail to impress farmers or to convince them that the outcomes were useful for planning responses.

To be fair, agroecological researchers would also acknowledge that nutrient balances are only a “snap-shot” of a single season’s practices (Defoer et al. 2000) and can depict “sustainability” or guide decision-making only in a context of existing soil nutrient reserves (Hartemink 2006). Individual researchers at ESPGRN would clarify, as one senior scientist did, that nutrient balances on their own “cannot – and never claim to – be used for [agronomic or land-use] planning at the farm level” (see also Vanlauwe and Giller 2006). However, the idea that negative balances represent a systematic withdrawal of nutrient “capital” that must be replaced underpinned researchers’ statements that nutrient balance calculation nevertheless “allows farmers and researchers to locate and reflect upon their most unsustainable practices” (same ESPGRN scientist). The belief that “there are no historical examples of sustained agricultural development in areas with declining soil fertility” (van der Pol 1992, p. 20) was deeply entrenched and guided the application of the nutrient balancing methodology as a “learning tool”.

The household-level factors that influence soil fertility shown in Table 2.4 can be contrasted with the presentation of nutrient-only factors shown in Table 2.2. “Visible” phenomena in Table 2.4 can all be observed directly in households’ fields but only some of these are incorporated into the nutrient balance calculations, e.g. the direct measurement of certain crop husbandry and waste management practices such as input application or the fate of residues. Other important and “visible” phenomena with significant interhousehold variation are not included: the impacts of crop spacing and intercropping; the timing of planting, weeding, or harvests; or the impacts of crop varieties, weeds, crop pests, or diseases. Their impact is seen only in aggregate, in the overall harvest of crop or crop residues, and cannot be depicted or manipulated in the mapping.

Perhaps the most important “visible” factor, according to respondents, was rainfall – not just total precipitation but the timing, predictability, and spatial distribution of storms. “We are always chasing the rains”, said one respondent, describing how most agricultural tasks like planting and weeding wait for and then must rapidly respond to rainfall. “Too little” or “too much” rain can make working the land difficult, or hamper the timely execution of tasks in ways that have major impacts on crop productivity. Rainfall (and temperature) would also significantly influence leaching and gaseous losses of nutrients in ways that the nutrient balances’ “transfer functions” are only approximating: capturing such impacts would require sophisticated monitoring equipment far beyond the means of the methodology. At a more general level, most of the old farmers would dispute the claim of the soil scientists that crop yields (in terms of kilograms per hectare) have been declining, since the more important, visible trend in Lanfiéla was that of rainfall diminishing and becoming more erratic (cf. Pieri 1992 for similar observations across the Sahel): “In a good year, our land will do at least as well as when I was a boy. Last year (1995–96) we had enough rain, we planted on time, and there was enough [cotton] fertilizer for us apply. But that was a good year.” (BDT)

Table 2.4 The (in)visibility of household-level factors influencing soil fertility

	Minimal intrahousehold variation	Major intrahousehold variation
Visible	Crop varieties; rainfall (onset, duration, frequency, quantities)	Crop husbandry (timing, spacing, weeding); pests, weeds and diseases; manure and household waste management
Invisible	Market prices; quality and variability of purchased inputs	Labor availability and bottlenecks (planting, weeding, harvest obligations; out-migration effects); intensification and extensification decisions; interseason and residual effects (manuring, fertilizer use, burning, land clearance); manuring and grazing arrangements; land tenure; market access

(Synthesis of factors reported by individual and group interviews, Lanfiéla 1996–1997)

The “invisible” factors in Table 2.4 are all factors that respondents used to justify or explain their decisions to intensify or extensify their agricultural production, and were cited as having had an impact on their perceptions of their soils’ fertility. All these factors lie entirely outside the consideration of the nutrient budgets and would have to be gathered through data collection off-farm (e.g. market prices or the quality of inputs), social analysis (e.g. land tenure, labor, manuring or grazing arrangements), or longer term household analysis (e.g. interseason and residual effects of land-use, out-migration). Three case studies from Lanfiéla elaborate on the ways in which factors from the lower right corner of Table 2.4 can put nutrient balances in a broader, social context, considering time, livelihood, and community dimensions.

Case 1. Cotton or Côte d’Ivoire?

BST’s household was one of only four in the sample that relied purely on hoe cultivation, which would place this household in Class “D”, the lowest, “poorest” rank within the CMDT’s wealth ranking. However, their cotton and maize yields in 1996 were both above the village average (1,573 and 1,335 kg ha^{-1} respectively). The head of the household (BST) was justifiably proud that their total cotton harvest put them in the top 40% of income earners, ahead of bigger and better-equipped, plough-owning families. “When my sons were younger we used to hire a plough from [a neighbour], but now we have enough labour to manage on our own.”

The use of this labor is interesting. BST and his four sons worked the land during the planting and weeding part of the year. The two women later helped with the harvest, while two younger children did not work in the fields at all. The eldest son spent a good part of the year in Côte d’Ivoire, doing odd jobs and construction work, but would return for each agricultural season. It was expected that, within a few years, his younger brothers would follow this example, which had been set by BST himself a generation earlier when he was still young and unmarried. “You had to choose between working cotton and Côte d’Ivoire, but when you are young it is no choice at all. Cotton is your father’s [money] and you will always come back to it some day. But in Côte d’Ivoire you can make money of your own, send it home, and make your own life.” The proximity of Lanfiéla to Côte d’Ivoire means that at least half the total population may be absent at any time, involved in migrant labor south of the border. Resident villagers rather pragmatically also justified out-migration as valuable for “reducing the number of mouths to feed” at home. However, many young migrants would be expected to return home to work during the peak agricultural seasons.

This household’s dedication of energy to hoe cultivation yielded an impressive cotton harvest in 1996, but was not able to apply significant amounts of organic or inorganic inputs. As a result, the household nutrient balance was –29.1 kg N ha^{-1} on nearly 5 ha of cultivated land, which ranked the household in the bottom 10% of the sample’s household balances. The eldest son actually did not find this surprising, “Of course we will use our soil: what else do we have here? But it is not as if the money from that cotton is going nowhere, is it?" Many households would describe a cycle of nutrient depletion that would be used to finance new livelihood opportunities, followed by fallowing or later reinvestment in their land (c.f. Scoones 2001). In this household's case, the availability of young male labor during the agricultural season ensured good food and cash crop yields without (for the moment) the need for costly manure or fertilizer expenditures. Out-migration was also reducing the household's costs in Lanfiéla while creating new, livelihood opportunities in Côte d'Ivoire for the younger sons in the near future. Finally, remittances and cotton income were being used to finance two weddings in 1998, representing serious, household investments in a future back in Lanfiéla.

Case 2. Nutrient Balances in Space and Time

DT's household is much older, larger, and more complex than BST's, and illustrates the challenges of accounting for area expansion and crop rotations. The land that he had inherited from his father, which included both a "home" field adjacent to their compound in the village and a smaller "bush" field nearly 2 km away, had been split with two other brothers. These three households continued to pool their labor and the use of their ox ploughs for major agricultural tasks. Many of DT's sons and daughters had migrated to town or to Côte d'Ivoire but with two of the sons returning in 1996, the household proper included 6 men and women actively working on the farm all year long and a further 19 women and children who contributed during weeding and harvest. One of the main projects occupying the household that year was the expansion of its 1.5 ha "bush" field: many trees were felled and burned through the dry season and over 4 ha was initially ploughed. However, this area proved too ambitious for the available labor, even with the two, returned sons and the labor of brothers and nephews. Ultimately only 3.8 ha of the bush field was planted with cotton, millet, and groundnut, and – as that freshly cleared field filled with weeds – barely half that area (2.5 ha) was actually harvested by the end of the year.

Such a scenario illustrates the complexity of agricultural tasks as they are truly executed in a world of unfolding labor bottlenecks, as well as the problems facing a nutrient balance calculation. The decision to "sacrifice" the weediest parts of the farm in the latter part of the rainy season was pragmatic, but leaves social and biophysical justifications for dividing the calculated –38.1 kg N deficit of the "bush" field, for example, against the 2.5 ha harvested (–15.2 kg N ha^{-1}), the 4 ha ploughed (–9.5 kg N ha^{-1}), or the 3.8 ha planted (–10.0 kg N ha^{-1}). Furthermore, whatever nutrient deficit is calculated for 1996–1997 needs to be put in the context of the past and future managements. The typical rotation of maize (fertilized and manured) following cotton is often sufficient to compensate for the apparently large deficits of a cotton season in a given field (Ramisch 1999a, p. 20). In this particular case, DT explained that the "bush" field was still endowed with "energy, fresh from the [cleared] forest" (something the nutrient balance could not calculate) and therefore hadn't received as much mineral fertilizer as the older, "home" field. The household's cotton harvest in 1996 was its largest ever, even if the per hectare productivity of cotton on their land had declined.

The price of mineral fertilizers increased significantly in Mali in the mid-1980s, following the lifting of subsidies under the IMF-led structural adjustment programme. A common response countrywide was the substitution of increased area of cultivation for reduced fertilizer use (Benjaminsen 2001). DT's example suggests that while overall cotton output increased, any drop in per hectare productivity was more associated with the increased labor demands that went unmet on the larger area than to nutrient depletion or to having expanded cultivation onto "marginal" land.

The ability of households to extensify production in Lanfiéla is embedded with a number of "invisible" assumptions, such as land tenure, commodity prices, and the ability of a household to deploy labor or networks to respond. DT, commenting on the decision to expand the "bush" field:

> "That forest was never a place my father or his father farmed, it was a forest! And yes, the hamlet farmers might have one day farmed it but that is not my problem. With the price of cotton this good, it was worth all this work to clear the trees. By god it was work, but now we can use that field for whatever we choose."

This option is much less available further north in Mali's cotton zone, where the landscape is more fully covered by cultivation and forested fallows are scarce. Throughout Mali, land rights are usufruct[3] and available through negotiation with villages' founding lineages. This can add incentives for households with labor resources and/or good elite connections to maximize the area they cultivate, potentially by "claiming" or "borrowing" fallows from less advantaged households (cf. Moseley 2005, p. 50).

Case 3. Nutrient Flows as Social Flows

The third case (DD) involves the founding family of the Fulani settlement, which had the largest cattle herd in the area (343 head in early 1997). They also had a conspicuous abundance of manure produced both in wet season corrals in the uncultivated bush near the home compound, and dry season ones on the household's 5.88 ha crop land. Corralling the herd on the farmland was the preferred means of fertilizing but these branch enclosures were too massive to move often, leaving large parts of the crop land unmanured during the dry season. To fertilize these areas, and to clear out the wet season corrals, DD's household borrowed a cart every year to accelerate the burdensome task of applying (in 1997) 14.63 t of manure. An equal amount was given to the cart owner as payment for the loan of the cart, a "gift" that in 1997 conferred 190 kg N.

This arrangement was viewed as a bit of a prize for any cart owner in the village. Often, if the village chief or another elder's cart was used, it had served to maintain

[3] A household or individual only has the right to *use* the land (i.e. to cultivate it) and cannot buy or sell it. If cultivation ceases it reverts to the lineage and is available for someone else to exploit, so long as the lineage elders support that claim.

solidarity between the Fulawere settlement and the villagers. In 1997, however, the chosen cart owner was the recently arrived head-master of the village school, himself a sedentary Fulani with no animals. To many of the cart-owning villagers, this intraethnic deal seemed too cosy, a subtle rebuff for the previous season's exclusion of Fulani herds from watering at the newly finished village dam.

From the nutrient balancing standpoint, this household was doing extremely well, ending 1996 with a surplus of 59.8 kg N ha^{-1}. However, this did not translate into superior crop yields: weeds flourished as well as the millet and maize, whose yields only matched the area average. Part of this might be due to the dedication of most of the household labor to herd management rather than crop husbandry. From the family's own perspective, though, this was evidence that despite the heavy manure doses "the land grows tired": several years before, they had been selling part of their maize harvest, but could no longer afford to do so in 1995 or 1996. DD felt that inorganic fertilizers would help improve their yield but commented: "We don't grow cotton and so the CMDT has no time for us. We can't get their fertilizers or the [cotton harvest-based] credit to buy them." The strongly positive nutrient balances of these heavily manured fields supported the transfer of nutrients to elite villagers' lands but the exclusion of the Fulani households from the "development" afforded by cotton to the rest of the village was palpable.

Reconciling Invisible and Visible Perspectives: Implications for Research and Policy

Previous critiques of nutrient balances have warned that the data-intensive calculation process creates a false sense of precision about the "invisible" world of soil nutrients whose relationship to a social context is unknown or only implied (Mortimore and Adams 2001; Scoones 2001; Ramisch 1999a; Scoones and Toulmin 1998). The material presented in this chapter confirms the partiality of the knowledge conveyed by nutrient balances by revealing the importance of multiple other "invisible" phenomena that were excluded from or could not be easily incorporated into the nutrient balance methodology. Declining cotton yields (if such a trend was even visible, since overall production continued to grow) could not easily be attributed to soil factors when farmers themselves noted that declining or variable rainfall, or decisions about area expansion and labor bottlenecks were more visibly impinging on productivity. Households such as BST's or DT's who were shown to be running negative balances either believed this was a necessary, temporary measure to fuel other livelihood improvements, or considered that such deficits would be offset by future crop rotations or compensatory soil management. The snapshot of a given season's impacts was therefore easily dismissed as only part of a greater story about any particular household's agricultural or livelihood portfolio. Even positive nutrient balances, such as in DD's case, were no assurance of a "sustainable" system or of good yields given the social precariousness of the pastoral Fulani livelihoods within the cotton-dominated landscape.

To what extent should the factors displayed in Table 2.4 be included in biophysical analyses, such as nutrient balances? In a truly participatory and emancipatory science this question can only be answered by those who are going to use (or to further contribute to) the knowledge such biophysical analyses are intended to generate. In Lanfiéla, initially understood as an "agro-pastoral" community but clearly one where migration and return are even more central to many livelihoods, the factors outlined in Table 2.4 could serve as the basis of a broader set of indicators to describe agricultural or livelihood sustainability. In such a situation, nutrient balances and resource flow mapping might be useful for describing subcomponents of household farming systems, and could be used to compare the impacts of different management decisions by the same actor. With measures of soil nutrient status, balances could also contextualize trends of crop or soil performance (Moseley 2005; Benjaminsen 2001; Kanté 2001). But given the problematic nature of data collection and full balance calculation, it seems unwise to present data generated by nutrient balances to policy makers as conclusive evidence of a soil fertility "crisis" or to guide land-use planning questions, such as whether to continue expanding cotton areas, either locally or at more regional levels.

It is true that nutrient balancing methodologies and models have advanced considerably in the ten years since I first worked in southern Mali. The NUTMON methodology, for example, has evolved from a focus on farm-level nutrient management to a methodology now called "MonQi": a "multi-scale, multidisciplinary" monitoring and evaluation tool that considers not only soil nutrients but financial and "environmental" analyses of farm livelihoods (MonQi.org). Other, recent modeling efforts (e.g. Rowe et al. 2006) have also included livelihood components and labor submodels even while attempting to resolve uncertainties within the biophysical components. Such models bring ever greater data demands and still rely, as NUTMON or PLAR did, upon assumptions and simplifications of subcomponents that are outside of the focus of "visibility". The alternative approach is to restrict nutrient balance calculations to purely biophysical phenomena, tracking for example the nutrient demands and uptake of alley-cropped trees and maize (Radersma et al. 2004). While certainly of use to agronomists or plant breeders, choosing to treat soil fertility only in terms of mineral nutrients is unlikely either to interest farmers or policy-makers, or to lead to a broader understanding of the complex ecologies of agricultural landscapes.

The power of the nutrient mining narrative lies in appearing to make visible an explanatory mechanism for a broader crisis of food insecurity and rural poverty in Africa. The danger of this narrative lies in taking the nutrient flows it has made "visible" and letting them eclipse everything else: assuming, for example, that redressing soil nutrient imbalances is the "entry point" to boosting agricultural productivity and halving hunger by 2015 (UN Millennium Project 2005, p. 107). This case study does not dispute the existence of Africa's livelihood or environmental problems, but cautions that simply casting light upon a particular, biophysical component of soil fertility does not necessarily reveal the true nature of something so complex. Each nutrient balance "snapshot" of a household's farming system is already only a partial reflection of that system's sustainability with social parameters and forces essentially excluded from the balance calculation. Scaling up or aggregating such snapshots to the community, regional, or (inter)national level will only further distort any interpretation of what is made "visible" and what is not in any given analysis.

References

Benjaminsen, T. A. (2001). The population–agriculture–environment nexus in the Malian cotton zone. *Global Environmental Change, 11*, 283–295.

Benjaminsen, T. A., Aune, J. B., & Sidibé, D. (forthcoming). A critical political ecology of cotton and soil fertility in Mali. Accepted by *Geoforum*.

Bentley, J. W., & Baker, P. S. (2005). Understanding and getting the most from farmers' local knowledge. In J. Gonsalves, T. Becker, A. Braun, D. Campilan, D. De Chavez, E. Fajber, M. Kapiriri, J. Rivaca-Caminade, & R. Vernooy (Eds.), *Participatory research and development for sustainable agriculture and natural resource management: A sourcebook* (Understanding participatory research and development, Vol. I, pp. 58–64). Ottawa, Canada: International Potato Centre-Users' Perspectives with Agricultural Research and Development, Laguna, Philippines and International Development Research Centre.

Bentley, J. W., & Rodriguez, G. (2001). Honduran folk entomology. *Current Anthropology, 42*(2), 285–301.

Berckmoes, W. M., Jager, E. J., & Koné, Y. (1990). *L'intensification agricole au Mali sud: Souhait ou réalité* (p. 40). Amsterdam: Royal Tropical Institute (KIT). Bulletin 318.

Bingen R. J. (1998) Cotton, democracy and development in Mali. *The Journal of Modern African Studies*, 36, 265–285.

Blaikie, P. M., & Brookfield, H. (1987). *Land degradation and society* (p. 296). London: Methuen.

Cleaver, K. M., & Shreiber, G. A. (1994). *Reversing the spiral – The population, agriculture, and environment Nexus in sub-Saharan Africa*. Washington, DC: The World Bank.

de Ridder, N., Breman, H., van Keulen, H., & Stomph, T. J. (2004). Revisiting a 'cure against land hunger': Soil fertility management and farming systems dynamics in the West African Sahel. *Agricultural Systems, 80*, 109–131.

Defoer, T. (2002). Learning about methodology development for integrated soil fertility management. *Agricultural Systems, 73*, 57–81.

Defoer, T., Budelman, A., Toulmin, C., & Carter, S. E. (2000). Building common knowledge. Participatory learning and action research (Part I). In T. Defoer & A. Budelman (Eds.), *Managing soil fertility in the tropics. A resource guide for participatory learning and action research*. Amsterdam: Royal Tropical Institute (KIT).

Defoer, T., Hilhorst, T., Kanté, S., & Diarra, S. (1995). Analysing the diversity of farmers' strategies. *ILEIA Newsletter, 11*(2), 9–11.

Elwell, H. A., & Stocking, M. (1982). Estimating soil life-span for conservation planning. *Tropical Agriculture (Trinidad), 61*(2), 148–150.

Færge, J., & Magid, J. (2004). Evaluating NUTMON nutrient balancing in sub-Saharan Africa. *Nutrient Cycling in Agroecosystems, 69*, 101–110.

Fujimura, J. H. (1987). Constructing 'do-able' problems in cancer research: Articulating alignment. *Social Studies of Science, 17*, 257–293.

Glaser, B. G., & Strauss, A. L. (1967). *Discovery of grounded theory. Strategies for qualitative research* (p. 271). New York: Aldine Publishing Co.

Gruhn, P., Goletti, F., & Yudelman, M. (2000). Integrated nutrient management, soil fertility, and sustainable agriculture: Current issues and future challenges. *Food, Agriculture and Environment Discussion Paper* 32. Washington, DC: International Food Policy Research Institute (IFPRI).

Haraway, D. J. (1991). *Simians, cyborgs, and women: The reinvention of nature* (p. 287). New York: Routledge.

Hartemink, A. E. (2006). Assessing soil fertility decline in the tropics using soil chemical data. *Advances in Agronomy, 89*, 179–225.

Henao, J., & Baanante, C. (1999). Nutrient depletion in the agricultural soils of Africa. *IFPRI 2020 Vision Brief* #62 (Oct 1999). http://www.ifpri.org/2020/BRIEFS/number62.htm.

Henao, J., & Baanante, C. (2006). *Agricultural production and soil nutrient mining in Africa: Implications for resource conservation and policy development*. Muscle Shoals, AL: International Fertilizer Development Center (IFDC).

Hilhorst, T., Muchena, F., Defoer, T., Hassink, J., de Jager, A., Smaling, E. M. A., et al. (2000). Managing soil fertility in Africa: Diverse settings and changing practice. In T. Hilhorst & F. Muchena (Eds.), *Nutrients on the move: Soil fertility dynamics in African farming systems* (pp. 1–27). London: International Institute for Environment and Development (IIED).

Kanté, S. (2001). Gestion de la fertilité des sols par classe d'exploitation au Mali-Sud. *Tropical Resource Management Papers* #38, Wageningen.

Latour, B. (2001). *Pasteur: Guerre et paix des microbes; suivi de irréductions* (2nd ed., p. 363). Paris: La decouverte.

Lightfoot, C., Dalsgaard, J. P., Bimbao, A. M., & Fermin, F. (1992). *Farmer participatory procedures for managing and monitoring sustainable farming systems* (p. 35). Manila, Philippines: International Center for Living Aquatic Resources Management (ICLARM). Contribution No. 892.

Long, N., & Long, A. (Eds.). (1992). *Battlefields of knowledge: The interlocking of theory and practice in social research and development* (p. 306). London: Routledge.

Mazzucato, V., & Niemeijer, D. (2001). Overestimating land degradation, underestimating farmers in the Sahel. Drylands Programme. *Issue Paper* #101. London: International Institute for Environment and Development (IIED).

McIntire, J., & Powell, J. M. (1995). African semi-arid tropical agriculture cannot grow without external inputs. In: J.M. Powell, S. Fernandez-Rivera, T.O. Williams, C. Renard (eds.) *Livestock and sustainable nutrient cycling in mixed farming systems of sub-Saharan Africa.* Conference held at Addis Ababa, (pp. 539–552). Ethiopia, 22–26 Nov 1993. Addis Ababa: ILCA.

UN Millennium Project (2005). *Halving hunger: It can be done*. UNDP, Task Force on Hunger. London: Earthscan.

Mortimore, M., & Adams, W. M. (2001). Farmer adaptation, change, and 'crisis' in the Sahel. *Global Environmental Change, 11*, 49–57.

Moseley, W. G. (2005). Global cotton and local environmental management: The political ecology of rich and poor small-hold farmers in southern Mali. *The Geographical Journal, 171*(1), 36–55.

Oldeman, L. R., Hakkeling, R. T. A., & Sombroek, W. G. (1991). *World map of the status of human-induced soil degradation: An explanatory note*. Wageningen and Nairobi: International Soil Reference and Information Centre and United Nations Environment Programme.

Pieri, C. J. M. G. (1992). *Fertility of soils: A future for farming in the West African savannah.* (translated from French by P. Gething) (pp. 348). Berlin, Germany: Springer.

Pinstrup-Andersen, P., Pandya-Lorch, R., & Rosegrant, M. W. (1999). *World Food Prospects: Critical issues for the early twenty-first century*. Food Policy Report (pp. 32). Washington, DC: International Food Policy Research Institute (IFPRI).

Radersma, S., Otieno, H., Attah-Krah, A. N., & Niang, A. I. (2004). System performance analysis of an alley-cropping system in Western Kenya and its explanation by nutrient balances and uptake processes. *Agriculture, Ecosystems, and Environment, 104*(3), 631–652.

Ramisch, J. J. (1999a). In the Balance? Evaluating soil nutrient budgets for an agro-pastoral village of Southern Mali. *Managing Africa's Soils Series* #9. London: International Institute for Environment and Development (IIED).

Ramisch, J. J. (1999b). The Long Dry Season: Crop–livestock linkages in Southern Mali. Drylands Programme. *Issue Paper* #88. London: International Institute for Environment and Development (IIED).

Ramisch, J. J. (2005). Inequality, agro-pastoral exchanges, and soil fertility gradients in southern Mali. *Agriculture, Ecosystems, and Environment, 105*, 353–372.

Roe, E. (1991). Development narratives' or making the best of blueprint development. *World Development, 19*(Suppl 4), 287–300.

Rowe, E. C., van Wijk, M. T., de Ridder, N., & Giller, K. E. (2006). Nutrient allocation strategies across a simplified heterogeneous African smallholder farm. *Agriculture, Ecosystems, and Environment, 116*, 60–71.

Sanchez, P. A., Shepherd, K. D., Soule, M. J., Place, F. M., Buresh, R. J., Izac, A.-M. N., et al. (1997). Soil fertility replenishment in Africa: An investment in natural resource capital. Chapter 1. In R. J. Buresh, P. A. Sanchez, & f Calhoun (Eds.), *Replenishing soil fertility in Africa* (pp. 1–46). Madison, WI: Soil Science Society of America. Special Publication Number 51.

Scoones, I. (Ed.). (2001). *Dynamics and diversity: Soil fertility and farming livelihoods in Africa* (p. 244). London: Earthscan.

Scoones, I., & Toulmin, C. (1998). Soil nutrient budgets and balances: What use for policy? *Agriculture, Ecosystems, and Environment, 71*, 255–267.

Sheldrick, W., & Lingard, J. (2004). The use of nutrient audits to determine nutrient balances in Africa. *Food Policy, 29*(1), 61–98.

Smaling, E. M. A. (1993). *An ecological framework for integrated nutrient management with special reference to Kenya*. Ph.D. Thesis. Wageningen: Agricultural University.

Smaling, E. M. A., & Fresco, L. O. (1993). A decision-support model for monitoring nutrient balances under agricultural land use (NUTMON). *Geoderma, 60*, 235–256.

Smaling, E. M. A., Stoorvogel, J. J., & de Jager, A. (2002). Decision making on integrated nutrient management through the eyes of the scientist, the land-user, and the policy maker. In B. Vanlauwe, J. Diels, N. Sanginga, & R. Merckx (Eds.), *Integrated plant nutrient management in sub-Saharan Africa: From concept to practice* (pp. 265–283). Wallingford, UK: CAB International.

Stoorvogel, J. J., Smaling, E. M. A. (1990). *Assessment of soil nutrient depletion in sub-Saharan Africa 1983–2000*. Report 28. Wageningen: The Winand Staring Centre for Integrated Land, Soil, and Water Research (SC-DLO).

van der Pol, F. (1992). *Soil mining: An unseen contributor to farm income in southern Mali*. Amsterdam: Royal Institute of the Tropics (KIT). Bulletin *325*, 48.

Vanlauwe, B., & Giller, K. E. (2006). Popular myths around soil fertility management in sub-Saharan Africa. *Agriculture, Ecosystems, and Environment, 116*(1–2), 34–46.

Vanlauwe, B., Ramisch, J. J., & Sanginga, N. (2006). Integrated soil fertility management in Africa: From knowledge to implementation. Chapter 18 in N. Uphoff, A. S. Ball, E. Fernandes, H. Herren, O. Husson, M. Laing, C. Palm, J. Pretty, P. Sanchez, N. Sanginga, J. Thies, (Eds.) *Biological approaches to sustainable soil systems* (pp. 257–272). Boca Raton, FL: Taylor & Francis.

World Bank. (1996). *Natural resource degradation in sub-Saharan Africa. Restoration of soil fertility. A concept note and action plan*. Washington, DC: Africa Region, World Bank.

Chapter 3
The "Demonization" of Rainforest Migrants, or: What Conservation Means to Poor Colonist Farmers

Anne M. Larson

Abstract Poor peasants – particularly rainforest colonists, who were heralded as pioneers until quite recently – are often blamed for the destruction of the world's remaining tropical forests. This chapter uses a political ecology approach to examine rainforest colonization in the buffer zone of Nicaragua's Indio-Maíz Reserve and to demonstrate that the "demonization" of peasant colonists is unjustified. It traces historical, cultural, and economic dynamics in rainforest migration and pasture conversion and examines the land use practices of recent colonists in the context of a dominant conservation discourse and a competing peasant-oriented counter-discourse. It attempts to understand the meanings of conservation to peasants themselves and argues that solutions will only be found when peasants' viewpoints are fully taken into account – requiring integral, multiscale approaches.

Keywords Conservation • Discourse • Nicaragua • Rainforest colonization • Ranching

Introduction

> My mule sloshes stolidly through the knee-deep watery mud. My back, shoulders and even my face are splattered with it, after five hours on the trail. I am travelling from the nearest town with road access out to one of my field sites in Nicaragua's lowland rainforest – or what used to be the rainforest and is now a mosaic of forest, pasture, and agricultural fields. It is November and my first trip to this particular community after seven months of rains have soaked the paths and now-useless roads, making the mud so deep in some places that even a horse couldn't wade through. On a later trip I stumbled, almost literally, across a horse that had gotten stuck in such a hole and was dying there.

A.M. Larson (✉)
Center for International Forestry Research (CIFOR), Aptdo J-148, Managua, Nicaragua
e-mail: a.larson@cgiar.org; alarson@alfanumeric.com.ni

L. German et al. (eds.), *Beyond the Biophysical: Knowledge, Culture, and Power in Agriculture and Natural Resource Management*,
DOI 10.1007/978-90-481-8826-0_3, © Springer Science+Business Media B.V. 2010

> To forget the stiffness in my knees and ankles, I chat with Don Rubén, my guide. Don Rubén turns out to be a member of a sister cooperative of one of the organizations I am studying. 'I understand the cooperatives are interested in taking care of the forest, Don Rubén, but why?'
>
> Don Rubén answers, 'I think it's important to protect an area of forest to leave for my children, so they will learn to appreciate it.'
>
> I am pleasantly surprised by his answer. I wonder why he doesn't want cattle like all the others. 'But what about cattle?' I ask.
>
> Don Rubén gets visibly enthusiastic, 'Oh, yes! It would also be really great to leave them 20 head of cattle!'
>
> – Dialogue between the author and her guide 1999

Although the dynamics surrounding rainforest conversion in agricultural frontiers are clearly due to a complexity of economic, social, and cultural factors and involve both wealthy and poor, commercial and subsistence farmers, in practice it is poor peasants who are often blamed for the deforestation of the world's remaining tropical forests. As de Jong et al. (2006, p. 1) state, "the spectre of landless migrants moving into tropical forests, clear-felling as they go, causing irreversible damage to once-pristine areas, is one of the common images of our time."

Population growth and shifting or "slash and burn" agriculture are the most commonly cited causes of deforestation, in spite of extensive scholarship challenging Malthusian models (Hecht 1985, 2005; Kaimowitz and Angelsen 1998) or pointing out the rationality and even sustainability of shifting cultivation (Okigbo 1984). And both, intentionally or not, are associated with certain moral judgments regarding poverty and "irrational" behavior. In combination with conservation practices such as the establishment of exclusive protected areas (which often see peasants as "the problem"), this has fomented the "demonization" of poor peasant colonists (see also Hirsch 2000; McElwee 2001).

This chapter presents the dynamics surrounding peasant migration in the buffer zone of the Indio-Maíz Reserve in southeastern Nicaragua, principally in the municipality of El Castillo in the Río San Juan province. The region was "re-opened" to migration in the wake of the 1988 peace accords that ended the US-backed Contra war against the Sandinista government, and particularly after the change of administration in 1990. The reserve was established in 1990 in an attempt to stem the tide of migration that was so clearly about to be unleashed. Some peasants were returning to farms previously colonized in the late 1970s and abandoned during the war, but they were joined, over the ensuing decade, by hundreds of new migrants as well.

In the context of a new, dominant conservation discourse surrounding the reserve and projects aimed at stopping deforestation in the buffer zone, a small number of NGOs promoted an alternative discourse based on peasants' rights and economic development with conservation. This chapter explores the meanings of conservation to peasant colonists in light of these competing discourses, economic need and historical and cultural dynamics, by looking at the experiences of peasants working with one peasant-oriented NGO.

The chapter starts from the belief that demonization is made possible by narrow, simplified, and localized perspectives that fail to understand important historical and contextual factors or the viewpoints of colonists themselves. It thus uses a political ecology approach to bring multiple scales and points of view into account. Specifically, it seeks to understand the historical, cultural, and economic context of migration; the dominant conservation discourse and the counter-discourse arising from one project and the peasants who worked with it; and the extent to which the land use practices of these peasants changed or differed from nonparticipants. The chapter argues that effective local alternatives will only be found when colonists' viewpoints are fully understood and taken into account in the search for workable solutions, and that the colonization “problem” will not be solved without integral and multiscale approaches.[1]

This chapter is organized into seven sections, including this one. The following section summarizes literature about agricultural frontier issues and presents the political ecology framework. The third section presents the history of Río San Juan in the Nicaraguan imaginary, and the fourth, the history and driving forces of colonization. The ensuing section discusses the new conservation context for colonization and the resulting demonization of colonists. The sixth section presents the experience of peasant colonists organized in Coopesán and is followed by the conclusions and recommendations.

Theoretical Approaches to Agricultural Frontiers

Literature on agricultural frontiers, prominent in the 1980–1990s, has been largely limited to understanding the push and pull factors of migration and explaining why colonists deforest. Recent works have gone beyond these categories to examine the characteristics of migration and migrants (de Jong et al. 2006), their relationships to conservation and development projects and discourses (Nygren 2000), new developments that challenge previous policy approaches (Hecht 2005), and frontier institutions and violence (Kaimowitz 2002).

This analysis is informed by three additional bodies of literature on the relationship between poverty and degradation, protected areas, and political ecology. As mentioned earlier, the poor are often blamed for forest (and other environmental) degradation, although numerous studies have demonstrated this view to be far too simplistic.

[1]The analysis presented here is based on dissertation research conducted between 1995 and 2000 (see Larson 2001). In particular, this paper draws on interviews conducted during two field visits to the community of San Ramón in 1998 and 1999, including: extensive interviews with key informants in the peasant cooperative Coopesán and in the community, in-depth case studies (semi-structured interviews, including life histories) of 18 coop members from 15 households of varying income levels, and a survey of 21 (out of 50) Coopesán member households and 46 (out of 110) non-member households. Due to mobility problems at the time of the survey, these were not entirely random samples. The author additionally interviewed municipal and relevant central government officers and officials from most of the NGOs working in the region, and also participated in various workshops and meetings with them over a five-year period.

Fairhead and Leach (1996, 1998) have written extensively on external interpretations of environmental change that drive development discourses, particularly in West Africa, and found these interpretations both to differ considerably from local perspectives and to be inaccurate. Literature on swidden agriculture and the use of fire has demonstrated that it can be a rational, productive use of forests (Dove 1983; see also Chapter 5) and that repression of these practices may be a smokescreen for other interests (Kull 2004).

Swinton et al. (2003) find that both the poor and nonpoor deforest, and that incentives are as important as poverty in understanding degradation. Ravnborg (2003) concurs, arguing that blaming poverty rather than the incentive structure serves the interests of the wealthy, by distracting attention from the destruction they cause, and also promotes project interventions rather than necessary changes in incentives.

Geist and Lambin (2002) take a systemic view of deforestation by looking at the interactions and feedbacks among various causal factors. Based on a comprehensive review of 152 subnational case studies, these researchers conclude that synergies among causal factors lead to identifiable patterns that drive tropical deforestation. These include economics, policies, and institutions, and both underlying and proximate factors. They argue, as have many others, that effective policy solutions must be based on a detailed understanding of the particularities of any given location.

The social science literature on protected areas highlights an ongoing tension regarding exclusion and "participation" of resident and neighboring populations. Although it rarely takes into account colonist immigrants except in relation to indigenous populations (see Dressler 2006, for example), this literature has profoundly challenged the view of peasants as "the problem" and promoted participatory and conservation-development alternatives, both on practical and ethical grounds. A recent anthropological review of the consequences of protected areas critiques park projects, including conservation and development projects, for ignoring the role humans have played in shaping the purportedly "pristine" forest environment; failing to take fully into account the effects of park formation on local populations' livelihoods and cultures; and attempting to include local knowledge and practices but without understanding their meaning or consequences (West and Brockington 2006).

There is a natural affinity between the conceptual framework of political ecology and the reality of agricultural frontiers that make it an ideal, if not necessary, analytical tool for understanding the nature of conflicts and decision-making regarding land use in colonization areas.[2] Political ecology is based on four concepts (Gezon and Paulson 2005; see also Paulson et al. 2003). The first is political, economic, and ecological marginality and the extent to which these may interact

[2]It is important to mention that many agricultural frontiers have been long inhabited by indigenous populations prior to the arrival of colonists. This aspect of frontiers will not be addressed in this paper, since indigenous peoples have not lived in the area of this study for over 100 years.

and reinforce each other. The idea of marginality is captured in the very concept of agricultural frontiers, which represent areas at the margins of the institutional setting that characterizes the rest of a nation (Kaimowitz et al. 2003). They are likely to be more violent and politically volatile (see Duncan Baretta and Markoff 1978; Kaimowitz 2002), further from the markets and infrastructure usually needed for a robust economy, and/or ecologically "fragile", especially as forests are cleared and converted to other uses that are often not considered sustainable or desirable.[3] These may be mutually reinforcing as, for example, more powerful economic interests take over political posts and promote land uses that drive out poorer actors.

The second political ecological concept sees resource use, and particularly pressures for overuse, as an outcome of the organization of social relations (Watts 1983). In this case, the decisions made about land use in the frontier are often based on the assertion of claims in relation to other actors. In particular, in many agricultural frontiers land clearing is essential for laying claims to land at least informally if not also formally, although in Nicaragua peasants in general respect a claim with only the clearing of the border around it. Also, social relations of production in out-migration areas may be responsible for the expulsion of poorer residents who move to the frontier in search of land. In other cases, large ranchers may use poor peasants to clear and convert lands to pasture for them (Jones 1990).

Third, political ecology recognizes a plurality of "positions, perceptions, interests, and rationalities" (Paulson et al. 2003, p. 205; see also Peet and Watts 1996). The dominant perception of the advance of agricultural frontiers has shifted dramatically from one that (as recently as the late 1970s in the official documents of multilateral agencies) saw forests as wastelands and conversion as progress (IDB 1977) to one that rejects all forest conversion as deforestation and degradation. The past perception still lives on in the memories of today's colonists, who also come from a position of greater "need" than conservation agencies and NGOs. Numerous interests converge on frontiers as each actor seeks to gain from or "save" the forest and other frontier resources. In fact, again the very nature of agricultural frontiers, which are often perceived and treated as open access resources, attracts a plurality of actors and interests.

Finally, political ecology argues that broader-scale political economic processes shape local processes and vice versa. The effect of the extralocal on the local could not be any clearer than in frontier areas, which are shaped by the immigration of actors from other places, often driven by larger-scale factors such as national economic and development policies. These areas are shaped as well by conflicting interests among conservation efforts with ties to global funding and discourses, these frontier immigrants, the national government, logging companies, and so on.

---

[3]The idea of ecological fragility in frontiers often refers to shallow soils that make them unsuitable for repeated agricultural use, though this is not always the case (see Hecht 2005). Such lands often end up being converted to ranching, the 'sustainability' of which is disputed (Yatsuda Arima and Uhl 1997). Fragile and unsustainable or not, of course, the paramount social, political and ecological issues relate to the greater 'value' placed on rainforests today.

These local processes may, in turn, reshape extralocal processes in various ways, such as through social movements, protests, or the alteration of landscapes that result in the reformulation of national policies.

Fundamentally, political ecology brings to the forefront issues of power and scale in the analysis of local land use and, in our study, places frontier colonists firmly in the context of broader ideological struggles regarding peasants, conservation, and development. In fact, it is only through the *failure* to recognize power and scale issues that it becomes possible to blame poor peasants for deforestation.

Río San Juan in the National Imaginary

> Here, … civilization had taken root. An enterprising German … had made extensive clearings on both banks of the river …. I experienced a feeling of almost triumph in witnessing the enterprise which was thus reclaiming the wilderness. When I first passed up the river, I had contemplated the advent of the axe-bearing pioneer of civilization as an inevitable event, but one which I could hardly hope to witness. A few years only had elapsed, and lo!, the hero of Industry was here … (Squier 1855, p. 59)

Río San Juan, both the river and the region,[4] have occupied an important place in Nicaragua's national imaginary, and the river today is still a centrepiece for national positioning – a kind of periodic ritual chest-beating – in sovereignty battles with bordering Costa Rica (see Rocha 2005). The river took on its symbolic and mythical significance in the 1500s, when Spanish conquistadors began to search for the legendary passage through the American continent that would connect the Pacific to the Atlantic Ocean. Their dream became reality in 1539, when the explorers Adolfo Calero and Diego Machuca found it: the river, thereafter known as the Río San Juan, or San Juan River, that connects Nicaragua's huge lake Cocibolca with the Atlantic (Rabella 1995).

Nicaragua's history has revolved around this river passage (Chamorro 1970). Since Spanish colonization the San Juan has transported explorers and conquistadors, traders and pirates, and soldiers from all sides of several wars that have been decisive in the political and territorial development of the country. The colonial city of Granada was pillaged repeatedly by pirates, including the well-known Sir Francis Drake, who entered by the river passage. The US filibuster William Walker sailed down this river before declaring himself president of Nicaragua, and was defeated on the same waters. The San Juan River became a major passageway for travellers from the east to the west coast of the United States during the California gold rush. Nicaragua "wove its national imaginary" around the idea that nature, or divine providence, had given it the perfect location for an interoceanic canal (Kinlock 1994).

[4] I will refer to the river as the San Juan River and the region, which goes by the same name in Spanish, as Río San Juan.

This romantic history is much more attractive than present-day reality. In spite of the historical, economic, and political importance of the river, the region as a whole and even the riverbanks have been largely abandoned by most national governments. Its abundant natural resources have been considered, until recently, to be an inexhaustible source of unclaimed wealth to be exploited by whomever gets there first.

As markets have boomed – and then sometimes crashed – for certain rainforest products like rubber, *raicilla*,[5] and precious woods, these became the focus of conflict for extractivists, merchants, and companies all scrambling to get the most of these largely open access resources, at the expense of the resources themselves. In some ways similar to the Western frontier of the United States, the dream of a better future attracted poor colonists from the more populated Pacific region, who came in search of land or of jobs with enclave companies, to clear land for cattle ranches (*haciendas*) or to forge their own way as extractivists. "Development" and "progress" meant taming the wilderness and bringing civilization to the jungle by clearing it, as expressed in the Squier quotation at the beginning of this section. As recently as 1977, the Inter American Development Bank, citing a 1970 report, argued that Nicaragua still had ten million hectares of "idle resources" – that is, forests – that could be converted to pasture (IDB 1977).

From the beginning of the colonial era, a particular conception of the relationship between humans and their natural environment prevailed: natural resources were there for the taking. There was a seemingly endless supply of land for the landless, to be converted to productive uses. Forests were for clearing, or for harvesting the best trees and then clearing. Ranching was the region's productive vocation. It should be of no surprise that these ideas of progress are still very much alive among the peasantry today.

Colonization and the Appeal of Ranching

> [The colonization project began in 1965] when 14 landless farmers who were aware of the zone's high potential, with great pioneer spirit moved to the place now called Nueva Guinea, which at that time was only virgin jungle (IAN 1974).

Eastward migration accelerated with the cotton boom on the Pacific coast in the 1950–1960s, and again with the cattle boom of the 1970s (Karliner 1989). Peasant producers were being pushed off their lands to make way for these expanding exports in the hands of large producers. In order to dissipate growing rural discontent and demands for land reform in the Pacific, the Nicaraguan government turned to the frontier as an escape valve, promoting a planned colonization project that included part of Río San Juan. This was to be the center of what was advertised as the largest colonization project in Latin America, with settlements stretching from

[5] *Ipecacuana*, or ipecac root, is used in pharmaceuticals.

Costa Rica to Honduras (IAN 1974; Jones 1990).[6] The oldest residents in the geographical area of interest to this study received agrarian reform titles during this period (Estrada 1997; Estrada et al. 1996).

The Nicaraguan Agrarian Institute (IAN) hardly needed to advertise to promote colonization. A study published by the Ministry of Agriculture and Ranching described colonization as "massive" from the 1960s (Kellerman 1974) until the start of the war against the Sandinista government in the early 1980s. It appears that most people, including government officials, assumed that the ecology of the Atlantic was the same as the Pacific, with the only difference that it rained more. One IAN pamphlet said, "The lands of this region are fertile, and could perfectly well, given the richness of its vegetable layers and the constant rains, produce three harvests annually" (IAN 1974). A rule book for colonists from 1974 states that colonists were required to undertake agricultural and ranching activities.[7]

Peasants who moved into the region in this period report their participation in the extractive enterprises already mentioned, as well as the sale of wild animal pelts, the production of basic grains, and small-scale ranching for family consumption (Estrada 1997; Estrada et al. 1996). They moved to the frontier because they were told it was a place of abundance, where land and wild animals were available to all for the taking, with good virgin soils and ample rainfall. One colonist told me she had heard that the deer would walk right up to you for you to shoot them and that you could "swim in beans" from the harvests. Another marvelled at the quantity of land people were able to claim or buy cheaply. And these pioneers were celebrated (IAN 1974).

Two important changes of particular relevance to this study occurred during the Sandinista period (1979–1990) in the municipality of El Castillo. First, as the counterrevolutionary war proceeded, the government pulled peasants from remote communities into resettlement areas closer to population centers. Second, many peasants from remote communities chose to flee to Costa Rica or join the Contra forces, rather than accept resettlement. The war and the population depletion from rural areas meant that colonization to the rainforest stopped, and forests that had already been cleared in these areas began to recover.

What ensued in 1990, however, was like the breaking of a dam. With the end of the war and the change of government, Río San Juan's former landowners began to return to their war zone farms. Sandinista sympathizers returned from resettlement areas or sent a son to reclaim the family land. Some began clearing and planting as early as 1988. Others returned only to reestablish their claim in order to sell their land to newcomers, who were also beginning to venture into the zone. Refugees returned from Costa Rica; Contra sympathizers came out of hiding.

---

[6]Nevertheless, it turned out that much of the land planned for settlement had already been invaded, hence the colonization program became much more of a titling program than a resettlement project (Jones 1990).

[7]IAN did finally recognize the problems that ensued with annual crop production and began to promote perennials, but too late to have a significant impact (Jones 1990).

In addition, the Chamorro government, like previous governments, used the frontier as a land bank to assuage social problems elsewhere, particularly as compensation for demobilized soldiers from both the Sandinista and Contra armies, as approximately 20,000 counterrevolutionary forces disarmed and 60,000 were laid off from the Sandinista army (Cajina 1995). A flood of new immigrants soon joined the movement of returnees and new agrarian reform beneficiaries. A 1992 study in the buffer zone of the newly established reserve showed 14 new communities, formed after 1989, with an approximate total of 632 families (Offen 1992). By 1995, there were at least three additional communities and a total of more than 1,500 families (Larson 1995).

Important political, economic, and structural changes drove migration during this period. These included the peace process and demobilization of thousands of soldiers, combined with economic structural adjustment policies that left numerous people without jobs, capital, or credit, particularly peasants and small-scale farmers (Maldidier 1993).

By later in the decade, colonists were arriving more often from old frontier areas rather than other parts of the country. Interestingly, these migrants appeared to be carrying on somewhat of a family tradition: their parents or grandparents were pioneers of what had been rainforest earlier in the century. Now these old frontier areas were overrun by pasture. Most of the colonists I interviewed referred to ecological incentives for migration. These included lack of wood for firewood and construction purposes, insufficient rainfall and water sources, pasture invasion of agricultural plots, and spent soils. Many had converted their own lands to pasture, in spite of having no cattle of their own.

Why didn't farmers capitalize their valuable land in other ways that would allow them to stay there? Although the crisis period had more or less passed by the late 1990s, macroeconomic, credit, and development policies still excluded peasants. Resources such as credit and technical assistance were not available for small- and medium-scale farmers to enable them to intensify production on their current plots in such a way that the same land could provide enough food for an increasing number of people as families grew. For ranchers, extensive ranching was still cheaper than intensifying (Larson 2002).

Life experience in the old frontier did not appear to have affected many people's behavior or attitudes upon arriving in the new frontier. Many plan – or at least planned – uncritically to repeat the same pattern. The older generation tends to see the conversion of the forest to pasture as inevitable and desirable. Others contemplate the contradictions – the loss of fertile soil, that is, not the loss of forest *per se* – but see no reasonable alternatives. Many even view the old frontier landscape as desirable, although they could not produce grains there, but hope that this time they will accumulate the cattle that will allow them to be the "winners" this time.

A combination of factors makes forest clearing in the frontier an important form of capital formation in Nicaragua. Population densities in the frontier are low, land is free or cheap, and high population mobility historically has left weak ties to "place". Ranching has been an important path out of poverty for poor farmers. It is a logical alternative in the frontier, in particular where markets are distant and therefore difficult and expensive to access, and land is cheap and available. It is still more profitable, or at least secure, than cropping rainforest soils (Larson 2002).

There are many specific strategies a farmer may use to build the capital necessary to begin developing a cattle herd. These include fattening pigs, migrating temporarily to Costa Rica, or selling timber. The most important strategies centre on land and cattle. By moving to the frontier, a farmer can sell higher priced pasture to purchase cheaper land in the frontier, and still afford a cow and a calf. Land in the frontier can be also be converted to pasture and sold to buy cattle. Clearing frontier forest is viewed as a land "improvement" involving a large labor investment; planting pasture will help keep the weeds and brush from regenerating in the short term. The peasant will sell these investments, or *mejoras*, to a wealthier peasant or rancher, and then move further into the frontier to claim or purchase a cheaper plot, now with extra capital. At the same time, cattle breed more cattle which can be sold to buy more land (Larson 2002).

The colonists arrived in Río San Juan to tell a story about conquering nature. Conquering nature, after all, is not about taking what you can get and moving on, like so many others had done; it is about making something "better". It means bringing "civilization" to the wilderness.

From Pioneers to Modern-Day "Pirates"

> [The peasants] explained that just a few years ago they were being paid to clear the land, … even … with international aid. They were told that they were creating a 'light in the jungle' that would become a model for tropical colonization … [W]hy are the peasants now being blamed? (Offen 1996, p. 7)

Twenty years earlier, there were no apparent contradictions. Pioneers were celebrated, like the "enterprising German" over a hundred years earlier whose axe began to "civilize" the banks of the San Juan River. But by 1990, a new actor had begun to change the entire nature of the conflict. The environmental movement shifted the ground under their feet. Peasant colonists complain that they are the ones now seen as the pirates, the invaders, the pillagers like Francis Drake.

One of the country's most prominent environmentalists and former Environment Minister, Dr. Jaime Incer, was quoted in a national paper saying that burning land for agriculture is savage behavior and only worthy of the most primitive societies, and suggested that peasants burn the land because they are lazy (*La Prensa*, 9 May 1998). The head of an important environmental NGO said that poverty does not justify destruction and that even after years of environmental education, peasants are still showing their ignorance (*La Prensa*, 3 June 1998). Although the image of peasants as "lazy, ignorant savages" is hardly (unfortunately) limited to environmentalists, this attitude – rarely stated so crudely in public – is representative of an important section of those who speak in defence of Nicaragua's forests.

The idea of a binational peace park with Costa Rica, known as the System of Protected Areas for Peace (*Sí-a-Paz*, literally "yes to peace"), was first formally proposed in 1987 by Dr. Incer and a group of specialists and activists.[8] It was timed to coincide with the Esquipulas peace process then under way to seek a negotiated end to the Contra war, and served as a symbol of peace, as well as a sign that Nicaragua was an aware and active participant in this new phase of global concern about environmental problems.

Various laws and agreements establishing *Sí-a-Paz* created 13 different management areas and parks in both Nicaragua and Costa Rica (IRENA/MIRENEM 1991). The most important protected area is the Indio-Maíz Reserve, stretching some 3,000 km^2 in the eastern half of the Río San Juan province. This was established in the most remote area of rainforest in the province, virtually uninhabited since the disappearance of the indigenous people who lived there more than a century before. Nicaraguan law also established a 1,800 km^2 buffer zone to the west (MAG/INRA/IRENA 1991). Although there were important contradictions and even errors in these laws, this framework provided a keystone for the attempted organization of postwar colonization in the region. The idea was to promote sustainable development in the buffer zone while limiting human use of the reserve to scientific research.

Although the Institute for the Environment and Natural Resources (IRENA, now MARENA) saw the country's agroexport model as the cause of rainforest destruction, this was not part of its project analysis, which only addressed the local context. Emphasis was placed on conservation. Although grassroots participation was also emphasized, no peasants participated in the *Sí-a-Paz* Commission, which was set up to oversee the project. Nor did peasants play any role in defining the problem (IRENA/MIRENEM 1991; Jetten and de Vos 1992).

One of the most important aspects of the project was the attempt to regulate land acquisition. As old colonists returned and new colonists flooded into the buffer zone, the mayor's office of El Castillo together with several NGOs tried to organize – or at least keep track of – their arrival. In addition to handing out plots to demobilized soldiers and officers, the Agrarian Reform Institute (INRA) was also put in charge of delineating and titling the lands of old and new colonists. This project was supported by Danish government aid through DANIDA, which, throughout the decade, was a key player in the buffer zone and a primary proponent of the Indio-Maíz Reserve. Titling was intended to help stabilize the population and keep migrants out of the Reserve.

Many parks in Third World countries have been highly controversial because they have restricted access by local residents to traditional hunting and gathering or even agricultural areas. This is not the case of the Indio-Maíz Reserve. That is, the park did not take away resources from already-existing local communities in the municipality of El Castillo. Yet the park remains controversial. In particular, in the perception of peasants, resources *have* been taken away from them. In Nicaragua, land is commonly viewed as a *right*, and the frontier has been that source of land for over 100 years.

---

[8]Costa Rica was not friendly to the Sandinista government and permitted the use of its border lands to harbor counterrevolutionary forces.

The establishment of the park was not the only important effect of the growing environmental movement on southeastern Nicaragua. With the loss of the elections in 1990, hundreds of well-qualified Sandinista professionals lost their government jobs. The nonprofit sector became their alternative, and environment and sustainable development discourse their bread and butter. As of 2000, there were two dozen different NGOs implementing some kind of environmental project in the municipalities of San Carlos and El Castillo alone.

Almost all of the environment and development projects in the region would describe themselves as committed to "sustainable development". Nevertheless, there were important differences. For the majority, the top priority was environmental protection, particularly conservation of resources in buffer zone areas where human settlement is legally permitted, particularly activities that would stop colonization of the core regions of the Reserve. For a few, the primordial concern was the "development" side of the term. The former were more likely to emphasize environmental education that speaks in broad terms about air quality and the regional water supply; the latter were more likely to emphasize specific farm-level advantages to peasant farmers, as well as peasant organization and empowerment.

Several peasants who had returned to San Ramón, one of the communities studied, close to 1990 reported that the first NGOs to arrive appeared totally insensitive to the realities of peasant livelihood needs, even arguing that they should not cut down a single tree. By the late 1990s, however, the conservation organizations appeared to understand that peasants must have clear benefits in order to support their projects. But development concerns were a lower priority than conservation, and only seen as a means to that more important end.

In spite of almost universally proclaimed sensitivity to the plight of colonists, in interviews and informal conversations many NGO and government officials who emphasized conservation priorities expressed little understanding of peasants' economic realities. Pasture conversion and ranching were seen as "cultural backwardness" rather than an economic problem. Hence "development" projects were not aimed at addressing this economic reality. Rather, given overall poverty levels, it was assumed that colonists would (or should) be happy with the relatively small livelihood or nutritional benefits offered by small-scale agricultural diversification schemes.

At the same time, many of these officials easily fell into language similar to that of the environmentalist leaders mentioned at the beginning of this section. Some criticized the purchase and sale of land in the frontier as if constant movement were the norm, and demonized the perpetrators as "speculators" rather than "peasants", as if they were getting rich in some easy and illegitimate way.[9] It is much easier to criticize the peasantry for their behavior if their actions are reinterpreted as speculation rather than understood as economic logic.

---

[9]There were also clearly land speculators, those who made it a business to exact a price from peasants from other regions looking for land and help them move into the reserve. This appears to have involved only a handful of people.

For the peasantry, the problem can be described as follows: they need land on which to produce and/or capital with which to produce, and the frontier presents the best alternative. For virtually everyone else, the problem is a very different one. Stated as neutrally as possible: peasant colonists are clearing tropical rainforest for agriculture and pasture. Less neutrally, depending on who is defining it: peasants are destroying valuable timber or invaluable biodiversity and/or promoting climate change.

In summary, explanations for peasants’ behavior in the frontier can be divided into two categories. Those who are more sympathetic to the peasantry argued one or more of the following:

- Forest clearing is a rational economic decision for peasant colonists.
- Peasants understand that they are destroying the forest, but they are poor and have no alternative.
- Peasants do not understand the ecology of the region.

Those who are more critical of the peasantry argued:

- Peasants are ignorant: they do not understand that they are destroying a valuable resource.
- Peasants are “culturally backward.”
- Peasants have made a lucrative business out of buying and selling frontier lands.

For those concerned about the rainforest, *why* peasants move to the frontier becomes secondary to *what* they do when they get there; hence, conservation efforts focused exclusively on the local arena. For most of these actors, the economy is seen, at best, as an external given that is basically ignored in the local analysis, and “culture” refers to a dichotomy between civilization and barbarism – a dichotomy that associates peasants with the latter. Ironically, of course, taming the wilds and converting rainforest to pasture was precisely the definition of “civilized” – by this *same professional class* – only a short time ago.

Discourses and Counter-Discourses, and Land Use in Practice

> If he’s just clearing [a tree] to clear it, it’s good to punish him, but not if he’s going to use it.
>
> – Coop member

The dominant discourse argued for “saving the forest” and, in particular, protecting Río San Juan’s reserve. Peasants heard, over and over, that the forest is a “source of water, pure air to breathe, shade from the blazing sun, and protection for poor animals who do not have any place to live due to the barbarous deforestation” (Nygren 2000, p. 823). The government’s priority was to enforce the law and keep control over resource rents: keep people out of the reserve, prevent deforestation, and demand permits for extraction of all kinds. The priority of key NGOs was to support this effort, and win peasants’ support, by promoting alternative agricultural products on a small scale, such as coffee, *achiote*, or cocoa. All of the critical arguments with regard to the peasantry, presented above, were heard from both government and heads or employees of these NGOs.

The project presented here is not typical of NGOs in the buffer zone. Far from demonizing peasants, it chose to work with and through them, aiming to base proposals for change on a grounded understanding of their logic of production and worldview – and through a process of respectful negotiation. Although the peasants in this project may not be entirely aware of the names they have been called by others, they – like many other colonists – are fully cognizant that the law, the government, and most other projects have failed to offer viable livelihood alternatives. They view forest conversion as a rational economic decision and many such projects as irrational as well as unjust. This section briefly presents the philosophy of this alternative approach, the project (and later cooperative) members' own view of environmental concerns, and what was possible in terms of altering land use practices. It also demonstrates elements of outside conservation agendas that were not possible to change through this approach in the absence of broader national policies addressing underlying problems associated with the provision of alternative livelihoods.

San Ramón is an isolated frontier community that was first founded in the 1970s, abandoned during the war and repopulated in the 1990s. Its population rose from about 15 families in 1983 (just before fleeing to join the Contras or to refugee camps) to 110 by 1998. It is located just inside the outer edge of the Indio-Maíz Reserve buffer zone, on the western edge of the municipality of El Castillo. The Center for Rural and Social Research, Promotion, and Development (CIPRES) is a national NGO that had a multifaceted project running along the corridor leading from the old frontier area of Nueva Guinea south through San Ramón and deeper into the buffer zone all the way to Sábalos, near the border of the reserve. Like most other NGOs in Río San Juan, CIPRES was interested in promoting sustainable production practices in these colonization areas. But unlike the others, its primary concern was to build local capacity among the peasantry and improve local livelihoods. CIPRES did not consider itself part of an environmental movement, but rather part of a grassroots, primarily peasant-based movement. An essential part of local capacity building and development for CIPRES, then, was independent local organization and self-management.

Like all the NGOs in the region, CIPRES recommended not burning agricultural sites, planting nitrogen-fixers like velvet bean to improve soil fertility, refraining from the use of agrochemicals, planting live fencing, and leaving trees to regenerate in pastures. It also promoted land use planning, including leaving a forest reserve for firewood, timber needs for the farm, and to protect water sources. Instead of condemning ranching altogether, as did many environmentalist NGOs, it counselled peasants to convert only what they needed, rather than systematically planting pasture as the opportunity arose, thus leaving larger agricultural areas in regeneration. In particular they promoted diversification of production and the planting of useful trees. CIPRES also prepared forest inventories and management plans with several participants.

It was part of CIPRES' fundamental philosophy that any external project must begin from the peasants' own logic of production: new practices should not try to replace this logic but rather complement it. It prioritized seeking common ground in an atmosphere of mutual respect. Project directors argued that long term and lasting change could only be built through a slow process that involved demonstrating the viability of new strategies and their gradual incorporation into local production practices. This process required commitment, and this commitment could only be built by projects, in the words of one project organizer, that "respect the rural cultural, economic, and social world of the peasantry". The primary technical support person was of peasant origin himself and was integral to this strategy.

CIPRES was careful to introduce its alternatives in terms of the benefits it could offer farmers. Its representatives often distinguished CIPRES from other NGOs by pointing out its emphasis on "conservation *and use*", as opposed to biodiversity conservation in general. The problem of deforestation was understood primarily as promoting future shortages of firewood and timber for farm needs and contributing to future problems with the water supply. Deforestation was not presented as a problem related to biodiversity or global warming. In interviews, peasant leaders made it clear they had no interest in biodiversity for its own sake. CIPRES also pointed out the value and use of forest species that often go up in smoke, and sought to promote both farm-level use and sale of valuable timber. It firmly believed that the only way to promote resource conservation was through resource use. Experimenters were encouraged to plan their farms and think about the future. This meant establishing an area for annual crops, perennials, and pasture, and for a forest reserve. It meant leaving or planting trees around springs and streams. It meant thinking about alternatives and planning beyond the next agricultural cycle to the medium or long term.

In addition to appealing to the peasants' own farm-level interests, CIPRES also did something else that had an important influence on participants' behavior. In spite of conflicts between peasant leaders and CIPRES staff, they were proud that this NGO, like no other, promoted the peasants' appropriation of the project in a very concrete way. In September 1995, this group of experimenters became a legally constituted cooperative, Coopesán; its primary function was the management of a revolving credit fund. In 1996, Coopesán and six other sister cooperatives in the region constituted an umbrella organization known as the *Central de Cooperativas* (Cooperío).

Land Use Practices

I conducted a survey on land use using six different classifications to compare key production practices between cooperative members and nonmembers: degree of diversification, "conservation" practices, number of timber/firewood trees planted, number of edible trees (such as fruit and coffee) planted, and the percentage of land

Table 3.1 Average results for six categories of land use practices by sample group, San Ramón

Land use practices	Nonmembers (N = 30[a])	Cooperative (N = 21)
Diversification[b]	5.5	7.6
Conservation practices[c]	0.5	2.1
No. timber trees planted	53	394
No. fruit/coffee trees planted	9	153
Percent forest	22.4%	26.2%
Percent pasture	25.4%	27.8%

[a] Results are presented only for corresponding economic groups (there were no cooperative members in the two poorest groups).
[b] Number of different types of agricultural products produced on farm.
[c] Number of encouraged minus discouraged practices.

in forest and in pasture.[10] In choosing these categories, rather than just measuring "deforestation" I was accepting the peasants' own description of good farm management in combination with criteria generally used by conservation NGOs. Accepting the latter two criteria as the only indicators would oversimplify a complex reality and underhandedly reduce the terms of debate to the meanings of degradation imposed by outsiders.

In the first four categories, the average for all cooperative members shows much better performance than that of the nonmember group (see Table 3.1).[11] These differences hold when comparing groups with the same income level, farm size, and length of time working the same farm. Nevertheless, the differences between the two samples are less pronounced for percentage forest, and percentage pasture shows *greater* pasture conversion on the part of the cooperative.

Good Farm Management

Peasants in Cooperío adapted CIPRES' perspective to construct their own counter-discourse to that of conservationists – a concept of "good farm management" firmly based on an argument for "conservation and use" and a farmer's right to make his or her own decisions. The use of green fertilizers was intended to allow farmers to use the same agricultural land more often, rather than having to clear forest for good yields. Planting useful fruit trees and diversifying agricultural production was aimed at improving household nutrition. Planting timber species increased the

[10] Diversification and percentage of land under forest and pasture are based on the time of the survey; number of trees planted was based on the past three years; and conservation practices were analyzed as a mixture of the present and past 1 to 3 years, depending on the particular practice.

[11] Though the size of the coop sample is small, I conducted independent sample t-tests to compare the results and found that the differences are highly significant (at the .01 level). Numerous iterations of the smaller coop sample were compared to smaller random samples of the larger non-member group (Larson 2001).

value of on-farm timber for the future. Planting trees in general was promoted to stabilize bare soil and protect water sources. This combination of practices was said to simply constitute good farm management. Members saw diversifying, making firebreaks, occasionally using green fertilizers, and planting trees as "the right things to do". In contrast, farmers who cut down all their trees and then had to go ask others for firewood were considered irresponsible land managers. One coop leader argued that failing to take care of water sources is nonmembers' "greatest crime", and several others mentioned this as a concern.[12] They pointed out that other community members bragged about large areas they had cleared.

Good farm management means being responsible with the farm's resources, and it is based on a landowner's right to use them as she or he sees fit. One coop member described how another was thrown in jail for cutting down a tree by the river. He offered the comment that opens this section: "if he's just clearing it to clear it, it's good to punish him, but not if he's going to use it". Another said, "I own the trees here, I should be able to make the decisions … When I don't have a place to work any more, I'll have to clear forest". This sense of the right to make one's own decision about the land was particularly common among ranchers. "[The trees] are mine. How can someone tell me not to fell them? Is that fair?", complained one rancher.

Efforts by CIPRES and the cooperative had a greater effect on the farms of poor farmers and ranchers than on members who had more than ten head of cattle (here called "middle ranchers"); these differences can be seen in comparisons between members and nonmembers from each income group as well as among member groups (Table 3.2). Poor farmers and ranchers in the coop were much better than nonmembers in overall diversity and tree planting, and somewhat better with regard to conservation practices; middle rancher members were only marginally better than nonmembers. Poor farmers and ranchers were keeping a greater percent in forest than the nonmember group, and than middle ranchers. As for percent in

Table 3.2 Average proportion of farm area in pasture and forest by Income Group for Cooperative Members and Non-Members, San Ramón

Income group	N	Sample	Percentage of pasture	Percentage of forest
Poor peasants	12	Nonmembers	12.7	24.3
	6	Cooperative	16.7	41.7
Poor ranchers	11	Nonmembers	31.3	23.3
	6	Cooperative	22.8	29.9
'Middle' ranchers	7	Nonmembers	38.0	17.8
	9	Cooperative	38.6	13.4

[12]Nevertheless, given that the ecological relationship between tree cover and stream water is a complex one, peasants are not always convinced by the simplistic arguments the environmental NGOs commonly repeat: "the streams will dry up, the rains will stop falling, and the region will become arid" if you cut down the trees.

pasture, poor farmers in both groups generally had a small portion in pasture, with coop members slightly higher, while poor ranchers in the coop had somewhat less than those in the nonmember group. Middle ranchers both in and outside of the cooperative had the same percent pasture. It might be that CIPRES' appeals to peasants not to convert pasture unnecessarily – that is, before having the means actually to acquire animals – may have had an effect on the poor ranchers. Yet it is more likely that a greater availability of seeds, seedlings, and small loans from CIPRES allowed this group to diversify its investments rather than trust solely in the still distant prospect of ranching.

That is, small farmers may also aspire to being ranchers, but they know this future is unlikely. Several people referred to their prior experience in Nueva Guinea as the reason they were open to CIPRES' ideas. One woman member said, "You shouldn't deforest everything because then you won't have anywhere to work, like out there [in Nueva Guinea] where only the wealthy ranchers live. Why have so much pasture if you don't have cattle?" Neither of these groups was as dependent on ranching as its primary source of income as were members of the wealthier ranching group. They also appeared more open to other alternatives, at least as long as these alternatives did not foreclose the possibility of also investing in ranching. They also needed the kind of aid that CIPRES and the coop could provide more than the middle ranchers.

The economic reality of ranching was not a distant prospect for middle ranchers. This is an economic reality over which CIPRES had little influence; neither did its small loans have a large impact on these families' economies. In interviews, ranchers often complained that CIPRES' loans were far too small. Ranchers saw ranching as the only viable path for improving their livelihoods. As one said, "wealth is cattle and pasture". Yet they did not remain completely unconvinced by CIPRES' advice. First, they were more likely to convert their land to pasture more slowly, as their herd grew, rather than as fast as possible. Second, some were clearly committed to reforesting part of their land and/or protecting the regeneration of useful trees. One rancher who had two small reforested areas said, "I want my pasture and my reforested area too"; another explained, "I like to have the pasture clean, but there should be shade". A third rancher had planted over 2,000 trees. At least one rancher expressed interest in the possibility that incentive payments may exist some time in the future for rainforest reserves.

CIPRES' approach, which illustrated a commitment to working from peasants' own production logic, clearly made it difficult to for the NGO to oppose ranching. On the other hand, it is unlikely that this opposition would have made any difference in peasants' land use practices or aspirations, although it may have changed their discourse. In addition, because CIPRES emphasized negotiation and persuasion, rather than the setting of rules which would likely be rapidly broken upon its departure, these peasants today are probably more likely to be open to an economically viable alternative to ranching if one were to become available.

What did CIPRES' approach mean for the adoption of new land use practices? Concretely, it meant that some practices were probably adopted out of a commitment to CIPRES, that is, out of a desire to please the people they became friends with at

CIPRES.[13] Others were adopted because peasants were convinced that they and their farm would benefit, if not immediately, in the medium or long term – a time frame that they had not previously considered. And others were largely ignored. By adopting an approach that started from the peasants' logic of production, but could not offer a viable economic alternative to ranching, the message of the importance of finding alternative livelihood strategies was diluted in practice.

Conclusions

> Civilization was born when the first tree was felled, and will die when the last one falls.
>
> – Billboard in El Castillo

Based on the political ecology framework, the historical, multiscale, and multifaceted analysis presented in this chapter has sought to understand conservation from the point of view of the colonists themselves and to demonstrate that the demonization of peasants is unjustified. CIPRES' aid to peasants in the region was built around the promotion of sustainable farm management and building a strong local organization. It would be easy to believe that coop members who praised forest conservation measures did so only to please outsiders, adopting the NGO's discourse in the interest of encouraging the project to continue or increase its aid. This is undoubtedly true in some cases, but it is clearly far from the whole story. We have shown that coop members' farm practices did differ substantially, in some key ways, from the norm.

Deforestation is a global problem with very different local implications. At the local level, biodiversity loss is only a problem where people exploit that biodiversity as part of their survival or production strategies. Deforestation and pasture conversion mean degradation to conservationists, but to peasants, these are a sign of development and progress. Loss of forest is only a farm level problem when you run out of the trees you use for firewood or construction. Forest and tree cover provide certain ecological "services", but direct contributions of these services to livelihoods are often hard to establish. In fact, there is so much rain and humidity in the rainforest that some peasants find the prospect of "less rainfall" or drier soils appealing.

Historically and culturally, frontier colonization has been a sign of national progress. It has meant turning wastelands into productive fields. It has meant taming wild nature: in particular it has meant strong, hardworking men taming nature. It has meant providing land and sustenance to those who have none. Ranching has been the symbol of this progress. The poor plant rice and beans; those who can get ahead become ranchers. Ranching is not an odious option because it destroys the forest.

[13] Or more accurately, some families saw benefits but others did not. For example, there were families with orange or other fruit trees who let the fruit rot rather than eat it.

Many peasants fear the rainforest; it is dark, wet, and unknown (Tomé Valiente 1998). It lies in the way of making pasture, which is clean and civilized.

So what does forest conservation mean to peasant colonists in San Ramón in this context? Organizers spoke about conservation and use, or conservation and sustainable use, and coop members talked about "care" and "respect" for the forest. Like the soil, the forest is meant to be used and cared for. A good farmer takes care of his or her farm. A household uses only what it needs. Forest clearing is perfectly acceptable if the land will be put to use, although there should always be an area in reserve. Water sources should be protected, but not necessarily by native forest; a farm should be populated with resources it can use, and a responsible farmer will not use up the resources he or she needs. The idea of "respecting" the forest is complementary to this very practical and production-oriented view of the farm.

These criteria were much clearer among coop members than nonmembers. Coop members, at least in part because of the economic and moral support provided by CIPRES, were able to take a pause on their road as colonizers. They were given the appropriate kind of opportunity to plan their resource use: appropriate because it was actor-oriented and respectful of the culture and daily livelihood constraints of those involved. But forest clearing and ranching are in no way seen as bad farm management unless they are done irresponsibly; such an idea would be entirely illogical, counter-intuitive, and counter-historical. On the other hand, native forest is not particularly useful. Peasants were interested in trees and other forest products they could use or sell. The native forest serves primarily as a reserve of fertile soil, which only becomes useful when the trees are removed.

This apparent contradiction might imply that peasants are simply lying when they express concern about forest conservation. But it is not a question of deception as much as of meaning: coop members took CIPRES' advice and the practices it promoted, reinterpreted and internalized them, and developed their own discourse promoting "good farm management". Fundamentally, these peasants see development concerns as primary, and conservation as an important (secondary) set of practices that must fit in to their conception of development – the opposite perspective of conservationists.

Recommendations

Many of those promoting the conservationist paradigm in Río San Juan are quick to lay blame and more likely to accuse peasants of ignorance, backwardness, speculation, and deceit. This is partly due to their frustration and inability to effect change. The research presented here demonstrates that even a highly respectful and peasant-based approach to conservation was unable to alter significantly the practices that conservationists most censure – deforestation and pasture conversion, although it did improve land use in ways that are also important for conservation. In their limited view, however, many conservation NGOs turn to critical accusations to justify repressive measures such as threatening fines or jail and increased policing of reserve borders. Nevertheless, change will only be possible through mutual understanding, dialogue, and the unbiased collective search for workable alternatives that satisfy *both* conservation and livelihood needs. Specific recommendations from this research include:

1. Researchers (and practitioners) should seek to measure degradation based not only on their indicators of interest but also using local community criteria.
2. Understanding, open communication, and respect between project organizers and beneficiaries should be fostered by (i) hiring field staff from backgrounds similar to the participants and (ii) encouraging participants to organize in their own interest and to formulate their own demands on the project. In contrast, demonizing peasants only creates antagonism and is unlikely to change land use practices.
3. Discourses on conservation are often easy to sell, but they will not change practices unless they are tied to viable livelihood alternatives. Conservation initiatives should be grounded in a clear understanding of the logic and meaning of current practices.
4. Options based on subsistence may only appeal to the poorest participants but are unlikely to affect land use practices of somewhat better off groups with higher aspirations.
5. Finally, solving the kind of deforestation problem described in this chapter requires policies beyond the colonized frontier. Migration, deforestation, and ranching are firmly rooted in broader-scale dynamics and problems that cannot be solved locally. These require, fundamentally, a national development policy that promotes the *inclusion* of peasant producers in the national economy, instead of their ongoing relegation to the margins.[14]

Acknowledgments This research was undertaken as part of my dissertation research and would not have been possible without generous support from an EPA STAR Fellowship, Fulbright IIE, the Rural Sociological Society, and the National Science Foundation. I also want to thank Wil de Jong, Anja Nygren, Marja Spierenburg, and Laura German for very helpful comments on an earlier draft of this chapter.

References

GoN [Government of Nicaragua] (n.d.). *Propuesta de Plan Nacional de Desarrollo, Gobierno Bolanos*. Managua.
Cajina, R. (1995). Cronología General 1990–1994. *Proyecto Ejército y Sistema Político en Situación Post-bélica y de Transición*, Caso Nicaragua 1990–1994, Managua.

[14]Until 2007, Nicaragua's national development policy considered peasants as little more than a supply of cheap labour, rather than as a group of producers with the potential to develop on its own merits (GoN, n.d.). Policy options include: national policies supporting long-term credit and technical assistance for investments in both out- and in-migration areas (such as for intensification in the former and community forest management in the latter), and the study and support of alternative commodity markets where these are possible and desirable – including payments for environmental services.

Chamorro, P. J. (1970). Los pies descalzos de Nicaragua. (Reprint.) Series originally printed in *La Prensa*, Nicaragua.

de Jong, W., Tuck-Po, L., & Ken-ichi, A. (2006). Migration and the social ecology of tropical forests. In W. de Jong, L. T. Po, & A. Ken-ichi (Eds.), *The social ecology of tropical forests: Migration, populations and frontiers* (pp. 1–24). Kyoto: Kyoto University Press and Trans Pacific Press.

Dove, M. R. (1983). Theories of swidden agriculture, and the political economy of ignorance. *Agroforestry Systems, 1*(2), 85–99.

Dressler, W. H. (2006). Co-opting conservation: Migrant resource control and access to national park management in the Philippine uplands. *Development and Change, 37*(2), 401–26.

Duncan Baretta, S., & Markoff, J. (1978). Civilization and barbarism: Cattle frontiers in Latin America. *Comparative Studies in Society and History, 20*(4), 587–620.

Estrada, U. (1997). *Resumen Ejecutivo: Diagnóstico Rural Participativo en la Cuenca del Río Sábalo y Microcuenca El Guineal. Project report*. Nicaragua: Fundación del Río.

Estrada, U., Hernández, D., & Ruiz, A. (1996). *Resumen Ejecutivo: Diagnóstico Rural Participativo en la Cuenca del Río Santa Cruz. Project report*. Nicaragua: Fundación del Río.

Fairhead, J., & Leach, M. (1998). *Reframing deforestation: Global analyses and local realities – Studies in West Africa*. London: Routledge.

Fairhead, J., & Leach, M. (1996). *Misreading the African Landscape: Society and ecology in a forest-Savanna Mosaic*. Cambridge/New York: Cambridge University Press.

Geist, H. J., & Lambin, E. F. (2002). Proximate causes and underlying driving forces of tropical deforestation. *BioScience, 52*(2), 143–150.

Gezon, L. L., & Paulson, S. (2005). Place, power, difference: Multiscale research at the dawn of the twenty-first century. In S. Paulson & L. L. Gezon (Eds.), *Political ecology across spaces, scales, and social groups* (pp. 1–16). New Brunswick, NJ: Rutgers University Press.

Hecht, S. (1985). Environment, development and politics: Capital accumulation and the livestock sector in eastern Amazonia. *World Development, 13*(6), 663–684.

Hecht, S. (2005). Soybeans, development and conservation on the Amazon Frontier. *Development and Change, 36*(2), 375–404.

Hirsch, P. (2000). Underlying causes of deforestation in the Mekong Region. Paper presented at the workshop on *Forest Management Strategies in the Mekong Region.* Vientiane, Aug 2000. Available at: www.iges.or.jp/en/fc/phase1/3ws-20-hirsch.pdf. Accessed 13 July 2006.

IAN (1974). *Proyecto Rigoberto Cabezas*. Pamphlet. Managua: Instituto Agrario Nicaragüense.

IDB. (1977). *El Subsector Pecuario en Centroamerica, Division de Estudios Generales, Departamento de Desarrollo Económico y Social*. Managua: BID, BIRF and AID.

IRENA/MIRENEM. (1991). *Marco Conceptual y Plan de Acción para el Desarrollo del Sistema Internacional de Areas Protegidas para la Paz, SI-A-PAZ*. Managua/San José, CA: IRENA and MIRENEM.

Jetten, T., & de Vos, H. (1992). *Desarrollo, o Desajuste Inestable?* Ámsterdam: CEDLA.

Jones, J. (1990). *Colonization and environment: Land settlement projects in Central America*. Tokyo: UN University Press.

Kaimowitz, D. (2002). Resources, abundance and competition in the Bosawas Biosphere Reserve, Nicaragua. In R. Mathew, M. Halle, & J. Switzer (Eds.), *Conserving the peace: Resources, livelihoods and security* (pp. 171–98). Winnipeg/Manitoba: International Institute for Sustainable Development and IUCN.

Kaimowitz, D., & Angelsen, A. (1998). *Economic models of tropical deforestation: A review*. Bogor: CIFOR.

Kaimowitz, D., Fauné, A., & Mendoza, R. (2003). Your biosphere is my backyard: The story of BOSAWAS in Nicaragua. *Policy Matters, 12*(September), 6–15.

Karliner, J. (1989). Central America's other war. *World Policy Journal, 6*(4), 787–810.

Kellerman, J. (1974). *La Conservación y Restauración de Suelos, Aguas y Bosques en Nicaragua*. Managua: Ministerio de Agricultura y Ganadería (Nicaragua) y Ministerio de Relaciones Exteriores (Francia).

Kinlock, F. (1994). El canal interoceánico en el imaginario nacional. *Taller Historia* No. 6. Managua: Instituto de Historia de Nicaragua.

Kull, C. A. (2004). *Isle of fire: The political ecology of landscape burning in Madagascar*. Chicago, IL: University of Chicago Press.

Larson, A. (1995). Land tenure and deforestation in Nicaragua: The reopening of the agricultural frontier in Rio San Juan. Paper presented at the *Conference of the Latin American Studies Association.* Washington, DC: Sheraton Hotel, 28–30 Sept 1995.

Larson, A. (2001). *Rainforest conservation and grassroots development: If ever the Twain shall meet? Peasant colonists and forest conversion in the Nicaraguan rainforest*. Ph.D. Dissertation. Berkeley: University of California.

Larson, A. (2002). *Tendencias Actuales de la Frontera Agrícola 1992–2001: Un estudio comparativo de comarcas y productores a través del espacio y del tiempo. Research Report*. Managua: CIFOR and Nitlapan-UCA.

MAG/INRA/IRENA. (1991). *Acuerdo Territorial para la Zonificación Agroforestal en las Cuencas Hidrográficas del Sureste de Nicaragua*. Managua: MAG, INRA and IRENA.

Maldidier, C. (1993). *Tendencias Actuales de la Frontera Agrícola en Nicaragua. Consultant Report*. Managua: ASDI and Nitlapan-UCA.

McElwee, P. (2001) Parks or people: exploring alternative explanations for protected areas development in Viet Nam. Paper presented at the *Workshop on Conservation and Sustainable Development.* New Haven, CT, 30–31 Aug 2001. Available at: http://research.yale.edu/ CCR/ environment/papers/mcelwee.pdf. Accessed 13 July 2006.

Nygren, A. (2000) Environmental narratives on protection and production: Nature-based conflicts in Rio San Juan, Nicaragua. *Development and Change* 31: 807–830.

Offen, K. (1992) Productos Forestales No Maderables y su Manejo Campesino en la Zona de Amortiguamiento, Si-a-paz. Final report, July. Managua.

Offen, K. (1996) Paisajes del desarrollo y conservación en el discurso nacional: El caso de SI-A-PAZ, Nicaragua. Paper presented at the *Congreso Internacional de Geográfos Latinoamericanistas.* Tegucigalpa, Honduras, 2–6 Jan 1996. Mimeo.

Okigbo, B. N. (1984). Shifting cultivation in tropical Africa: Definition and description. In A. H. Bunting & E. Bunting (Eds.), *The future of shifting cultivation in Africa and the task of the universities* (pp. 18–36). Rome: FAO.

Paulson, S., Gezon, L. L., & Watts, M. (2003). Locating the political in political ecology: An introduction. *Human Organization, 62*(3), 205–217.

Peet, R., & Watts, M. (Eds.). (1996). *Liberation ecologies: Environment, development, social movements*. London/New York: Routledge.

Rabella, J. (1995). *Aproximación de la Historia de Río San Juan 1500-1005*. Managua: Solidaridad Internacional.

Ravnborg, H. M. (2003). Poverty and degradation in the Nicaraguan hillsides. *World Development, 31*(11), 1933–1946.

Rocha, J. L. (2005) El Río San Juan: Caudal de conflictos, reserva de nacionalismos. Revista Envío 284, November. Available at: www.envio.org.ni. Accessed 3 Apr 2006.

Squier, E. G. (1855) Nicaragua: An exploration from ocean to ocean. *Harper's New Monthly Magazine* LXV (XI), Oct.

Swinton, S. M., Escobar, G., & Reardon, T. (2003). Poverty and environment in Latin America: Concepts, evidence, and policy implications. *World Development, 31*(11), 1867–1872.

Tomé Valiente, C. (1998). *Investigación sobre Simbología Socio-Económica y Cultural de la Población Reasentada en las Comarcas de los Municipios de San Carlos y El Castillo*. Managua: Solidaridad Internacional.

Watts, M. (1983). *Silent violence*. Berkeley, CA: University of California Press.

West, P., & Brockington, D. (2006). An anthropological perspective on some unexpected consequences of protected areas. *Conservation Biology, 20*(3), 609–616.

Yatsuda Arima, E., & Uhl, C. (1997). Ranching in the Brazilian Amazon in a national context: Economics, policy, and practice. *Society and Natural Resources, 10*, 433–452.

Chapter 4
Beyond Biodiversity: Culture in Agricultural Biodiversity Conservation in the Himalayan Foothills

Laxmi P. Pant and Joshua J. Ramisch

Abstract This chapter explores the cultural dimensions of agricultural biodiversity conservation through a case study of the relationships between caste-based food traditions and local varieties of rice and finger millet managed by smallholder subsistence farmers in the Himalayan foothills of western Nepal. The empirical material for this study is derived from interviews with primary stakeholders, a household survey, and direct observation of cultural practices and spiritual traditions of rural farming communities. The different caste-based food traditions in the study area relate directly to differential use and appreciation of the local landraces of both crops, which are in turn conserved or managed to varying degrees. The empirical data provide strong evidence that agro-biodiversity management is not simply an agronomic or biogenetic issue, but that cultural preferences and practices are central to the creation, maintenance, and ultimate viability of biodiversity in agroecosystems. These findings suggest that future conservation efforts must engage local communities and their cultures fully in agro-biodiversity management, through participatory plant breeding, increased awareness and marketing of landrace identity within commodity supply chains, and through advocacy on behalf of smallholders' rights.

Keywords Agriculture • Biodiversity • Conservation • Culture • Nepal • Public policy

---

L.P. Pant (✉)
School of Environmental Design and Rural Development,
University of Guelph, Guelph, Ontario N1G 2W1, Canada
e-mail: lpant@uoguelph.ca; laxmi_pant@yahoo.com

J.J. Ramisch
School of International Development and Global Studies (SIDGS), University of Ottawa,
Tabaret Hall (Rm 328), 550 Cumberland Avenue, Ottawa, Ontario K1N 6N5, Canada
e-mail: joshua.ramisch@uottawa.ca

L. German et al. (eds.), *Beyond the Biophysical: Knowledge, Culture, and Power in Agriculture and Natural Resource Management*,
DOI 10.1007/978-90-481-8826-0_4,

Introduction

Cultural diversity and agricultural biodiversity are inextricably linked. The ecologically complex settings that gave birth to major ancient civilizations are also the centers of domestication for the crops that are still globally important today (Rhoades and Nazarea 1998). Human cultures and plant populations have coevolved to the point that cultural knowledge about production, processing, and storage are now essential to the survival of both domesticated crops and humans (Nazarea-Sandoval 1992). Domesticated crops by definition reflect human agency, shaped by a legacy of preferences that have valued or discarded species or varieties not just for their nutritive value but also for their taste, color, symbolism, or other contributions to daily social and cultural lives (Zimmerer 1991).

While conventional agricultural science has been interested in the raw genetic material held and managed by farmers all over the world, it has been much less appreciative or understanding of how local knowledge and cultural practices have created or sustained this landrace[1] diversity (Nazarea 1995). Indeed, positivist science strives to identify and isolate universal scientific principles from cultural practices and spiritual traditions, downplaying relationships between culture and agriculture in general, and culture and agricultural biodiversity in particular. While this paradigm has certainly furthered human understanding and manipulation of simple systems, the generalizations of positivist science are much less useful for generating practical prescriptions for sustainably managing complex natural systems (Gadgil et al. 1993).

This chapter uses case study material from the rice and finger millet food traditions of Nepal to argue that agricultural biodiversity management must necessarily engage with local cultural knowledge and practices. This research employs Cernea's (2005, p. 75) concept of culture in agriculture as, "a cluster of fundamental building blocks of agricultural production processes, rural [economic, social, cultural and spiritual] life, and their actors, whose understanding is indispensable for grasping the deeper essence of agriculture." Taking this recognition that "agro-biodiversity" is not a purely biological phenomenon, but rather one that is culturally constructed and relevant to given cultural (sub) groupings, will present scientists, farmers, and other land managers with opportunities for new approaches to biodiversity conservation. These include: (i) crop improvement research that integrates conventional and alternative scientific traditions, such as participatory plant breeding (PPB) (Morris and Bellon 2004); (ii) strategies to better identify, protect, and promote local landraces and genetic diversity through dedicated market supply chains or "slow food" movements (Jones et al. 2003); and (iii) lobbying for the customary rights and intellectual property rights (IPRs)[2] of ethnic and rural farming communities (Escobar 1998).

[1]Landraces are domesticated animals or plants adapted to the natural and cultural environment in which they live or originated.

[2]In contrast to customary or traditional rights, IPR are legally recognized rights to creations of the mind. Common types of intellectual property include copyrights, trademarks and patents, which provide an economic incentive to the creator to develop and share ideas through clear and exclusive ownership rights. Agrobiodiversity has been increasingly patented by global agrocommercial enterprises, largely through obtaining free access from places of origin and claiming ownership through breeding.

The chapter begins with a review of the “cultural” dimension of agro-biodiversity management. After a brief overview of international treaties on agricultural and human cultural diversity management, the limitations of contemporary practices for addressing the cultural dimension in agro-biodiversity conservation are identified before moving to the empirical section. Case study data show how food traditions in Nepal relate to and maintain the genetic diversity of both rice (a high-status, prestigious crop) and finger millet (a lower-status crop) despite the availability of modern high-yielding crop varieties. Conclusions are drawn, with a series of policy suggestions for successful management of agricultural biodiversity and human cultural diversity.

Culture in Agro-biodiversity Management

The attributes of agro-biodiversity can be described at the genetic, species, and agroecosystem levels (IPGRI 2004). The genetic diversity of a crop manifests itself in variations such as plant height, spike length, and grain color of individuals within that species. A given population will therefore be heterogeneous with regard to these traits, which will be inherited by predictable proportions of the population as a whole and available for passing on to successive generations. At the agroecosystem level, agro-biodiversity encompasses not only the abundance and diversity of species – i.e. plants (crops, weeds, trees, etc.), humans, and nonhuman animals – but also the biophysical variations, such as upland and lowland conditions, irrigated and rain-fed, and arable farming and perennial vegetation.

This agro-biological diversity interacts strongly with culture: culture shapes the environment and the environment in turn shapes cultural preferences. Biological diversity (from the genetic through to the landscape level) is directly affected and moulded by farmers’ practices and circumstances. At the same time, biological diversity constrains or facilitates the opportunities available to rural elements of society, from individual or household livelihoods through to wider communities or national economies. Because many of the planet’s areas with the highest biological diversity are inhabited by indigenous and traditional peoples, the 1988 Declaration of Belém by the International Congress of Ethnobiology claims an “inextricable link” between biological and cultural diversity. The term “biocultural diversity” has also been proposed to describe this intimate interrelationship (Posey 1999a), although it has been challenged as a term that does not reflect precisely on the nature of that relationship, and for seemingly privileging the analysis of “exotic” or isolated communities (Cocks 2006). Critics of agricultural modernization would argue more generally that trends towards industrial agriculture and monocultures of hybrid, “improved” crop varieties threaten not only the cultural and livelihood diversity of rural peoples but also the genetic, agro-biodiversity that has supported those societies (Shiva 1997; Altieri 1987).

The current rate of species extinction is extremely high compared to the natural average rate, not least in developing countries in the South (MEA 2005). Similarly, there is a rapid loss of genetic diversity in domesticated plants, with potential risks for food security (FAO 1998). As a result, there is broad political and scientific consensus about the need to halt and reverse the loss of biodiversity, with international responses including the 1971 Ramsar Convention for wetlands, the 1974 Convention on Trade in Endangered Species of Flora and Fauna (CITES), and the 1992 Convention on Biological Diversity (CBD) (Rosendal 2006).

The positivist approach to science that underpinned imperial expansion into the biodiversity-rich, tropical countries collected and conserved plant species in ex situ gene banks, treating diversity itself as a resource that sustains current human populations and one that should remain available for future generations. Gene banks literally freeze a specimen's evolution, or more correctly the coevolution of biological and cultural diversity. Besides gene banks, which tend to be housed in former colonial facilities in the North (or similar facilities near to centers of high diversity), *in situ* models of conservation maintain diversity of species and management practices on farm, where diversity is available to local land-users but perhaps much less so to the international scientific community (Jarvis et al. 2000).

The problems of ownership and benefits sharing as agro-biodiversity becomes commodified and valued within international markets remains highly problematic, especially when resource poor local communities (as custodians or managers of diversity) are confronted with international capital and elite interests (Escobar 1998). The positivist, scientific solution has been to protect genetic resources (whether naturally occurring or derived from research) with IPR, but this has been challenged as inadequate and unethical – with ownership rights going to corporations rather than communities responsible for cultivating diversity over generations. Among other reasons, IPR oversimplify ownership regimes by recognizing only individual and not collective rights, and also favor market values over cultural and spiritual ones (Posey 1999b; Shiva 1997). Critics would argue that biological and cultural diversity are not objects to conserve or commodities to market, but are integral to human existence in which utilization is part of the celebration of life (Posey 1999a).

Cultural elements are therefore central to agronomic and biodiversity management decisions and not (as the conventional plant breeding model might assume) just interesting details operating at the margins. Farmers and land-users create and maintain agro-biodiversity through conscious choices of crop species and varieties, which are visibly expressed through the retention of desirable seeds or the neglect of (or linguistic inattention to) less desirable varieties or species (Sperling et al. 1993). While farmers may choose varieties for agronomic criteria (such as early maturity or stable yields under low fertility or low rainfall conditions) these criteria may actually rank well behind gastronomic considerations or symbolic values. For example, in the Philippines, Nazarea-Sandoval (1992) found that farmers distinguished local landraces of rice on gastronomic criteria eight times more often than on their morphological characters.

Farmers also decide what varieties to plant (or not to plant) against a backdrop of agroecological and socioeconomic demands and constraints (Friis-Hansen 1989; Nazarea-Sandoval 1995). The classic, post-Green Revolution analyses of the adoption of high-yielding varieties (HYV) of crops like rice show that they were more likely taken up by those wealthier farmers who were able to consistently purchase external inputs (i.e. fertilisers and pesticides), while poorer farmers more likely retained their traditional varieties (Herdt and Capule 1983)[3]. Such analyses have also shown the importance of agroecology in shaping the retention of landraces or the adoption of HYV, but have generally tended to discount the role of culture as a factor in its own right.

Cultural Dimensions of Treaties and Conventions Related to Agro-biodiversity

The Convention on Biological Diversity (CBD), signed in 1992, is an elaborate framework for balancing biodiversity conservation against the sharing of benefits derived from the exploitation of biodiversity. This includes protecting the rights of access and benefit sharing (ABS) for both local communities and the international community, as well as the IPR of innovators – breeders operating within the free market regime and patenting varieties under the auspices of the World Trade Organisation (WTO).

During the drafting of the CBD, the global South (largely developing countries) argued that their genetic resources should no longer be considered a common heritage of humankind, freely available to all, especially as they must pay high prices for patent-protected, improved crops and medicines derived from this genetic capital (Rosendal 2006). The CBD enshrined this right to national sovereignty over genetic resources to counterbalance the rights and interests of the expanding patent regime. However, it is arguable that this has only been a symbolic victory. Protected areas in the South have not expanded substantially under the CBD, and the number of biological patents held by developing countries was only 4% in 2005 (UNDP 2005). The legal, IPR instruments for protecting and compensating local knowledge and property rights are much weaker than the ones that can trace and acknowledge the rights of biotechnological innovations, and do not provide sufficient incentives to conserve genetic materials so important to the world's food supply (Brush 1996, 2007; Eyzaguirre 2007).

New crop varieties, specifically in developed countries, are protected under the International Union for the Protection of New Varieties of Plants (UPOV). The original, 1961 version of the UPOV provided exemptions to breeders and farmers to save, use and exchange protected crop varieties. These exemptions have been steadily restricted or eliminated in subsequent revisions (1972, 1978, and 1991), which have strengthened protection for plant breeders under the paradigm of positivist science and IPR (Adhikari and Adhikari 2004; Gauchan et al. 2002). The signatories of the WTO agreement on Trade Related Aspects of Intellectual

[3]Likewise, HYV have tended to be more widely adopted in high-potential growing areas, and much less so in more marginal zones (Rhoades 1989).

Property Rights (TRIPS) are required to protect new plant varieties either by patents, an effective *sui generis* legislation (a unique form of intellectual property protection suitable for national sovereignty), or a combination of the two. Critics argue that the UPOV is an unrealistic template for protecting local rights, since it commodifies the local knowledge and cultural identities under a free trade regime where the genuine curators of plant generic resources in the global South cannot be expected to reasonably compete with the power of media, money, and markets – or "bioimperialism" (Shiva 1997). A farmer expressed dissatisfaction with this regime[4] as follows: "… farmers contribute to conservation and sustainable use of crop genetic resources, but receive no financial support through the treaty, and … a treaty that facilitates access without protecting farmers' rights to reproduce and exchange seeds, only promotes biopiracy" (IISD 2007, p. 7).

Finally, it is worth noting that the recently enacted 2005 Convention on the Protection and Promotion of the Diversity of Cultural Expressions (CCD) might also have relevance for the cultural aspects of agro-biodiversity. The CCD recognizes the dual nature of cultural expressions as objects of trade and artifacts of cultural value as well as the sovereign right of nation states to formulate and implement cultural policies and measures for the protection and promotion of human cultural diversity (Graber 2006). Critics argue that the CCD is "a muddle," never defining "culture" or "cultural identity" even though these concepts are fundamental to operationalizing the rights and responsibilities of the Convention (Bruner 2008, p. 389). While the cultural and biophysical elements of agro-biodiversity might be well served by some combination of the CBD and CCD's provisions, the CCD is still a new treaty and the intersection between the cultural protections afforded by the CCD and the biodiversity conservation objectives of the CBD are yet to be explored by the international legal community.

Culture in the Contemporary Practices of Agro-biodiversity Management

Contemporary practices of agro-biodiversity management involve three main ways to make local crop diversity competitive over modern, high-yielding crop varieties. These include improving local crop genetic resources, increasing consumer demand for local produce, and increasing farmers' access to genetic resources (Jarvis et al. 2000).

[4] This statement was made at the second session of governing body of the International Treaty on Plant Genetic Resources for Food and Agriculture (ITPGRFA) which entered into force in 2004. The ITPGRFA is intended to complement the CBD and UPOV by specifically recognising 64 cultivated plant species important for food and agriculture as objects of trade as well as cultural artifacts. While it is the first international instrument to explicitly acknowledge "farmers' rights" as they relate to plant genetic resources, critics of this treaty argue that its emphasis on the positivist paradigm of science still promotes the interests of plant breeders in the global North over the local practices and cultural identities of farmers in the global South (Grain 2007; IISD 2007).

Table 4.1 Agricultural biodiversity management initiatives and their roles in conservation (Adapted from Jarvis et al. 2000)

Initiative	Strengths	Weaknesses
Participatory plant breeding	Enables farmers to continue selecting landraces and managing seed systems	Landraces are not necessarily used as parents for making crosses; farmers may fear desired traits will be lost during cross-breeding
Commodity supply chain management	Relevant as long as local crops or crop varieties carry a premium price for specific traits, as in the case of aromatic rice	When traits are not explicit or valued, this initiative would not help conserve a particular landrace
Community biodiversity register	Documents local knowledge about plant generic resources, and facilitates intra- and intergenerational knowledge transfers	Unless it is handled with caution, this practice can increase the risk of biopiracy, as the local knowledge is codified into a readily accessible form

In participatory plant breeding, farmers are involved in setting breeding goals, understanding the value of local crop diversity in formal breeding practices, and selecting parents with preferred traits for crossing if the need arises (Table 4.1). While conventional plant breeding develops widely adapted crop varieties whose characters are distinct, uniform, and stable ("DUS"), the participatory plant breeding approach emphasizes location- or livelihood-specific adaptations. The difference between these two modes of plant breeding depends on the level of farmers' involvement in parent selection, prebreeding trait development, cultivar development, and varietal evaluation stages. This can range from conventional plant breeding, where scientists have exclusive control of all stages, to traditional farmer breeding where a farmer performs all breeding activities by her or himself (Morris and Bellon 2004; Sperling et al. 1993). In Nepal, two rice varieties have been formally released through the enhancement of local landraces – *Chomrong Dhan* in 1991 and *Pokhareli Jethobudho* in 2006 (GRPI 2006). Stakeholders in Nepal consider that as long as the materials in breeding programs are derived from landraces, breeding improved crop varieties will contribute to rather than detract from crop diversity; however, not all breeding programs necessarily use landraces as parents (Joshi et al. 2002).

Agricultural commodity supply chain management (or branding of local produce) can make local crop diversity more competitive, specifically using two strategies to differentiate produce in the local market. The first strategy involves indicating the geographic origin for product differentiation (Salazar et al. 2007). For example, rice varieties from Kaski district are customarily marketed with a geographical indication (e.g., *Pokhareli Jethobudho*, *Pokhareli Masino*). The addition of the adjective

"*Pokhareli"* before the (vernacular) name of a rice variety denotes its origin from the Greater Pokhara Area, and gives greater prominence to that geography ahead of the landrace identity.

The second strategy has been the use of educational and awareness-raising activities, such as biodiversity fairs, the planting of demonstration blocks to showcase diverse landraces, and poetry and folk song competitions. These activities are aimed at promoting agro-biodiversity conservation and enhancing the consumer appeal of crop landrace-based food products, particularly when linking rural producers and urban consumers. For example, Sital Agro Products Pvt. Ltd. (hereafter referred to as "Sital") uses the brand name *Gunilo* (literally "good for health") to preserve the identity of its products in the local market (Pant 2004). Sital has established its own retail outlet – a "diversity shop" called the Green House in Pokhara valley – to interact directly with consumers rather than through other retailers. Sital further plans to promote the *Gunilo* brand in Kathmandu city and abroad among the Nepalese diaspora through a network of ethnic stores. However, the entrepreneur is aware that these initiatives would only be a minor player compared to the dominant, established agricultural commodity supply chain actors.

In the third approach, rural and tribal communities are facilitated to maintain a roster of genetic resources called community biodiversity registers (CBRs). A CBR is a record of flora and fauna, and contain such information as the morphological and agronomic characteristics, ecological adaptation, special uses, and the place of origin, if known. Local managers of CBRs not only keep track of households who store the seed but also address the problems of seed management at the community level and encourage farmer-to-farmer exchange of seed and information (Jarvis et al. 2000). Although the processes of maintaining CBRs have proved to be a strong learning tool at the local level, their implications for regulating bioprospecting and curbing biopiracy are controversial. A successful implementation of CBRs can prepare local communities to be extra vigilant about biopiracy (Gadgil 2000), but if it is not handled with caution, a CBR can actually increase the risk of biopiracy as the local knowledge about genetic resources is codified into a form readily accessible not just to local people but also to outsiders (Paudel 2004; Salazar et al. 2007).

While existing treaties and conventions acknowledge the importance of culture in biodiversity management, neither they nor the prevailing practices of agro-biodiversity management have been able to effectively address the complexity of culture's interaction with biodiversity. Farmers' rights as creators and custodians of biodiversity are harder to identify and defend in practice than those of technology creators backed by international resources, while the codification of local knowledge (like the ex situ conservation of genetic material) risks commodifying and extracting it in a context where safeguards or compensation mechanisms are still hotly contested. The case study below investigates how local cultural practices have created and maintained agro-biodiversity and suggests ways in which culture's roles in biodiversity management could be better acknowledged.

Study Area and Research Methods

The case study was conducted in Kaski district, in the western hills of Nepal (c.f. Chapter 8, where two of the study sites were also in the western administrative region). While only 800 km long and at most 200 km wide, Nepal is marked by a pronounced altitudinal gradient, which creates a high diversity of climates. In the south, the plains (*terai*) are 60 m above sea level, with a hot, humid, tropical climate, while the mountains (*himal*) in the north extend from cold to subarctic climates, up to the summit of Mount Everest at 8,848 m above sea level. Between these extremes is a hilly region (*pahad*) – such as where most of Kaski lies – with climates that are subtropical or temperate. Such marked climatic variation nurtures biological diversity in the wild as well as within cultivated agroecosystems.

Nepal also has a remarkable cultural diversity, including more than 70 ethnic groups, ascribed into four caste groups. The traditions of the caste system have evolved over many generations, but this hierarchy was initially founded on the basis of a division of labor in ancient communities (Upadhaya 1999). The four caste divisions were associated with the following traditional occupations, from the highest *Brahman* caste (scholars) to *Chhetri* (rulers and warriors), *Vaishya* (traders and business people) and *Sudra* (artisans and menial workers). An important division between the castes would group the *Vaishya* and *Sudra* together as "Matwali" (literally the "alcohol-drinking castes"), in contrast to the *Brahman* and *Chhetri* who are grouped as "Tagadhari"[5]. *Tagadhari* were expected to refrain from drinking alcoholic beverages, and as we shall see, the *Tagadhari*/*Matwali* distinction is also closely aligned to distinctive food traditions.

The empirical material for this study has been generated through key informant interviews, focus group interviews, a household survey, and direct observation in the villages of Rupakot and Begnas in Kaski district, which is in the foothills of the Annapurna Himalaya. The study involved *Brahman* and *Chhetri* from the *Tagadhari* caste group and *Vaishya* ("*Gurung*") from the *Matwali* caste group.[6] Six focus group interviews were conducted with men, women, and gender-mixed groups, stratified by the *Tagadhari*/*Matwali* caste groups. The key informants who were interviewed included service providers and village leaders. Finally, a stratified random sample of 78 *Tagadhari* and *Matwali* households (about 20% of the total population) was surveyed with the help of two enumerators working as rural change agents in the study area. The survey generated data on the popularity of traditional foods and the cultural and ecological reasons for growing crop landraces. Finally, direct observation served as a way to triangulate what people said with what they actually do.[7]

[5]This name denotes the sacred thread that these "higher" castes are permitted to wear across their torsos as a sign of their status.

[6]*Gurung* are an ethnic group in Nepal who have been recruited into the Gurkha regiment of the British Army. Kaski is one of the territories of *Gurung*.

[7]The first author was brought up in the hills of Nepal and is consequently familiar with the culture and traditions of Nepal's various ethnic communities.

Caste-based Food Traditions and Agro-biodiversity

In this case study, agro-biodiversity is represented by rice and finger millet varieties and cultural diversity is represented by the traditions of the two caste groups (*Tagadhari* and *Matwali*), particularly as they relate to the foods symbolically associated with and eaten at festivals. Considering festivals is important because these may be the only times during the year that poorer members of society will consume certain foods, particularly rice-based ones. Indeed, in Nepal, rice is considered a prestigious, high-status food that only the affluent can afford to eat regularly, whereas finger millet is generally looked down upon as a poor person's food. The food traditions of *Tagadhari* and *Matwali* reflect this division, with rice featuring more prominently among the higher caste *Tagadhari's* foods and finger millet being more important to *Matwali* traditions. Of course other distinctions exist too; for example, *Tagadhari* eat more milk-based dishes, while *Matwali* (particularly the *Gurung* of the study area) are fonder of meat-based foods.

Although *Tagadhari* celebrate more Hindu festivals and *Matwali* celebrate more Buddhist festivals, both caste groups observe many common festivals as well (Table 4.2). Besides their importance in the seasonal festivals shown in this table, traditional foods also play an important part in celebrating life cycle events (e.g. naming ceremonies, weddings, funerals, etc.). The social harmony of Hindu and Buddhist religions in Nepal contributes to the many shared traditions, although, as we shall see, the different castes each prepare their foods for these festivals in different ways and with different landraces.

Rice and Ritual

Rice is one of the most important ceremonial foods, and the cultural and spiritual uses of rice varieties relate to culinary, medicinal, and symbolic values. Out of eleven local rice varieties presented in Table 4.3, eight are used by both caste groups, and the remaining three rice varieties are preferred by only one of the groups. The castes differ in which landraces they prefer for different foods.[8] For example, a caste-based culinary preference is seen for the preparation of *bhuja* (buttered, boiled rice). Although boiled rice (*bhat*) is a regular food for richer households, *bhuja* is prepared only for special occasions. Both caste groups used criteria of aroma and grain softness to assess the quality of *bhuja*, but *Matwali* preferred *Pahele* while *Tagadhari* preferred to use *Jethobudho* for the same purpose.

One of the most popular breads during major festivals is *selroti* (ring-like bread) (Fig. 4.1). While both caste groups preferred *Gurdi* landrace for making *selroti*, the alternate varieties for making this bread differed: *Sano Madishe*, *Thulo Madishe*,

[8]For ease of comprehension, the names of landraces are Capitalized while food names are always in lower case letters.

Table 4.2 Major festivals of Nepal and caste groups observing each

Festivals	Translation	Month	M	T
Dashain	Festival of Goddess Durga to observe her victory over demons	Sept–Oct	×	×
Tihar	Festival of light observed in the month of Kartik	Oct–Nov	×	×
Nwagi	Ceremony of new harvest of rice	Oct–Nov	×	×
Mangshir shakranti	First day of the month of Mangshir	Nov–Dec	×	
Mangshir purnima	Full moon of the month of Mangshir	Nov–Dec	×	
Push shakranti	First day of the month of Push	Dec–Jan	×	
Pandhra push	Fifteenth day of the month of Push (longest night of year)	Dec–Jan	×	×
Loshar	New year's eve of Tibetan calendar (longest night of year)	Dec–Jan		×
Maghe shakranti	First day of the month of Magh	Jan–Feb	×	×
Matatritha aunshi	Mother's day (last dark moon of April/May)	Apr–May		×
Buddha purnima	Birthday of the Lord Buddha (full moon of April/May)	Apr–May	×	×
Pandhra ashar	Fifteenth day of the month of Ashar	June–July	×	
Saune shakranti	First day of the month of Saun	July–Aug	×	×
Saunmash	The month of Saun	July–Aug	×	
Nagpanchami	Fifth bright day in July/August	July–Aug	×	
Janai purnima	Full moon of August/September	Aug–Sept		×
Gokarna aunshi	Father's day (last dark moon of August/September)	Aug–Sept		×
Krishna janmasthami	Birthday of Lord Krishna	Aug–Sept	×	×
Teej	Three day festival of women	Aug–Sept		×

M: Festival observed by Matwali; T: Festival observed by Tagadhari.

and *Naulo Madishe* were preferred by *Tagadhari*, while *Matwali* favored *Pahele*, *Jethobudho*, *Jardan*, or *Chinia*. The castes show a similar pattern for the preparation of the popular food *chiura* (flattened rice), which is eaten at Dashain, the largest festival in Nepal. Both castes agreed that *Jarneli* is the best variety for *chiura*, but again had different preferences for second-place varieties: *Pahele* for the *Matwali* and *Thulo Madishe* for the *Tagadhari*.

As Table 4.3 shows, there are also many cases which have entirely different preferred varieties for making the same food. The most extreme case would be for the preparation of *latte* (sweetened and buttered boiled rice), which is traditionally eaten during the festival that falls on the 15th day of the month of *Push* (December/January). The *Tagadhari* preference would be to use a sticky rice landrace (*Anadi*), dismissing any nonsticky or modern varieties which have a lower gluten content. However,

Table 4.3 Preference of rice landraces in traditional foods

	Boiled rice dishes			Rice breads				Sticky rice dishes				Other foods		
Landraces	*bhat*	*bhuja*	*pulau*	*jhilinga*	*selroti*	*tauke roti*	others	*khatte*	*latte*	*puwa*	*siraula*	*chiura*	*kashar*	*khir*
Gurdi	T			M	M,T		T			T				T
Pahele	M,T	M	M,T	M,T	M			M,T	M	T		M		T
Jethobudho	M,T	T	M,T	M,T	M			M,T	M	T				T
Jarneli	T		M,T					M,T		T	M,T	M,T		
Rato Anadi								M,T	M,T	T[a]	M,T			
Seto Anadi								M,T	M,T		M,T			
Sano Madishe				T	T	M	T						T	T
Thulo Madishe					T	M	T					T	T	
Naulo Madishe				T	T		T							
Jardan					M	M								
Chinia				M	M									

M: use preferred by *Matwali*; T: use preferred by *Tagadhari*.
[a] Medicinal use only.

Fig. 4.1 *Selroti* (ring-shaped rice bread)

Matwalis, who have adapted this food tradition from their *Tagadhari* neighbors, mentioned that they prepare *latte* using nonsticky rice as well (from widespread varieties like *Jethobudho* or *Pahele*) and had no particular attachment to *Anadi* for this food.

Many landraces were associated with foods that were unique to one caste's festivals or ceremonies. For example, *kashar* is a sweet ball that is a popular food during major *Tagadhari* life cycle rituals, such as *Bartabandha* (admission of boys into their religion) and *Bibaha* (weddings), but is not prepared by *Matwali*. The *Tagadhari* also prepare *khir* (rice pudding) for many occasions and festivals, including during the rice-planting month of *Saun* (July/August) when eating *khir* is believed to bring prosperity. The *Matwali* tend not to eat as much milk-based food and have no particular preferred landrace for *khir*, while the Tagadhari strongly identified *Jethobudho* as the best variety.

These caste-based culinary preferences evolve over time. Among the *Matwali*, the baking of *tauke roti* (pan bread) in wedding ceremonies was once common, and specific landraces (e.g. *Jardan* and *Chinia*) were used. However, as one *Matwali* man noted, this traditional association is changing: "[preparing *tauke roti* for the bride's family] incurs huge cost to the bridegroom's family, although it is not very delicious to eat. Now, things are changing. It is no more obligatory to prepare *tauke roti. Selroti* (ring-like bread) instead serves the purpose." The shift away from preparing *tauke roti* has led to the local extinction of the *Jardan* variety, and those households still preparing *tauke roti* are more likely to consider other landraces as substitutes (e.g. *Madishe*).[9]

[9]Tagadhari households also prepare *tauke roti*, but only for the *Buddha purnima* festival in April/May. No specific variety is preferred for this use.

Besides these culinary values, foods made from sticky rice varieties in particular have medicinal uses. Focus group participants from the *Tagadhari* community described using *Rato anadi* to prepare *puwa* (a food from rice flour) to cure back pain and body ache, particularly for women during postnatal care. In addition to culinary and medicinal values, landraces also have symbolic values. *Tagadhari* differentiate specific rice varieties as religiously "pure" and "impure", but this symbolic phenomenon was uncommon among *Matwali*. The landraces *Anadi*, *Tauli*, *Jhauri* and *Aanga*, as well as the modern variety CH-45, were perceived to be "impure" and unfit for use in festivals and rituals. This would include not only the festive foods but also religious offerings such as *prasad* (foods offered to the God) and *tika* (rice mixed with vermilion powder and put on the forehead during festivals and rituals). The attributes of "impurity" of a variety, however, are not clear, specifically when a new variety is introduced. The status of a rice variety is collectively determined based on cultural and religious values. A mixed-gender *Tagadhari* focus group described how modern varieties such as *Masuli* that have finer grain and higher yield have been quickly adopted, and thus easily accepted in cultural and religious use. However, CH-45, despite its higher yield, has not been accepted for religious purposes mainly because of its coarse grain and poor cooking quality.

The caste-based culinary preferences which associate the quality of certain foods with a given landrace have significant implications for the amount of land dedicated to each variety within an individual farm and the landscape. Cultural preferences also shape the extent to which farmers will be motivated to conserve or manage varieties associated with their favorite foods, regardless of the agronomic or ecological reasons for growing the different landraces (Table 4.4).

The varieties that are planted on the largest areas include those with multiple uses, such as *Pahele* and *Jethobudho* which are both grown mainly for selling on the market, and those varieties that are well adapted to marginal environments, such as *Chinia*, *Gurdi*, and *Madishe* (Rijal et al. 2000). However, many of the landraces with more specialized food uses are also grown on-farm for home consumption, even if they require specific niches (e.g. *Jarneli* needs good, rain-fed conditions), since they are less likely to be available in local markets. Thus, even if modern varieties are high yielding, cultural preferences for particular aromas and grain characteristics ensure a higher market price and a place on local farms. Beyond their contributions to preferred foods, some landraces, such as *Jarneli* or *Ekle*, are also retained on-farm for weaving straw mats or as fodder for cattle and buffalo, services which are not provided by the short, tough straws of modern, dwarf rice varieties.

Millet and Matwali

As with rice, *Tagadhari* and *Matwali* have distinct preferences for finger millet landraces (Table 4.5). For example, *Jhyape* is valued by both communities but for different purposes. While *Tagadhari* use this variety to prepare *dhindo* (porridge),

Table 4.4 Agronomic and ecological reasons for growing specific rice landraces

	High food quality	High yield	High price	Tolerates drought	Tolerates low fertility	Tolerates shade	Early maturing	Medicinal value	Long straw (mat weaving)	Fodder value
Gurdi		×		×	×	×				
Pahele	×		×							
Jethobudho	×		×						×	
Jarneli							×		×	
Rato Anadi	×							×		
Seto Anadi	×					×				
Sano Madishe		×		×	×					
Thulo Madishe		×		×	×					
Naulo Madishe		×		×	×					
Jardan										
Chinia		×								
Ekle	×		×						×	×
Bhiraphul	×								×	
Jhinuwa	×								×	
Jhauri				×			×			
Phake							×			
Naldunge						×				
Mansara				×	×					
Manamuri				×						

Table 4.5 Preferences for finger millet landraces in traditional foods

Landrace	Traditional foods *roti* (bread)	*puwa* (flour-based)	*dhindo* (porridge)	*jand* (beer)	*rakshi* (alcohol)
Samdhi kodo (Juwai kodo)	M, T	M, T		M	
Jhyape			T	M	
Lapre			M	M	M
Kalo dalle				M	M
Seto dale				M	M

M: use preferred by *Matwali*; T: use preferred by *Tagadhari.*

Fig. 4.2 Alcohol distillation from finger millet grains

Matwali use it to prepare *jand* (local beer). Furthermore, *Matwali* distill *rakshi* (home made alcohol) (Fig. 4.2) from *Lapre*, *Kalo dalle*, and *Seto dalle* landraces, which are preferred because of their larger grains and higher alcohol recovery. However, *jand* (local beer) can be brewed from any of the varieties.

Partly because of this widespread association with alcohol (whose consumption is forbidden to the higher castes), *Tagadhari* consider finger millet as an “impure” crop and avoid its consumption during religious offerings. In addition to the religious offerings, orthodox Brahmins abstain from eating porridge and bread made from finger millet flour in regular meals as well. In contrast, *Matwali* even offer the finger millet foods to their family deities. It should be noted, however, that these “traditional” distinctions appear to be in flux; a few *Tagadhari* households reported preparing *rakshi*, thus breaking with the expected tradition of abstaining from brewing and drinking alcoholic beverages. New generations of Brahmins have even challenged the overall notion of impurity of this crop. This is further evidence that

Table 4.6 Agronomic and ecological reasons for growing specific finger millet landraces

	High food quality[a]	High brewing quality[a]	High yield	Early maturing	Can be planted late	Fodder value
Samdhi kodo (*Juwai kodo*)	×		×			×
Jhyape	×	×	×	×		
Lapre	×		×	×		×
Kalo dalle		×			×	
Seto dale		×	×	×		×
Sayakhole	×					×

[a] Most favored characteristics.

cultural traditions are dynamic and agricultural biodiversity management strategies should focus on actual practices rather than simply stereotyping or idealizing "traditional" behaviors.

Similar to the case with rice, finger millet landraces have symbolic values beyond their culinary ones. For example, both caste groups consider white colored foods to be superior to black ones. The *Samdhi kodo* variety is preferred by both communities to prepare *roti* (pan bread) and *puwa* (a food from finger millet flour) due to its clean, white color. This landrace of finger millet is also known by the name of *Juwai kodo*. *Juwai* in vernacular means "son-in-law," while *Samdhi* is the relationship between the fathers of spouses. These names signify that food prepared from this landrace is acceptable to offer to these special guests, largely because of the white color.

Again, as with the rice landraces, caste-based preferences for different finger millet varieties have agronomic and ecological implications which also influence the reasons why varieties might be grown or conserved (Table 4.6). While the quality for food and brewing was found to take precedence, the adaptation of varieties to marginal environments is also important, particularly their suitability for late planting and early harvesting. This popularity of short season varieties allows enough time for millet to be planted after the maize harvest and harvested before livestock and wild animals enter the field during winter fallows.

It is worth noting that Tables 4.4 and 4.6 both present data on "preferences" and agronomy in a form very commonly used in Participatory Rural Appraisal (PRA), normally for evaluating either new or local varieties (Kitch et al. 1998). In such ranking exercises, focus groups develop a list of the most important criteria for varietal selection and then score candidates against each one to create an ordered set of "community" preferences. While it was relatively easy for *Matwali* respondents to state that they would evaluate millet landraces preferentially for their high quality for food and for brewing, it should be clear from the discussion above that it would not be possible to identify any columns in Table 4.4 as the most favored characteristic(s). The local criteria for evaluation are not mutually exclusive, since variety preferences are tied so strongly to different foods and food processing techniques. Other researchers have also noted that these ethnogastronomic considerations lead to local farmers keeping multiple landraces present in their farms and gardens, and make it impossible to construct a hierarchy of most to least desired landraces (Rhoades and Nazarea 1998). Crop improvement, therefore, must contend with these multiple preferences and uses, which are unable to be satisfied with a single ideal or best variety.

Beyond Caste: Socioeconomics and Agro-biodiversity Management

Although caste informs the landrace preferences for production of the various foods and, by extension, the areas likely to be planted with these landraces, there are also significant socioeconomic influences on agro-biodiversity management. For example, wealthier households own larger and more fertile pieces of irrigated land, and grow a wider diversity of rice varieties for special food preparations. Although some of the traditional foods are popular among people of all wealth categories, variations are found in terms of some of the rarer food items (Table 4.7). For example, *selroti*, *latte*, and *siraula* prepared from rice are popular among all wealth categories. However, most other rice breads are prepared only by wealthier households. Even for foods prepared by an almost equal number of households from all wealth categories, the richer households prepared these with greater frequency in a given year, since poor households cannot afford special foods as frequently as the richer households. *Latte* is a good example because more than 80% of households in all wealth groups prepared this food, but wealthier households prepared it twice as often as poor households. Contrary to rice foods, traditional foods prepared from finger millet were more popular among poorer households. For example, women in the poorest households brewed *rakshi* from finger millet landraces and sold it in the local market.

If the percentages of households that prepared traditional foods are compared with the mean annual frequency of preparation as presented in the final column of Table 4.7, a typology of traditional foods emerges (Table 4.8). The *first* (upper-left) category includes foods prepared by more than 50% of households more than once a year. In addition to boiled rice (*bhat*), which is a regular meal of richer households, the foods in the first category include the popular festival treats *selroti*, *khir*, and *latte*. As noted in the previous discussion, the landraces most preferred for preparing these foods (*Jethobudho*, *Pahele*, *Gurdi* and *Madishe*) are also the ones planted on the largest areas.

The second (bottom-left) category of food are those prepared by many households (>50%), but less than once a year. Only the snack *siraula* fits this category. The *Rato Anadi* and *Seto Anadi* sticky rice varieties that are preferred to prepare this food are likely to be cultivated by many households, but in smaller plots (Sthapit et al. 2001). Thus even those rice landraces that are preferred for preparing infrequently cooked foods are likely to remain in rural communities if these foods are popular with a large proportion of households.

Table 4.7 Percentage of households and mean annual frequency of traditional food preparation for different wealth groups

	Wealthy (N = 30)		Medium (N = 31)		Poor (N = 17)		All (N = 78)	
Traditional food	%	Frequency	%	Frequency	%	Frequency	%	Frequency
selroti	100	8	100	7	88	7	97	7
jhilinga (raw)	20	<1	26	<1	24	<1	23	<1
jhilinga (cooked)	33	1	36	3	24	1	32	3
khir	93	7	84	3	41	2	78	3
latte	93	5	81	3	82	2	86	4
arsa	30	1	23	1	0	0	21	<1
anarsa	20	<1	13	1	0	0	14	<1
jhar	13	<1	3	<1	0	0	6	<1
phini	13	<1	10	<1	0	<1	9	<1
batasa roti	3	<1	0	0	0	0	1	<1
danaura	3	<1	7	<1	0	0	4	<1
kashar	13	<1	7	<1	6	<1	9	<1
siraula	77	2	52	1	53	1	62	1
rakshi	43	23	42	19	88	27	49	22

Table 4.8 Classification of traditional foods according to the percentage of households preparing them and the frequency of preparation

Mean annual frequency	Prepared by many (>50% households)	Prepared by few (≤50% households)
Frequently (1+ times)	*bhat*, *selroti*, *khir*, *latte*	*jhilinga* (cooked), *rakshi*
Rarely (≤1 time)	*siraula*	*jhilinga* (raw), *arsa*, *anarsa*, *jha*, *phini*, *batasha*, *danaura*, *kashar*

The third (upper-right) category of foods included the ones prepared by fewer than half of the households, but more than once per year. These foods include *Jhilinga* and *Rakshi*, which are both prepared by skilful women and sold in the local market. In contrast to other foods that were mainly prepared for household consumption, these foods are a popular source of income for rural women. Since these food items are demanded in local markets, cultivation of crop landraces preferred in these foods and processing them into value added products serves two purposes: (i) conservation of agro-biodiversity; and (ii) income diversification for improved livelihoods. The varieties preferred for these foods are also likely to remain in rural communities, especially to the extent to which their female custodians have the rights to land, seed, and labor needed to ensure these landraces a spot on the farm.

Finally, there are many traditional foods in the fourth (bottom-right) category that are rarely prepared and only by few households. The preparation of the foods of this category requires extraordinary skill that is found only among elderly women of the *Tagadhari* caste group, who typically sell some of these foods (i.e. raw *jhilinga*) in the market. The foods in this final category are on the verge of extinction and the crop varieties preferred to prepare them are also at high risk of disappearing from rural communities.

Conclusions and Policy Suggestions

Social structures (caste, gender, class) and human cultural diversity shape agro-biodiversity management because of the culinary, medicinal, symbolic, and spiritual values of crop varieties. In this case study, even though both castes grew and consumed both rice and finger millet, *Tagadhari* had richer rice food traditions and associated rice landrace preferences and management practices, while *Matwali* held more finger millet landraces and food traditions. This illustrates that while distinct human communities might be associated with specific forms of agro-biodiversity as apparent custodians, it would be hard to strictly attribute the diversity of rice and finger millet landraces to a particular wealth or ethnic group, let alone assign property rights to individuals. The observed diversity of crop landraces and their complex associations with caste-based preferences in foods in Kaski therefore represent important cultural goods that are valued at the level of the community; a way of life exemplified by the celebration of rituals and festivals involving those landraces. Protecting the rights and responsibilities of communities for that diversity is clearly complicated since both producers and consumers of rice and finger millet foods (in local, national, and potentially international markets) are involved in shaping the production and maintenance of landrace diversity. Farmers' rights over local landrace diversity could be protected through recognition of collective rights, which have worked relatively well at preserving other common property resources (at least at the local level) such as irrigation, fishing territories, and forests (Brush 2007).

The case material also shows culture intersecting with gender and class to shape opportunities for agro-biodiversity conservation or promotion. Currently, elderly women hold rich knowledge and skills for preparing traditional foods, specifically the rice breads that are at the verge of extinction. Socialization through upbringing is the only way for intergenerational transfer of knowledge and skills regarding these culinary traditions. Introducing culinary traditions and local knowledge in grade school and vocational training institute curricula would help transfer and maintain this knowledge, which is so important for agro-biodiversity conservation.

As for class, wealthier households had both the land to maintain more landrace diversity on-farm and the means to prepare a wider range of the festival foods derived from this diversity, as compared with poorer households who might only produce and consume subsets of the potential diversity. The status associations of the crops, foods, and landraces also have an impact on agro-biodiversity management. Both caste groups view consumption of rice foods as evidence of high social status, while the consumption of finger millet foods is stigmatized as a sign of poverty. Awareness and education about the importance of finger millet foods can help to overcome this cultural stigma, helping to conserve the rarer landraces in addition to their agronomic and nutritional benefits (such as the crop's high iron content).

The following policy principles are drawn from this study, specifically to integrate social, cultural, and spiritual dimensions into agro-biodiversity management policies and practices:

1. *Consider local crop improvement as a part of holistic rural development interventions and strategically address social and cultural issues in plant breeding efforts*. This requires stakeholders to move beyond the conventional dichotomy of participatory vs. centralized breeding, and engage in crop improvement and utilization as a part of cultural, spiritual and religious life. Social scientists would have a key role in facilitating this process, to broaden the perspective of crop improvement beyond a positivist focus emphasizing biophysical dimensions. For example, the *Tagadhari* distinction of religiously "pure" and "impure" rice varieties has implications for plant breeding. In another study in Kaski, farmers stated their reluctance to include culturally important landraces in a PPB programme for varietal improvement, because they believed that PPB would alter the variety's characteristics and render it useless for religious or cultural ceremonies (Rana et al. 2000). At the same time, farmers commented that these landraces would be continually grown due to embedded sociocultural, religious, and medicinal values – farmers would rather grow these varieties themselves than ask neighbors for grains or purchase them from the market. Of similar importance would be the social stigma that characterises rice as a prestigious crop and finger millet as a lower status one. Awareness and education campaigns that promote finger millet foods by highlighting agronomic or nutritional benefits (such as the crop's high iron content) can help to overcome this stigma to help both caste groups conserve the rarer landraces.
2. *Promote human cultural traditions and spiritual practices involving a range of crop varieties*, *rather than merely promoting a particular crop variety or a particular food product.* The rice landraces *Pahele*, *Jethobudho*, *Rato Anadi*, and *Seto Anadi* are popular in the study area's local markets because their food quality is relatively easier to distinguish and their uses are complementary and overlapping. The specific uses of landraces for the many rice bread varieties produced and consumed by relatively wealthier *Tagadhari* families ensure that at a local level landrace identity is preserved during food processing. Other studies have suggested that increasing the urban market demand for culturally important landraces and foods might encourage farmers to cultivate these varieties in larger areas and would potentially create links between cultural diversity and increased household income from local agro-biodiversity (Rijal et al. 2000).

   However, the longer the supply chain between producer and consumer, the greater the challenges to preserving (or promoting) a unique identity, particularly for local values which may be less appealing to consumers from different cultural backgrounds. The value of a particular crop variety in traditional foods may get fuzzy as we move from local to regional and international markets. For example, a foreigner or even an urban Nepalese consumer may not value *latte* prepared from *Anadi* rice as it is valued by *Tagadhari* in Kaski. Attempts to preserve crop landraces by finding novel uses may similarly fail to acknowledge the cultural context of local consumers and therefore not stimulate new demand for these varieties. For example in the Pokhara valley, finger millet was being promoted to prepare pizza, cookies, and breads, but local consumers were less interested in having these exotic foods prepared from local crops and landraces than in ensuring traditional foods were prepared from appropriate local crop varieties (LI-BIRD 2005). These findings suggest that landraces are more likely to be cultivated and preserved only if the diversity of their contributions to wider food traditions is promoted, which is a much different approach than simply targeting the improvement of a single variety or a single commodity in local or urban markets.

3. *Develop the capacity of local and national stakeholders to defend their rights and negotiate responses to changes in biophysical, technological, social and cultural systems.* No single organization or policy instrument (e.g. CBD, TRIPS, CCD) is sufficient to ensure effective agro-biodiversity conservation on their own. It is not reasonable to assume that the disparate objectives of biodiversity conservation, access, and benefit sharing, and the protection of IPR can always be made compatible; the principles enshrined in international agreements can only be the point of departure for negotiations (Rosendal 2006). However, the tendency of conservation- or culturally-oriented organizations and institutions to only work with like-minded bodies and not in interdisciplinary coalitions has not necessarily harnessed collective imagination, collective intelligence and collective innovation to advance agro-biodiversity management (Hall 2007; Pant and Odame 2006). At the local level, agro-biodiversity provides a number of ecosystems services, such as food, fibre, fuel, fodder, genetic resources, spiritual and religious values, local knowledge and education, sources of inspiration, recreation and aesthetic values, well-being and happiness, and a sense of place. To harness these services, a host of issues regarding agro-biodiversity management needs to be addressed: for example, promotion of traditional health care practices including traditional healing systems, enhancement of the quality and safety of traditional foods (e.g. promotion of traditional recipes in ecorestaurants), linking tourism with cultural and biological diversity, financing local agricultural biodiversity-based rural enterprises, and introducing biodiversity management curricula in grade schools and vocational training institutes.

In conclusion, the ongoing efforts to design and implement *sui generis* legal systems for plant variety protection in low-income countries like Nepal should move beyond agricultural biodiversity conservation issues *per se* to address social policy issues. These would include inter- and intragen erational equity, cultural traditions and spiritual practices, and developing the adaptive capacity of communities to respond to rapidly changing biophysical, sociopolitical, cultural, and technological systems. It is imperative to address the dichotomies, ambiguities, and confusions associated with the current debates over plant genetic resources management – such as *in situ* vs. *ex situ* conservation strategies, innovation and breeding vs. conservation, breeders' rights vs. farmers' rights, sacred vs. secular practices, and productivity vs. sustainability. While clarifying these ambiguities, public and private stakeholders will need to engage in negotiation over resources, processes, and value systems. Further research in this field of inquiry may focus on how dialogue over an effective system for plant variety protection would address social policy issues, not only in different countries but also within a country at different places and times with different sets of stakeholders, including individuals from different communities and wealth categories.

Acknowledgements The case studies are derived from the lead author's graduate thesis research funded by the Norwegian Agency for International Development (NORAD) and managed at the Norwegian University of Life Sciences, Norway. The Local Initiatives for Biodiversity Research and Development (LI-BIRD) facilitated fieldwork in Nepal with in-kind logistical support under a project of Biodiversity International, Rome. Gry Synnevåg and Kjersti Larsen at the Norwegian University of Life Sciences, together with Bhuwon Ratna Sthapit at the Biodiversity International, supervised the work. The authors are grateful to the supervisors, colleagues in Norwegian and Nepalese organizations, and farmers in Kaski District, Nepal, as well as the two anonymous reviewers for their helpful contributions to this chapter. The usual disclaimers apply.

References

Adhikari, R., & Adhikari, K. (2004). UPOV: Faulty agreement and coercive practices. In R. Adhikari & K. Adhikari (Eds.), *Evolving Sui Generis options for the Hindu-Kush Himalayas*. Kathmandu, Nepal: SAWTEE.

Altieri, M. A. (1987). *Agroecology: The scientific basis of alternative agriculture*. Boulder, CO: Westview Press.

Bruner, C. M. (2008). UNESCO, the WTO, and trade in cultural products. In J. Chaisse & T. Balmelli (Eds.), *Essays on the future of the World Trade Organization* (Policies and legal issues, Vol. 1, pp. 385–424). Geneva: EDIs.

Brush, S. B. (1996). Is common heritage outmoded? In S. B. Brush & D. Stabinsky (Eds.), *Valuing local knowledge: Indigenous people and intellectual property rights*. Washington, DC: Island Press.

Brush, S. B. (2007). Farmers' rights and protection of traditional agricultural knowledge. *World Development, 35*, 1499–1514.

Cernea, M. M. (2005). Studying the culture of agriculture: The uphill battle for social research in CGIAR. *Culture and Agriculture, 27*, 73–87.

Cocks, M. (2006). Biocultural diversity: Moving beyond the realm of 'indigenous' and 'local' people. *Human Ecology, 34*(2), 185–200.

Escobar, A. (1998). Whose knowledge, whose nature? Biodiversity, conservation, and the political ecology of social movements. *Journal of Political Ecology, 5*, 53–82.

Eyzaguirre, P. (2007). The impact of collective action and property rights on plant genetic resources. *World Development, 35*, 1489–1498.

Food and Agriculture Organization of the United Nations – FAO. (1998). *The state of the world's plant genetic resources for food and agriculture*. Rome: FAO.

Friis-Hansen, E. (1989). *Seeds of wealth: Seeds of risk, the vulnerability of hybrid maize production in the southern highlands of Tanzania*. Copenhagen: Centre for Development Research.

Gadgil, M. (2000). People's biodiversity registers: Lessons learnt. *Environment, Development and Sustainability, 2*, 323–332.

Gadgil, M., Berkes, F., & Folke, C. (1993). Indigenous knowledge for biodiversity conservation. *Ambio, 22*(2/3), 151–156.

Gauchan, D., Baniya, B., Upadhaya, M., & Subedi, A. (2002). National Plant Genetic Resource Policy for Food and Agriculture: A case study of Nepal. *A report submitted to the International Plant Genetic Resources Institute (IPGRI), Asia-Pacific-Oceania (APO), Regional Office.* Malaysia, 25 Sept 2002.

Graber, C. B. (2006). The new UNESCO Convention on Cultural Diversity: A counterbalance to the WTO? *Journal of International Economic Law, 9*, 553–574.

Grain (2007). Farmers call for suspension of Seed Treaty. Available at: http://www.grain.org/bio-ipr/?id=53. Accessed 18 May 2009.

GRPI (2006). Policy Trends. *GRPI Newsletter.* Sept 2006.

Hall, A. (2007). Challenges to strengthening agricultural innovation systems: Where do we go from here? *UNU-MERIT Working Papers* #2007-38.

Herdt, R. W., & Capule, C. A. (1983). *Adoption, spread and production impact of modern rice varieties in Asia*. Laguna, Philippines: International Rice Research Institute.

IISD (2007). Summary of the Second Session of the Governing Body of the International Treaty on Plant Genetic Resources for Food and Agriculture 29 October – 2 November 2007. *Earth Negotiations Bulletin*, 9(410). 13 pp. Available at: http://www.iisd.ca/download/pdf/enb09410e.pdf. Accessed 18 Feb. 2010.

IPGRI. (2004). *Diversity for well-being: Making the most out of agricultural biodiversity*. Rome: IPGRI.

Jarvis, D., Mayer, L., Klemick, H., Guarino, L., Smale, M., Brown, A., et al. (2000). *A training guide for in situ conservation on-farm*. Rome: IPGRI.

Jones, P., Shears, P., Hillier, D., Comfort, D., & Lowell, J. (2003). Return to traditional values? A case study of slow food. *British Food Journal, 105*, 397–304.

Joshi, K. D., Sthapit, B., Subedi, M., & Witcombe, J. R. (2002). Participatory plant breeding in rice in Nepal. In D. A. Cheveland & D. Soleri (Eds.), *Farmers, scientists and plant breeding: Integrating knowledge and practice*. New York: CAB International.

Kitch, L. W., Boukar, O., Endondo, C., & Murdock, L. L. (1998). Farmer acceptability criteria in breeding cowpea. *Experimental Agriculture, 34*, 475–486.

LI-BIRD. (2005). *Annual report (2003–2004).* Pokhara, Nepal: Local Initiatives for Biodiversity, Research and Development (LI-BIRD).

Millennium Ecosystem Assessment. (2005). *Ecosystems and human well-being: Biodiversity synthesis (Report of the MEA)*. Washington, DC: World Resources Institute.

Morris, M. L., & Bellon, M. R. (2004). Participatory plant breeding research: Opportunities and challenges for the international crop improvement. *Euphytica, 136*, 21–35.

Nazarea, V. (1995). *Local knowledge and agricultural decision making in the Philippines: Class, gender, and resistance*. Ithaca, NY: Cornell University Press.

Nazarea-Sandoval, V. (1992). Ethnoagronomy and ethnogastronomy: On indigenous typology and use of biological resources. *Agriculture and Human Values, 8*, 121–131.

Pant, S. K. (2004). Laxman Karki's story: A case on successful entrepreneurship. *The Journal of Nepalese Business Studies, 1*.

Pant, L. P., & Odame, H. H. (2006). Multi-stakeholder deliberation on dialectical divides: An operational principle of the systems of innovation. *Knowledge Management for Development, 2*, 60–74.

Paudel, K. C. (2004). Documentation of biological resources and associated traditional knowledge in Nepal. In R. Adhikari & K. Adhikari (Eds.), *Evolving Sui generis options for the Hindu-Kush Himalayas*. Kathmandu, Nepal: SAWTEE.

Posey, D. A. (1999a). Introduction: Culture and nature – The inextricable link. In D. A. Posey (Ed.), *Cultural and spiritual values of biodiversity: A complementary contribution to the global biodiversity assessment*. London: Intermediate Technology Publications.

Posey, D. A. (1999b). Cultural and spiritual values of biodiversity: A complementary contribution to the global biodiversity assessment. In D. A. Posey (Ed.), *Cultural and spiritual values of biodiversity* (pp. 1–19). London: UNEP/Intermediate Technology Publications.

Rana, R., Gauchan, D., Rijal, D., Khatiwada, S., Paudel, C., Chaudhary, P., et al. (2000). Socio-economic data collection and analysis: Nepal component. In D. Jarvis, B. Sthapit, & L. Sears (Eds.), *Conserving agricultural biodiversity in situ: A scientific basis for sustainable agriculture* (pp. 54–59). Rome: IPGRI.

Rhoades, R. (1989). The role of farming in the creation of agricultural technology. In: R. Chambers, A. Pacey, & L.A. Thrupp (Eds.), *Farmer first: Farmers' innovation and agricultural research*. (pp. 3–9). London: Intermediate Technology Publications.

Rhoades, R., & Nazarea, V. (1998). Local management of biodiversity in traditional agroecosystems: A neglected resource. In W. W. Collins & C. O. Qualset (Eds.), *Biodiversity in agroecosystems* (pp. 215–36). Boca Raton, FL: Lewis Publishers/CRC Press.

Rijal, D., Sthapit, B., Rana, R., Tiwari, P., Chaudhary, P., Pandey, Y., et al. (2000). PPB, seed networks and grassroots strengthening: Value addition aspects, Nepal component. In D. Jarvis, B. Sthapit, & L. Sears (Eds.), *Conserving agricultural biodiversity in situ: A scientific basis for sustainable agriculture* (pp. 202–205). Rome: IPGRI.

Rosendal, G. K. (2006). Balancing access and benefit sharing and legal protection of innovations from bioprospecting impacts on conservation of biodiversity. *The Journal of Environment and Development, 15*(4), 428–447.

Salazar, R., Louwaars, N., & Visser, B. (2007). Protecting farmers' new varieties: New approaches to rights on collective innovations in plant genetic resources. *World Development, 35*, 1515–1528.

Shiva, V. (1997). *Biopiracy: The plunder of nature and knowledge*. Toronto: Between The Lines.

Sperling, L., Loevinsohn, M. E., & Ntabomvura, B. (1993). Rethinking the farmer's role in plant breeding: Local bean experts and on-station selection in Rwanda. *Experimental Agriculture, 29*, 509–519.

Sthapit, B., Joshi, K., Rana, R., Upadhaya, M., Eyzaguirre, P., & Jarvis, D. (2001). Enhancing biodiversity and production through participatory plant breeding. Paper presented at the *International Symposium on Participatory Plant Breeding and Participatory Plant Genetic Resource Enhancement*. Colombia, CA: CGIAR Program for Participatory Research and Gender Analysis.

United Nations Development Programme – UNDP. (2005). *Human development report*. New York: UNDP.

Upadhaya, P. (1999). *Nepalese culture and society: A sociological/anthropological perspective*. Pokhara, Nepal: Bidhayarthi Pustak Pasal.

Zimmerer, K. S. (1991). Managing diversity in potato and maize fields of the Peruvian Andes. *Journal of Ethnobiology, 11*, 2.

Chapter 5
Local Knowledge and Scientific Perceptions: Questions of Validity in Environmental Knowledge

Laura German

Abstract Local ecological knowledge has been subject to a great deal of debate in recent decades. Early strands of this literature could be easily classified into two camps – one which purports the adaptive logic and scientific validity of local knowledge, and the other which seeks to expose its flaws by illustrating its divergence from scientific understandings. While acknowledging subsequent attempts to question this dichotomy (Agrawal (Development and Change 26:413–439, 1995); Long (Development Sociology: Actor Perspectives. London and New York: Routledge, 2001); Pottier et al. (Negotiating Local Knowledge: Power and Identity in Development. London: Pluto Press, 2003)), this chapter maintains the distinction as a means of exploring claims to validity of diverse bodies of knowledge. It does this through a series of case studies on biophysical processes that have been subject to much debate and misunderstanding in both public and scientific spheres. Local and scientific knowledge are juxtaposed in two ways. By highlighting biophysical processes for which local and scientific understandings diverge but for which local ecological knowledge is nevertheless functionally sound, the adaptive capacity of local knowledge is illustrated. As is shown, empirical foundations to local ecological knoweldge may be found even behind purportedly "erroneous" perceptions of cause and effect. Secondly, by exposing the subjectivities of scientific understandings on certain biophysical processes, the grounding of even the most "objective" knowledge in perceptual and political biases is illustrated. Case studies on shifting agriculture, watershed function, and ecological processes that challenge our predictive capacities help to illustrate both the scientific foundations of local knowledge and the "perceptual" foundations of science. The intention is neither to discredit scientific understandings nor to place undue emphasis on the merits of local ways of knowing, but rather to expose the unfair value judgements leveraged against the latter historically – and to call for a more even playing field in the politics of environmental knowledge.

L. German (✉)
Center for International Forestry Research (CIFOR), BOX 0113 BOCBD,
Bogor 16000, Indonesia
e-mail: l.german@cgiar.org

L. German et al. (eds.), *Beyond the Biophysical: Knowledge, Culture, and Power in Agriculture and Natural Resource Management*,
DOI 10.1007/978-90-481-8826-0_5,

Keywords Complexity • Fire • Local knowledge • Science • Shifting agriculture • Validity

Introduction

The fields of ethnoscience, political ecology, critical theory, development sociology, and the anthropology of science have generated a much better understanding of how knowledge is shaped not just by "objective" understandings of the world, but by institutionalized philosophies, political agendas, and social relations (Blaikie and Brookfield 1987; Ellen 1993; Fairhead and Leach 1996; Long 2001). Local ecological knowledge has gained prominence in recent decades for its contribution to rural development and conservation, while parallel developments continue to undermine certain widely held "truths" purportedly supported by scientific evidence. Yet these developments do not point to a leveling of the playing field of knowledge politics. Local knowledges the world over continue to be eroded by dominant world views[1] and the low place "other ways of knowing" occupy on the political, ideological, and epistemological[2] totem pole.

This chapter explores the question of validity in environmental knowledge through a set of case studies strategically chosen to illustrate the shortcomings of science in providing definitive understandings for complex ecological phenomena, while illustrating the empirical grounding of select local ecological understandings. The intention is not to emphasize the weaknesses of institutionalized science while extoling the virtues of local ecological knowledge, but rather to illustrate the subjective nature of questions of validity. Different ways of knowing and different sources and forms of knowledge have their own strengths and weaknesses in contributing to an understanding of complex ecological systems, and individuals may draw on different sources of knowledge and legitimacy based on the context or purpose at hand. An argument is made for a social-constructivist[3] approach to rural engagement, in which the world and understandings of it are co-created by social actors and spaces are created for diverse and often complementary (but potentially contradictory) knowledges to interact on equal footing. Such an approach

[1] Alternatively coined "dominant narratives" (Roe 1991), "environmental orthodoxies" (Batterbury et al. 1997), "received wisdom" (Kull 2004), or "doxa" (Chapter 8, applying the ideas of Bourdieu).

[2] Epistemology is the theory of knowledge, especially with regard to methods, validity and scope. It is the investigation of what distinguishes justified belief from opinion.

[3] "Constructivism" is a theory of knowledge which argues that humans generate knowledge and meaning from their experience interacting with each other and with the environment they live in. Constructivist theories of psychology view learning as an active process of (re)construction rather than as a transmission of existing knowledge. "Social constructivism" extends constructivism into social settings, with a major focus on uncovering the ways in which individuals and groups collaborate in creating their perceived social reality.

emphasizes "hybrid" understandings and interactive, adaptive approaches to dealing with complex systems and uncertainty.

Background

Complexity in Human Ecological Systems

Uncertainty, non-linearity, and complexity have long been recognized by ecologists as characteristics of ecological systems (Clements 1936; Odum 1953). Yet engineering natural systems by imposing ever-tighter controls on variables seeming to undermine short-term management objectives has long been the predominant approach to ecosystem management. This "command-and-control" type of management has significant limitations when dealing with complex systems (Holling and Meffe 1996). "Attempts by authorities to tighten control … by excluding disturbances like fires or floods or by establishing alternative property rights systems have often led, paradoxically, to the creation of larger, more difficult challenges for society than the original set of problems" (Lebel et al. 2006; see also Scheffer et al. 2001). The tendency for the scientific establishment to study natural systems by breaking them down into their component pieces has also run counter to the need to understand the emergent properties of ecosystems (that which is "more than the sum of its parts") and the complexity of social–ecological systems. An interdisciplinary network of scientists, the Resilience Alliance (www.resalliance.org), has coalesced to address this gap.

From a social perspective, resilience[4] may be lost due to inflexible, closed institutions (Resilience Alliance 2009). On the other hand, the existence of institutions and networks that learn and store knowledge and experience and ensure flexibility in approaches for dealing with problems play an important role in adaptive capacity (Scheffer et al. 2001; Berkes et al. 2002). Learning to live with change and uncertainty and the ability to nurture diversity are critical factors that seem to be required for dealing with natural resource dynamics during periods of change and reorganization (Folke et al. 2002). Knowledge is a critical piece of this puzzle.

The Systematic Erosion and Devaluation of Other Ways of Knowing

While local knowledge has gained in prominence in recent decades (Brokensha et al. 1980; DeWalt 1994; Sillitoe 1988), these gains in legitimacy come after a long

[4] Ecosystem resilience is the capacity of an ecosystem to tolerate disturbance without collapsing into a qualitatively different state (www.resalliance.org).

history of erosion and devaluation of "other" (non-Western, non-"scientific") ways of knowing.[5] This has occurred through centuries of imposition of dominant world views, in which local knowledges, practices, and political-economic systems have been systematically discounted, eroded, and rendered invisible through everyday processes of economic and ideological subjugation – at first through colonial powers and the political, scientific, and economic institutions and discourses they left in their wake, and more recently through the ubiquitous influences of globalization. Unlike the supernatural within "modern" religions, local beliefs of the supernatural and beliefs about the material world that are otherwise encoded in symbolic understandings (e.g. explanations about the natural world that are more symbolic or supernatural than biophysical or material) have been treated as "superstition." Religious and other cultural practices brought from without, on the other hand, have been treated as signs of "civilization." Educational, scientific, and religious institutions have systematically discredited local ways of knowing, eroding self-confidence and often the complex adaptive systems they give rise to (German et al. 2004) – often turning local people against their own history. The ubiquitous influences discrediting local ways of knowing are alive today in the tendency to treat local ways of knowing as "perception" (and heresy) and scientific knowledge as "truth."

In order to undo past wrongs to local ways of knowing, anthropologists have worked hard to validate local knowledge (Chambers et al. 1989; Warren 1990). They have often done so by using scientific concepts and methods as the measuring stick against which the validity of local ways of knowing are assessed, given their perceived legitimacy (Berlin 1992; Richards 1980). There is no doubt that research illustrating the similarities between local and scientific knowledge has served to raise the profile of local knowledge in the eyes of the global community. Yet how appropriate is it to utilize scientific knowledge as the basis upon which all other forms of knowledge are evaluated? Identification of subjectivities within science – and illustration of the diversity of ways in which the scientific community itself approaches the same reality – would certainly undermine efforts to establish a single test of validity from within the modern scientific establishment.

Ironically, the scientific "truths" we adhere to so strongly in the face of diverse interpretions of reality (including those of the millions of farmers worldwide seen as "ignorant" for their failure to embrace modern technologies) have often been undone through the test of time. As this chapter will demonstrate, many earlier scientific beliefs and the management systems they have given rise to have been discredited as new findings have come to light (Bruijnzeel 2004; Gunderson and Holling 2002; Holling 2001; Pyne 1997a, b). In its compartmentalization of reality, science has often missed the forest for the trees – controlling for immediate variables while often missing a larger set of system determinants and dynamics. This begs the question as to whether even the most "superstitious" of local

[5] This might be called "epistemological subjugation," or the forced submission of one's foundations of knowledge (including its nature, validity and scope) to control by others.

understandings don't have some grounding in what might be called an "objective" material reality. It also begs the question of whether the search for a single objective reality is not itself at the root of the problem, and whether multiple ways of "knowing" the world (and the value systems behind these) are not the way of the future.

On the Relationship Between Local and Scientific Knowledge

A large body of work exploring the nature of local and scientific knowledge has focused on comparing and contrasting "knowledge systems" – bodies of knowledge with some degree of uniformity and identifiable sets of properties that make them distinguishable from other bodies of knowledge. A large body of ethnobiologists has worked to systematically compare folk and scientific biological classification systems, exposing both commonalities and differences in the way in which people perceive the discontinuities in nature (Berlin 1992). DeWalt (1994) made a systematic attempt to identify sets of properties that distinguish these two types of knowledge systems. Scott Atran (1990) is one of the first scholars to try to question the divide between folk and scientific knowledge by illustrating how the foundations of modern science are built upon folk (ethnoscientific) understandings from early Europe. In his seminal work *The Cognitive Foundations of Natural History* (1990), he demonstrates the grounding of modern scientific understandings in the "folk" ecologies of western Europe. His work suggests that the remarkable similarities between folk and scientific biological classification systems are based not only on objective discontinuities in the natural world, but on their common foundations in local ways of knowing. Thus, European folk understandings laid the foundations for modern scientific practice.

Other scholars working in this tradition have shaped critiques to both the ethnoscientific orthodoxy and the establishment (concerning questions of validity in local knowledge systems) by illustrating the role of *purpose* in local classification systems. Thus, just as the particular aims behind land management may shape those aspects of knowledge that become stressed and refined over time, socio–political relations both in rural life and in the encounters between local people and researchers shape the form that local knowledge may take at any given time (Ellen 1993). Knowledge is purposive – not only in a material sense (e.g., refinement of those areas of knowledge having most relevance to economic or cultural aims), but in a political sense (e.g., verbalizing particular aspects of local knowledge most likely to help the "knower" to achieve a particular outcome). Thus, the "subjectivities" of local knowledge must encompass not only deficiencies in, but also intentionality of, what is known and – equally important – what is verbalized (Scott 1990). Scholarship in the last two decades has helped to highlight that such "intentional subjectivity" is not only a characteristic of local knowledge, but of scientific practice. A scientist's view of reality – whether humanist or naturalist, social or biophysical – shapes the questions that are asked, the methods chosen for analysis and the results which emerge. Studies have shown how subjectivities in science result from the scale of analysis, disciplinary orientation, the ideological orientation of the researcher, and the funding source, each of which influence what questions are asked and – equally important – what is omitted (German 2006; Trouiller et al. 2001; van Noordwijk et al. 2004).

More recent scholarship has questioned the concept of knowledge "systems" as internally coherent entities, uniform across time and space. Agrawal, for example, criticizes the effort to:

> create two categories of knowledge – Western and indigenous – relying on the possibility that a finite and small number of characteristics can define the elements contained within the categories. This attempt is bound to fail because different indigenous and Western knowledges possess specific histories, particular burdens from the past, and distinctive patterns of change (Agrawal 1995, p. 421).

This same critique is leveraged against the indigenous/Western and local/scientific knowledge dichotomies. Agrawal provides a convincing set of arguments against efforts to identify substantive, methodological, or contextual differences between indigenous and scientific knowledge, highlighting instead the "striking differences" among philosophies and knowledges within each category, and the "substantial similarities" across elements of each. Agrawal's final argument about the political foundations of knowledge preservation and the role of power in producing knowledge also echoes throughout a larger body of recent scholarship. Long (2001) and Pottier et al. (2003), for example, emphasize how knowledge is produced, contested, and negotiated within knowledge encounters among different social actors, based on actors' meanings, interests, and powers. Production of knowledge in such encounters is highly political due to the imbalances in resources and institutional legitimacy and control, and because what is excluded and who is qualified to know involves acts of power (Pottier et al. 2003). Latour (1990) has also questioned the asymmetric treatment of "Us versus Them" in the work of anthropologists, who have spent much more time researching the characteristics and social processes around local knowledge than around scientific knowledge. As a result of such critiques, social scientists are increasingly turning to science-in-the-making as a fertile area of inquiry (Knorr-Cetina 1981; Knorr-Cetina and Mulkay 1983), and to forms of resistance in which "counter-powers" are leveraged by local people in their encounters with outside institutions (Pottier et al. 2003). While duly acknowledging the limitations of the local/scientific knowledge dichotomy, this chapter nevertheless retains the juxtaposition as a means to explore the question of validity that has deeply hindered respectful and productive exchanges at the knowledge enounter.

The Science in "Irrational" Local Understandings and the Subjectivities of Environmental Science

In this section three main arguments are made through a synthesis of prior research around three main themes: the role of fire in agriculture, watershed function, and managing uncertainty. The first is that many of the critiques that can be raised about the validity of local knowledge are based on the disconnect between scientific and local *understandings* of ecological processes rather than the *outcomes* of these processes, and that the latter is more crucial to human adaptability. Secondly, for biophysical processes that are culturally or economically important but difficult to observe, symbolic understandings often stand in for material ones. Yet these spiritually-grounded, “superstitious”, or non-material understandings often result in behaviors that can be fully rationalized through a scientific lens. The final argument is an important caveat to the second – namely, that science is also underpinned by the historical, social, and political biases of the observer and that it can not always be used as the yardstick against which validity is assessed. While the scientific method helps to weed out fact from fiction for the specific questions being asked, these questions themselves, the methods applied to address them and the interpretation of observed patterns are all subject to biases of scientific and personal world view.

Case No. 1: Fire in Agriculture

The Symbolic Foundations of the Science of Fire

Fire ecology, the ecological processes and scientific discipline linking fire behavior with its ecological effects, provides an important illustration of both the science of local knowledge and the mythology of scientific understanding. Fire as a natural resource management tool has been rejected at least as far back as the mid-eighteenth century, a view that was systematically reinforced through colonial-era ideology and policy (Bryant 1994; Grove 1997; Kull 2004). Throughout the tropics, fire control has been linked symbolically to “civilization” and fire use to “primitive” states of cultural evolution. The behavioural corrolary has been active fire suppression in ecosystems at all levels of human intervention, from agriculture to “wilderness” management. These actions have been supported by the outdated belief that ecosystems progress toward an equilibrium state and that disturbance disrupts this harmonious balance (Clements 1936; Golley 1996). The effects of these symbolic understandings on scientific and public perception is perhaps best exemplified by “Smokey Bear[6]” fire suppression campaigns in the U.S., whose underlying logic is that fire is always harmful to nature.

More recent ecological research has shown that fire is integral to the functioning of many communities of organisms which have adapted to withstand and even exploit fire-prone environments (Archibald et al. 2005; DeBano et al. 1998; Kramp et al. 1986; Wisheu et al. 2000). Plant adaptations include production of many seeds to enhance survival; smoke-activated germination and fire-activated buds; shade

[6] Smokey the Bear is a cartoon figure utilized to mobilize the public against forest and wildfires in the United States.

intolerance of trees requiring fire-induced gaps in the canopy to recruit new seedlings; shedding of lower branches during maturation to reduce susceptibility to fire; energy storage in roots to enable resprouting; and coatings of flammable oils that foster intense fire, causing fire-activated seeds to germinate and enabling them to capitalize on the lack of competition in burnt landscapes (Kramp et al. 1986; Knox and Clarke 2005). Fire also has a host of important ecological functions and outcomes, including nutrient cycling, control of wildfires, pest and weed control, the maintenance of desired vegetation states, and biodiversity enhancement[7] (DeBano et al. 1998; Hart et al. 2005; Kull 2004).

Furthermore, command-and-control approaches to fire management have resulted in outcomes more harmful than fire itself (Holling and Meffe 1996). Fire suppression has resulted in changes to ecosystem dynamics and species composition and has backfired to create some of the most damaging wildfires in history. Fire suppression contributes to unnaturally high fuel loads in the forest understory, enhancing the scale and intensity of wildfires (Minnich 1983; Savage and Mast 2005). Others have argued that fire suppression has increased damage by herbivorous insects whose populations might otherwise be moderated by fire (McCullough et al. 1998). Fire suppression campaigns in the U.S., initiated on public wildlands in 1886, were revised in 1968 to permit naturally ignited fires to burn within proscribed guidelines but nevertheless remained within the old paradigm of fire suppression (Pyne 1984). The fires of 1988 in Yellowstone National Park, remarkable for their scale and intensity – and for defying scientific understanding of fire ecology at the time – provided a turning point in scientific understandings and management of fire (Christensen et al. 1989). In short, while the modern science of fire ecology is catching up, scientific understandings of fire have suffered historically from the common mythology that fire is, by definition, harmful for the environment.

Running in parallel to the mythology shaping fire suppression on public lands has been a mythology running throughout scientific practice and popular literature on the destructive nature of fire in agriculture. Nowhere is this better exemplified than the debate on shifting agriculture (Dove 1983; Kull 2004). In Southeast Asia, swidden agriculture has been long criticized for its inefficiency in resource use and lower productivity relative to alternative land uses. Yet in a study comparing swidden agriculture with sustained yield logging and wet rice cultivation, Dove (1983) demonstrates the flaws in prior statements about swidden agriculture as a wasteful use of rainforest ecosystems. While logging is shown to yield a higher gross return under sustained yield management, swidden agriculture compares more favorably in terms of other relevant variables. While wet rice cultivation sustains a higher population than either of the other two land uses, the returns to labor and land can be much smaller than for swidden agriculture (see also Conklin 1954, 1957).

[7] Resulting from the creation of patchy landscapes and attraction of herbivores away from overgrazed (unburnt) areas with more palatable new forage (Archibald et al. 2005; Wisheu et al. 2000).

"Scientific" results of comparative studies of land use systems (from which swidden agricultural systems have been critiqued) are clearly subjective, dependent upon the variables selected for analysis. These variables, in turn, are shaped by prior political and disciplinary biases of those defining research questions and methods.

Another critique of shifting agriculture has been the destructive use of the environment and its use of fire, for which the perjorative view from scientific circles is embodied in the epithet "slash and burn" – a term which continues to be used among biophysical scientists despite its long discredited usage by social scientists (Kato et al. 1999; Tinker et al. 1996; Tomich et al. 1998). Despite these ecological critiques, shifting agriculture has proven to be a land use system both matched to the ecological conditions of tropical moist forest (Conklin 1954; Uhl 1987) and able to reconcile local livelihood priorities with global ecological concerns (Tomich et al. 1998). Even where increased population pressure and reduced fallow lead to the transformation of tropical forest ecologies into grassland, a situation deplored for its tendency toward "ecological deterioration" (Kull 2004; Nye and Greenland 1960; Richards 1952), local residents may view this transition differently. Vigorous regrowth of *Imperata cylindrica*, a species deplored by scientists as a pest and indicator species of ecological degradation, is viewed by Banjarese farmers of Kalimantan as a sign that the land has been recuperated enough to end the fallow and return the land to cultivation (Dove 1983). A body of recent research focusing on the origin and functions of anthropogenic soils in the Brazilian Amazon also provides evidence for the constructive role of fire in improving soil conditions in a region renowned for its highly weathered, infertile soils (Glaser and Woods 2004; Hecht 2003; Lehmann et al. 2003; Posey 1985). Indeed, while some forms of fire practiced in some places do lead to more permanent ecosystem changes (Pfund 2000), evidence from virtually all forested landscapes has revealed the utility and ecological importance of fire (Pyne 1997a). The question of whether fire is harmful or not seems to depend as much on the values of the observer than on the biophysical changes induced in the environment. The understanding that scientific inquiry is shaped by the historical, social, and political biases of the observer calls for increased attention to the connection between self-interest and perspective (Dove 1983).

In addition to the questionable scientific grounding of such critiques, some argue that the persistent miscomprehension of swidden agriculture as destructive is founded on the economic and political self-interest of the broader societies in which these systems are embedded. Antifire rhetoric, for example, has been used to justify the penetration of external economic interests into the territories of swidden agriculturalists (Dove 1983, 1993a; Fairhead and Leach 1996). In Guinea, where setting bush fires carried the death penalty until the 1970s, official misconceptions of local land use practices have justified state action to appropriate the resources of local inhabitants (Fairhead and Leach 1996). Yet this miscomprehension may also be due to the need to preserve government or corporate interests. In Indonesia, the government persistently blamed shifting agriculturalists for the regional "haze" that was the subject of intense diplomacy within ASEAN, until scientific evidence from neighboring states was leveraged to show the cause to be the burning of forests for the expansion of industrial plantations. Interestingly enough, these plantations were duly authorized by government agencies and promoted by official policy. In Madagascar, repeated directives from the colonial government to ban fire were aimed at protecting plantations established on lands wrested from local people (Kull 2004). Curiously, fervent antifire repression in Madagascar seems to have itself been a tool for expansion of the practice by turning fire into a tool of resistance against state domination (Kull 2004).

The Science in "Irrational" Local Understandings

In addition to illustrating the political bias in scientific understandings, fire in agriculture provides an interesting window into the nature of disconnects between scientific and local understandings. Rather than illustrate the weakness of local knowledge relative to scientific understandings, this case study attempts to illustrate that apparently "irrational" local understandings may nevertheless be rooted in a strong material logic which provides the foundation for human adaptability. It echoes other studies that have shown the inherent logic of local ecological knowledge and practices involving fire in agriculture (Conklin 1954; Kull 2004; Leigh and Noble 1981; Sivaramakrishnan 1996).

A case study from the Brazilian Amazon illustrates how the divergence of local knowledge on ecological *process* nevertheless grounds an understanding of *outcomes* which is logically consistent with scientific understandings. In a study of shifting agricultural systems in blackwater ecosystems, German (2001, 2003) explores the knowledge underlying local practice in managing swidden agricultural plots on two soil types which differ in their fertility and origin (natural vs. anthropogenic[8]). In assessing the timing of the burn, farmers assess a complex interplay of factors required to produce a fertile plot: the type of pre-burn vegetation, the seasonality and timing of the burn, soil type, and the requirements of crops to be grown following the burn. Farmers easily articulate how each of these factors relate to one another in determining the location and timing of a burning event to open up new swiddens. However, their understanding of the underlying ecological processes involved in transforming vegetation on relatively infertile soil into a fertile agricultural plot does not involve the concept of nutrients. Rather, local understandings about ecological processes in the swidden agricultural cycle are embedded in the raw (*crua*) vs. burnt (*queimada*) dichotomy. While soil scientists understand the burn as a process by which nutrients in the standing biomass are liberated and made available for plant uptake, local residents understand it as a process by which the soil is heated and left burnt (an inherently fertile, albeit transient, state). Soil fertility is therefore considered directly proportional to the intensity of

[8] Of human origin.

the burn. According to one farmer, "The soil has to be purified. The slash only helps to give force to burn the soil below." When a soil reaches the point of abandonment, it loses its burnt status: "Manioc won't produce any longer. The soil is too raw."

Soil scientists listening to these farmers might reach the premature conclusion that their knowledge is inherently flawed. Yet if we are to use scientific understandings as a benchmark against which the validity of local knowledge is assessed, soil chemical and botanical data would suggest that these understandings guide behaviors with a strong material logic. Local understandings link perceived soil qualities with specific management practices in the same way soil chemical analyses would do. The more fertile the soil, the less biomass required to restore soil fertility to a certain level; the more burnt the soil under forested conditions, the less heat is required from the burn to restore soil "strength". This logic is clearly seen in the divergence of swidden agricultural practices on the two soil classes, the age and biomass of the pre-burn forest on the more fertile anthropogenic soils being less than the relatively infertile Latosols. The pre-burn vegetation selected for swiddens on anthropogenic soils was found to be 6.7 years younger on average than for the more infertile Latosols (German 2004). Soil fertility indices are also higher upon abandonment on the more fertile soils, a practice which ensures their sustained fertility for the more nutrient-demanding high-value vegetatable crops. Here, ethnoscientific explanations are logically consistent with scientific understandings in terms of outcomes (soil fertility and related crop performance) rather than the underlying biophysical processes producing certain outcomes (i.e. nutrient dynamics). Therefore, caution should be used when using scientific concepts as the basis for assessing the validity of local knowledge. Deeper exploration of local knowledge can illustrate its strong adaptive value (see also Conklin 1957; Denevan and Padoch 1987; Dove 1983; Dove and Kammen 1997).

Case No. 2: Watershed Function

The Political Foundations and Outcomes of Scientific Forestry

The common assumption that trees are by definition environmentally benign and socially desirable informs tree planting campaigns worldwide – for which the Indonesian President's *Indonesia Menanam* (People's Daily, April 23, 2006), Wangari Maathai's Green Belt Movement (www.greenbeltmovement.org/) and the United Nations' Billion Tree Campaign (http://www.unep.org/billiontree-campaign/) are but a few examples. This assumption is embedded not only in populist rhetoric, but in scientific practice. Scott (1998) uses the case of scientific forestry to illustrate the failure of a host of State-led projects designed to render landscapes more legible, administratable and lucrative for non-local actors (most notably, state bureacracies and large commercial firms). Using it as "a metaphor for the forms of knowledge and manipulation characteristics of powerful institutions with sharply defined interests" (Scott 1998, p. 11), Scott illustrates how the model of scientific forestry developed in the late 1700s in Prussia and Saxony became the basis for forest management techniques throughout the developing world for its seductive ability to convert rural territory into a "utilitarianism confined to the direct needs of the state" (Scott 1998, p. 12). Through state "fiscal forestry," trees with their vast array of possible uses were replaced by an abstract conception of trees representing certain volumes of commercial products (Lowood 1990). In addition to orienting scientific practice toward unitary measures of performance (sustained yield of a single product – timber), monoculture plantations soon became a powerful esthetic symbolizing order and progress.

Yet the monocropped forest was – and in many places, continues to be – a disaster for peasants who rely on species-rich forests and agricultural systems for the provision of food, fuel, fiber, and medicine (Scott 1998; Carrere and Lohmann 1996). Eucalyptus-based forestry has been especially controversial, provoking emblematic social resistance in Asia, Africa, and Latin America. These social movements and conflicts around Eucalypts have been driven by a host of factors, including: the species' depletion of soil nutrients, tendency to enhance erosion, negative effects on crops, excessive use of water (and related effects on water availability for humans and livestock), competing uses of agricultural land, reductions in rural employment (due to diversion of other land uses to labor-saving plantations), diversion of forest products from local markets to larger industrial users, transfer of public or common land to private corporations, negative effects on livestock,[9] and loss of diverse forest products (Casson 1997; German et al. 2006; Raintree, 1996; Scott 1998; Shiva and Bandyopadhyay 1987). Yet the large majority of questions being addressed by scientific forestry remain focused around yield potential, not only ignoring these effects but often acting counter to the interests they represent. In some cases, responses to such critiques have been absent or reactionary and politically-charged (Carrere and Lohmann 1996). Forms of inertia, themselves with political-economic underpinnings, include continued focus on breeding for unitary purposes and around a limited set of species selected for their promise in furthering industrial interests. When researchers have made attempts to assess the effects of fast-growing exotics on hydrology, variables chosen often reflect the political interests of the State and private sector rather than local people. This is perhaps best evidenced in the tendency to focus research on water use *efficiency* (Li 2000; Stape et al. 2004), which obscures effects on the key variables of concern to local users (i.e. total consumption and its effect on low season flows). Furthermore, research has shown water use efficiency of Eucalypts to *increase* with total water usage (Stape et al. 2004), illustrating the importance of how variables for scientific research are selected. This resistance to change within scientific circles may be a function of existing mental models that inscribe the realm of what is considered

[9] From replacement of indigenous trees and competition with undergrowth on communal lands.

possible, but are often embedded in dominant political-economic interests such as maximizing forest-based revenue. For a deeper exploration of how dominant discourses are framed and the power dynamics in encounters between local people and outside institutions, see Pottier et al. (2003) and Ojha et al. (Chapter 8).

Local Knowledge and Emerging Science on Tree–Water Interactions: Points of Convergence

Ethnoscientific research on the ecological function of different tree species in the highlands of eastern Africa has highlighted local concerns and knowledge about trees and their impacts at landscape level (German et al. 2006). Table 5.1 summarizes the concerns voiced by farmers about trees and their effects on livelihoods and environmental services in different sites (German et al. 2006; unpublished data). These problems were identified in the context of open-ended participatory diagnoses of landscape-level natural resource management problems without an explicit forestry component. However, many of the problems identified by local residents were equated by them to the harmful effects of trees.

These negative characteristics of trees often lead to conflicts among local residents. These conflicts are most acutely felt in the context of negative effects on water and crops, problems which tend to be manifest in certain landscape niches due to the specific uses of Eucalypts and the winners and losers related to each (German et al. in press). Landowners having land on or near springs often plant Euclayptus woodlots near springs to maximize yield. The fact that this practice continues despite widespread local concern suggests an understanding by local people that growth rates are improved when access to water is enhanced. This scenario of opposing stakeholder interests is similar for farm boundaries. Landowners, cognizant of the negative effects of Eucalypts on crop performance, push their Eucalyptus woodlots or tree lines to the corners or borders of their farms where the negative effects on their own crops will be minimized. This in essence pushes the burden to neighboring farmers. In Tanzania, Eucalypts are also cultivated in valley bottoms by tea plantations, which have a demand for timber but are otherwise not interested in alternative uses of these areas (e.g. for cash crops downstream), again enhancing utility for the land owner but with negative repercussions for water users downstream. In summary, the problems stemming from the cultivation of "harmful" tree species relate not only to the inherent characteristics of the species, but to a particular spatial pattern of land use which maximizes benefits to some interest groups at the expense of others.

Review of the scientific literature will focus on the relationship between trees and hydrology, as this is one of the most contentious issues both locally and globally. Despite the remarkable inertia of scientific forestry, a small group of researchers has begun to explore the relationship between forests and water at catchment scale. Contrary to scientific and public myths about the role of forests in water generation, a host of recent research has shown instead that trees are generally net consumers

Table 5.1 Local concerns about tree properties in the highlands of Eastern Africa

Problem	Highland areas affected	Species implicated
Negative impact of boundary trees on (neighboring) crops and soil, and related effects on cropland availability and yields	Ethiopia, Kenya, Tanzania, Uganda	*Eucalyptus* spp.; *Cupressus lusitanica*; *Allanblackia stunlamannii*; *Solanecio mennii*; *Ocotea usambarensis*; *Senecio gigas*; *Rahmnus prinoides*; *Podocarpus gracilior*; *Juniperus procera*; *Erica arborea*; *Olea europaea* subsp. Africana
Negative impact on springs, waterways and wetlands and related outcomes (conflict, water-borne disease, increased drudgery for fetching water)	Ethiopia, Kenya, Tanzania[a]	*Eucalyptus* spp.; *Olea europaea* subsp. Africana; *Ocotea usambarensis*; *Markhamia obustifolia*; *Cupressus lusitanica*; *Podocarpus gracilior*; *Senecio gigas*; *Acacia mearnsii*; *Mangifera indica*; *Parinari curatslifolia*; *Vernonia auriculifera*
Increased run-off from impermeable layers of leaf litter	Tanzania	*Acacia mearnsii*; *Albizia gummifera*; *Albizia schimperiana*
Negative effect on water taste	Ethiopia	*Eucalyptus globulus*; *Vernonia auriculifera*; *Senecio gigas*

[a] This was not stressed in Uganda because households in Kabale District, where research was conducted, have access to well water.

of water (Bruijnzeel 2004; Calder et al. 1997; Farley et al. 2005; Rumley and Ong 2006). This research finally supports local knowledge and age-old complaints by local people that certain trees have a negative effect on water availability. A study in Southeast Asia showed total annual water yield to increase with the percentage of forest biomass removed, with maximum gains in water yield upon total clearing (Bruijnzeel 2004). The study was unable to decipher a clear relationship between forest cover and "low season flows" (a key variable of interest to local stakeholders), and declared this the "single most important watershed issue requiring further research". A global synthesis of catchment data sets by Farley et al. (2005), however, demonstrated that catchment afforestation of shrubland and grassland with pine and Eucalypts not only reduced annual runoff by between 31% and 44%, but showed proportional reductions in low flow to be even larger than for annual runoff ($P < 0.001$). The effects experienced by local residents worldwide of fast-growing trees on spring discharge and waterways, most acutely observed during the dry season, are finally being acknowledged by the formal scientific establishment.[10]

Observations by local residents of the relative impacts of different fast-growing tree species on water draw-down, in which Eucalypts are seen as the prime culprit, also seem to be confirmed through recent research. Eucalypts were shown to have a larger impact than other tree species in afforested grasslands ($P < 0.002$), reducing runoff by 75% compared to a 40% average decrease with pines (Farley et al. 2005). Scientific research also supports local understandings about the relationship between tree growth rates and proximity to groundwater (Scott 1999). Mutually-reinforcing accounts of local knowledge from multiple world regions also help to support the observation that removal of fast-growing exotics and reforestation with "water-friendly" trees and grasses can help restore extinct springs (Carrere and Lohmann 1996; Cruz and Rivera 1983; German unpublished data).

While many species are seen by local residents to have a neutral effect on water, some species are believed to have a positive effect. In Tanzania, seven species were mentioned, all indigenous (German unpublished data):

- Mkuyu (*Ficus benjamina*)
- Msambo (*Allanblackia stunlamannii*)
- Mshai wawa (*Albizia harveyi*)
- Mvumo (*Ficus thonningii*)
- Muombeombe (*Hallea rubrostipuleta*)
- Mkonde (*Myrianthus holstii*)
- Nguanguzo (*Solanecio mennii*)

While research on the effects of different species on water is remarkably hard to come by in the literature, a comparative assessment of local knowledge across distant ecoregions can serve as an indication of the validity of local knowledge. In a high-altitude zone of Ethiopia, while many species were seen to have a neutral effect on water, no species found at this altitude was known to have a positive effect on water (German unpublished data). Despite this, local residents also knew of trees found at lower altitudes that conserve water. *Ficus* was again identified as a genus known to enhance water supplies. The only known scientific process through which trees could actually enhance water supplies is the hydraulic effect, in which water is not generated but rather moved upward within a soil profile through the hydraulic effect of tree roots. This does not discredit local ways of knowing; rather, it suggests that local interpretations of hydrological processes reflect the observability of these processes and the scale at which they are observed.

[10] South Africa is an important exception, with publicly funded research on the effects of plantation establishment on streamflow reduction being conducted since the 1930s (see Scott and Lesch 1997 and Scott and Smith 1997 for recent examples of this research).

Case No. 3: The Art and Science of Uncertainty and the Symbolic Foundations of Local Knowledge

> The scientific dialog has taken place in the larger cultural context of the 19th and 20th century, held together by its consistency with dominant social beliefs. The most important of these, the story line holding the scientific dialog together, has been the belief that technological progress increases material abundance while decreasing our dependence on the whims of nature.
>
> (Norgaard 2004, p. 7)

> Managing social–ecological systems will always be a combination of "art" and science.
>
> (Walker et al. 2006, p. 3)

The Science of Uncertainty and the Symbolism in Environmental Stewardship

Ecological systems are by nature complex. Historically, the challenges posed by this complexity have been addressed by scientists and managers alike through strategies to harness natural processes for human benefit through narrowly defined sets of parameters. Environmental management has long been oriented toward maximizing returns of a restricted set of environmental outputs – grain, meat or fiber; food, feed, or energy. When natural systems have failed to behave as predicted, ever-tighter controls have been applied in the form of chemical fertilizers (to counter depleting natural stocks), fire suppression (to reduce its apparently destructive effects), herbicides (to halt natural successional processes), or genetic engineering (to maximize yields of plant and animal products, or adaptation to extreme environmental conditions). Curiously, such approaches to resource management have been undergirded by ideologies of human separation from and domination over nature, as seen in the very concept of "nature," its embodiment in isolationist models of conservation, and the Judeo-Christian concept of environmental stewardship. Released from the constraining forces of the environment, humans were free to manipulate environmental variables toward their own ends.

A growing body of literature illustrates the deficiencies of such "command-and-control" approaches to natural resource management. While often effective in temporarily reducing undesirable ecosystem properties or disturbances, they have often led to the creation of more difficult challenges for the society (Holling and Meffe 1996; Scheffer et al. 2001). As stated by Walker et al. (2006), "although topdown optimization allowed for increased welfare in the early phases of natural resource use and exploitation, the secondary effects of this narrow approach are now accumulating everywhere, and we must move on." These secondary effects may be seen in fires of expanded scale and intensity in fire-suppressed ecosystems (Minnich 1983; Savage and Mast 2005), in the evolution of ever-expanding nutrient deficiencies in heavily nutrient-subsidized production systems (Sanchez et al. 1982), in the salination of heavily irrigated land (Gordon et al. 2007), in pest and weed resistance to chemical controls (Conway 1999), and in the spin-off problems emanating from control-oriented engineering schemes (Holling and Meffe 1996).

Lessons from ecosystem ecology and population biology have enhanced our understanding of the complex interconnectedness of biotic and abiotic components of ecosystems, and helped foster understanding of unanticipated spin-offs of manipulations to any component of a system (Sakai et al. 2001). The relatively new concept of "resilience" has also gained popularity as a framework for understanding such complexities and the principles by which they are governed. After more than a decade of research by the Resilience Alliance (www.resalliance.org/1.php), it is now understood that change and uncertainty are often the only "constants" in ecological systems, that ecosystems may have alternative stable states, and that complex feedbacks within and between diverse scales of socio-political and ecological organization can undermine any effort to control variables at a particular scale (Gunderson and Holling 2002; Holling 2001). The scientific methods and understanding which grounded earlier efforts to harness complex ecosystems toward human benefit are found to be wanting in fostering an improved understanding of complexity and uncertainty:

> Classical scientific approaches work best under highly reduced and controlled conditions. They are of far less use in the real-world situations of coupled social–ecological systems in which variables cannot be tightly controlled and independently manipulated, replication can be difficult or impossible, and people are understandably reluctant to subject themselves and their livelihoods to experimental manipulations for the sake of advancing scientific understanding (Walker et al. 2006).

While interdisciplinary efforts to understand the dynamic and complex nature of linked social–ecological systems have made great strides in advancing our understanding, there is a long way to go indeed in translating these into a tight body of theory governing their dynamics (ibid.) – and perhaps longer to translate these into a set of working principles and practices for human ecosystem management and governance.

Symbolic Foundations of Adaptive Processes

Throughout much of history, as official resource management systems were grounded in a strong faith in the ability to "control away" undesirable ecosystem variables, customary resource management systems worldwide – operating on a very different set of principles – were treated with disdain. Oriented toward risk management and the provision of a complex set of material, social, and symbolic resources to society, these systems were a world away from the "command-and-control" approach of the Western scientific establishment. As a result of both this distance and the deterministic nature of scientific thought, symbolic interpretations of environmental phenomena were equated with the simplicity of the tribal mind, and oft denoted as "superstition" or "witchcraft" by superior-minded Western observers. Belief systems that make less artificial distinctions between culture and nature are lumped into a single category of "animism", in contrast to the dominant religions which largely separate science from symbol, and the spiritual from the material realm. While much symbolism in other ways of knowing is not linked to material concerns, the work of anthropologists has shed light on the role that ideology can play in adaptive processes (see Misiko, Chapter 6). I wish to focus the current discussion on the role of science and symbol in traditional strategies to cope with environmental uncertainty.

While characterization of local resource management practices using a unifying logic and set of characteristics would be an exercise of meaningless simplification, it may be said that embodied in many of these systems – particularly those evolving within risk-prone environments – were mechanisms for risk aversion. Survival was long dependent on risk management and the embeddedness of adaptive strategies in collectively held beliefs and traditions (Berkes 1999). These beliefs can foster adaptive behavior in risk-prone environments by either strengthening or severing ties between the environment and human decision-making, and by codifying empirical observations about complex ecological processes made over many generations. Prior human ecological research in drought- and flood-prone environments is used to illustrate two divergent functions that local knowledge can play in dealing with uncertainty.

Adaptive strategies of pastoralist societies in drought-prone environments reduce risk through mobility, extensive social networks, and a detailed, empirically-grounded knowledge of the desert and its flora (Gardner 2005). In fact, all facets of pastoralist societies – from their knowledge and belief systems to their systems of land tenure and socio-political organization – have tended to be interpreted in functionalist terms, given the material necessities imposed by harsh desert environs (Swallow and Bromley 1995; van den Brink et al. 1995). These include, primarily, the need to ensure continuous access to pasture and water where rainfall is both scarce and variable in space and time, and the need to keep human and livestock populations within the carrying capacity of the environment (Markakis 2004). For example, Bedouin herders of the Middle East and northern Africa had traditional homeland and watering points within these areas over which an individual and his/her clan or lineage had rights. While access to such homelands was restricted, complex socio-political ties among neighboring clans facilitated migration across kin-based territories to access pasture and water over large areas. Communication networks, equally complex and widespread, ensured access to timely information about rains and rangeland (Gardner 2005). While both symbolic (supernatural) and ethnoscientific (empirical) interpretations guide interpretations of environmental change, all pastoral societies have detailed, empirically-grounded knowledge of rangeland vegetation matched to their immediate livelihood needs – namely its nutritional value, yield, and time of sprouting (Bollig and Schulte 1999). Pastoral environmental knowledge and social networks seem particularly tuned to strengthening the ties between environmental stimuli and decision-making on migratory patterns.

Michael Dove's (1993b) study of Kantu farmers of West Kalimantan, Indonesia, on the other hand, illustrates the use of supernatural or "symbolic" understandings of the environment to codify generations of accumulated experience on the "unknowable" (environmental uncertainty) – in this case, the depth and timing of floods affecting agricultural yields in different landscape locations. A Kantu farmer will use divination – the attempt to gain insight into a situation through standardized rituals – to tap into the foresight of major deities when making decisions on agricultural practice. When searching for a place to locate their swiddens, she or he will traverse a section of forest in search of omens from one of seven forest birds, which in turn help to determine where a new swidden should be located. Dove uses systematic recording of all omens observed and honored throughout the swidden cycle for 69 swiddens to argue that rules applied in interpreting these omens are arbitrary, thereby randomizing behavioral outcomes. Yet why would this be advantageous? Dove argues that lack of evidence for any regular variation in rainfall or flooding and the impossibility of correctly predicting a flood creates a critical uncertainty for farmers – critical in the sense that making the wrong decision may have dire livelihood consequences. The tendency for recent memory to have a stronger hold on farmer reasoning more than infrequent (but potentially life-threatening) events in the distant past (Ortiz 1979) would tend to induce maladaptive responses to unpredictable environmental dynamics if decision-making were left to "reason" alone. Dove (1993b) argues that the randomizing function of these divination practices favors the establishment of swiddens in multiple ecological zones rather than the zone most likely to maximize yields based on recent experience. This in effect grounds human decision-making in an implicit recognition of uncertainty. While scientifically-based development strategies try to eliminate uncertainty, Kantu divination practices embrace it. Ironically, by trying to make sense of the limits of human knowledge, the symbolism of Kantu farmers aids in transcending these limits (Dove 1996). By seeking the "right" solution to environmental uncertainty, Dove argues that development paradigms can exacerbate the volatility of relations between society and the environment, enhancing successes but also failures. The stark realities of such failures for people highly dependent on the local environment for their survival make an ideology grounded in risk-minimizing "averages" (randomization) rather than production-maximizing "extremes" highly adaptive indeed.

Discussion and Conclusions

Ways of Knowing and the Knowledge Interface

This chapter is not an attempt to expose the shortcomings of scientific knowledge and the virtues of local knowledge. Rather, it is an attempt to put into question the basis upon which questions of validity are assessed to illustrate the arrogance with which science and development have confronted other ways of knowing – both scientific and symbolic. Far from politically neutral encounters, knowledge exchanges between natural resource "experts," religious leaders, and the Western educational establishment one the one hand, and local people on the other, have had far-reaching effects on local epistemologies (which knowledge is seen as legitimate), adaptive processes, self-reliance, and self-respect. Agricultural and natural resource management specialists, and other institutions seeking to colonize the non-Western mind, continue to systematically erode such knowledge systems based on a different logic that may or may not be superior in value and long-term adaptive success to the prevailing value systems. The logic of yield maximization is very different from that of risk aversion, and the logic of deterministic environmental management very different from world views which foster more humble relations between society and the environment. So while smallholders worldwide increasingly embrace the yield and income-maximizing logic of agricultural and natural resource management "experts" – and traditional belief systems give way to more materialist rationalities – we must always ask ourselves what is lost in the process.

There are a number of approaches that may be utilized to foster greater understanding and appreciation of the science and ideology of local natural resource management strategies. The theory and methods of ethnoscience and ethnoecology are well developed, and easily accessible by those interested in gaining a greater understanding of the science of local people. These include methods for understanding local classification systems (Berlin 1992), processual knowledge on land management practices and related outcomes (Sinclair and Walker 1999), and for understanding processes of intergenerational knowledge transfer (Zent 2001; Zarger and Stepp 2004). For those interested in understanding the material logic behind traditional knowledge and belief systems, traditional practices can be subject to scientific experiments to confirm their functional grounding (see, for example, Wickama and Mowo 2001). However, care should be taken in using science alone as the benchmark of validity, given the very real limitations to scientific ways of knowing highlighted in this chapter. The most difficult challenge, however, is to foster greater appreciation of the subjectivities of scientific understanding and developmentalist paradigms. The next section summarizes an emerging field of interest that focuses on reconciling scientific and local world views by focusing on the social and political characteristics of the knowledge encounter rather than the content of different ways of knowing.

Toward Social-Constructivist Approaches to Rural Engagement

> The demystification of science through the ethnographic study of scientific practice and everyday knowledge brings into perspective a whole new set of images and representations of how the social world is constructed … A fresh panorama unfolds in which the interplay and interfaces of local people and scientists become central to the production of more acceptable, "human" solutions aimed at countering the "supremacy" and "excesses" of modern technological and economic development – (Long 2001, p. 170).

Since some subjectivity and uncertainty is characteristic of any knowledge base, a set of new approaches to collective knowledge creation has emerged. They focus neither on the similarities and differences between local and scientific knowledge, nor on the documentation and analysis of their substantive content. They aim not to *characterize* different bodies of knowledge but to *engage* diverse ways of knowing within and between scientific and local communities and constituencies of interest.

Constructivism acknowledges that knowledge is acquired through personal experience and that it is socially-determined or "constructed,"[11] whether in scientific circles or in "real life." "Social learning" and "collaborative learning," on the other hand, emphasize the added value of understanding an issue from multiple angles and engaging multiple sources of knowledge in problem-solving (Norgaard 2004). Social-constructivist approaches are those in which collective understandings are achieved through deliberative process (open discussion and debate among actors), peer learning, and other means of actively engaging diverse sets of interests and knowledge (Fosnot 1996).

Another set of approaches emphasizes the uncertainties inherent in managing complex systems. "Adaptive management" emphasizes the critical importance of learning processes over specific solutions to environmental problems (Hagmann and Chuma 2002), while "adaptive collaborative management" (ACM) emphasizes the multi-stakeholder nature of most environmental challenges and the need to learn collectively (Colfer 2005). Interactive, action-based approaches to scientific inquiry ("action research," "participatory action learning") have come about as a means to embed scientific inquiry in learning and change processes (Checkland 1991; Checkland and Holwell 1998; Morgan and Ramirez 1983; Röling 1996). The key characteristics of these approaches to learning are their collaborative and multi-stakeholder nature; the deliberative, constructive approach to producing "hybrid" understandings; and the interactive, adaptive approach to managing environmental challenges and uncertainties. In their totality, they present a more logical way of approaching the uncertainties inherent in complex socio-ecological systems. Yet they are inherently challenging due to the political dynamics and power imbalances that shape encounters between different social actors, requiring a facilitator highly sensitive to such dynamics as well as a dose of humility when deciding whether to intervene in the first place.

Implications for development and conservation research and practice are several. Perhaps the most fundamental is the need to maintain a self-critical stance toward our own attitudes and assumptions about the knowledge and practice of others – whether professionals or resource users. We must always ask ourselves, "Where does my resistance to this other way of thinking and behaving come from?" and, "What other interpretations might exist?" Secondly, it may be useful to explore the ethnoscientific or ideological bases of local environmental management practices. Some would support doing this by "validating" local ecological knowledge through experimental methods. I would argue, however, that using science as the measuring stick against which the validity of local knowledge is assessed is itself suspect – given the disciplinary and ideological biases of scientific disciplines, the limitations of the science of complex systems, and the value judgements this conveys to others. Rather, active engagement of diverse interests and bodies of knowledge on a level playing field in which hierarchies of knowledge and status are left behind is perhaps the most meaningful way to approach shared natural resource management challenges.

[11] As opposed to always reflecting some "objective", material reality.

This requires grounding the exchange in *local* priorities (as articulated and framed by diverse local perspectives), and a radical shift in modern notions of scientific professionalism.

References

Agrawal, A. (1995). Dismantling the divide between indigenous and scientific knowledge. *Development and Change, 26*, 413–439.

Archibald, S., Bond, W. J., Stock, W. D., & Fairbanks, D. H. K. (2005). Shaping the landscape: Fire-grazer interactions in an African Savanna. *Ecological Applications, 15*(1), 96–109.

Atran, S. (1990). *The cognitive foundations of natural history: Towards an anthropology of science*. Cambridge: Cambridge University Press.

Batterbury, S., Forsyth, T., & Thomson, K. (1997). Environmental transformations in developing countries: Hybrid research and democratic policy. *Geographical Journal, 163*(2), 126–132.

Berkes, F. (1999). *Sacred ecology: Traditional ecological knowledge and management systems*. London: Taylor and Francis.

Berkes, F., Colding, J., & Folke, C. (2002). *Navigating social–ecological systems: Building resilience for complexity and change*. Cambridge: Cambridge University Press.

Berlin, B. (1992). *Ethnobiological classification: Principles of categorization of plants and animals in traditional societies*. Princeton, NJ: Princeton University Press.

Blaikie, P., & Brookfield, H. C. (Eds.). (1987). *Land degradation and society*. London: Methuen.

Bollig, M., & Schulte, A. (1999). Environmental change and pastoral perceptions: Degradation and indigenous knowledge on two African pastoral communities. *Human Ecology, 27*(3), 493–514.

Brokensha, D. W., Warren, D. M., & Werner, O. (1980). *Indigenous knowledge systems and development* (p. 473). Washington, DC: University Press of America.

Bruijnzeel, L. A. (2004). Hydrological functions of tropical forests: Not seeing the soil for the trees? *Agriculture, Ecosystems and Environment, 104*, 185–228.

Bryant, R. L. (1994). Shifting the cultivator: The politics of teak regeneration in colonial Burma. *Modern Asian Studies*, *28*, 225–250.

Calder, I. R., Rosier, P. T. W., Prasanna, K. T., & Parameswarappa, S. (1997). *Eucalyptus* water use greater than rainfall input: A possible explanation from Southern India. *Hydrology and Earth System Sciences, 1*, 246–256.

Carrere, R., & Lohmann, L. (1996). *Pulping the south: Industrial tree plantations and the world paper economy*. London: Zed Books.

Casson, A. (1997). The controversy surrounding eucalypts in social forestry programs of Asia. *Resource Management in Asia-Pacific Working Paper* No. 3. Canberra: Research School for Pacific and Asian Studies, The Australian National University.

Chambers, R., Pacey, R., & Thrupp, L. (Eds.). (1989). *Farmer first: Farmer innovation and agricultural research*. London: Intermediate Technology Publications.

Checkland, P. (1991). From framework through experience to learning: The essential nature of action research. In H. Nissen, H. Klein, & R. Hirscheim (Eds.), *Information systems research: Contemporary approaches and emergent traditions* (pp. 397–403). Amsterdam: Elsevier.

Checkland, P., & Holwell, S. (1998). Action research: Its nature and validity. *Systemic Practice and Action Research, 11*(1), 9–21.

Christensen, N. L., Agee, J. K., Brussard, P. F., Hughes, J., Knight, D. H., Minshall, G. W., et al. (1989). Interpreting the Yellowstone fires of 1988. *BioScience, 39*(10), 678–685.

Clements, F. E. (1936). The nature and structure of climax. *The Journal of Ecology, 24*(1), 252–284.

Colfer, C. J. P. (2005). *The complex forest: Communities, uncertainty, and adaptive collaborative management* (p. 370). Washington, DC: Resources for the Future and CIFOR.
Conklin, H. C. (1954). The ethnoecological approach to shifting agriculture. *Transactions of the New York Academy of Science, 17*, 133–142.
Conklin, H. C. (1957). *Hanunoo agriculture: A report on an integral system of shifting cultivation in the Philippines*. Rome: FAO.
Conway, G. (1999). *The Doubly Green Revolution: Food for all in the twenty-first century*. Ithaca, NY: Cornell University Press.
Cruz, M. E., & Rivera, R. (1983). *Cambios Ecológicos y de Poblamiento en el Sector Forestal Chileno*. Santiago: GIA.
DeBano, L. F., Neary, D. G., & Ffolliot, P. F. (1998). *Fire's effects on ecosystems*. New York: Wiley.
Denevan, W. M., & Padoch, C. (Eds.). (1987). *Swidden-fallow agroforestry in the Peruvian Amazon, advances in economic botany* (Vol. 5). New York: New York Botanical Garden.
DeWalt, B. (1994). Using indigenous knowledge to improve agriculture and natural resource management. *Human Organization, 53*(22), 123–131.
Dove, M. (1983). Theories of swidden agriculture and the political economy of ignorance. *Agroforestry Systems, 1*, 85–99.
Dove, M. (1993a). A revisionist view of tropical deforestation and development. *Environmental Conservation, 20*(1), 17–25.
Dove, M. (1993b). Uncertainty, humility and adaptation in the tropical forest: The agricultural augury of the Kantu. *Ethnology, 32*, 145–167.
Dove, M. (1996). Process versus product in Bornean Augury: A traditional knowledge system's solution to the problem of knowing. In R. Ellen & K. Fukui (Eds.), *Redefining nature: Ecology, culture and domestication* (pp. 557–597). Oxford/Washington, DC: Berg.
Dove, M. R., & Kammen, D. M. (1997). The epistemology of sustainable resource use: Managing forest products, swiddens and high-yielding variety crops. *Human Organization, 56*(1), 91–101.
Ellen, R. (1993). *The cultural relations of classification: An analysis of Nuaulu animal categories from Central Seram*. Cambridge: Cambridge University Press.
Fairhead, J., & Leach, M. (1996). *Misreading the African landscape*. Cambridge: Cambridge University Press.
Farley, K. A., Jobbagy, E. G., & Jackson, R. B. (2005). Effects of afforestation on water yield: A global synthesis with implications for policy. *Global Change Biology, 11*, 1565–1576.
Folke, C., Colding, J., & Berkes, F. (2002). Synthesis: Building resilience for adaptive capacity in social–ecological systems. In F. Berkes, J. Colding, & C. Folke (Eds.), *Navigating social–ecological systems: Building resilience for complexity and change* (pp. 352–387). Cambridge: Cambridge University Press.
Fosnot, C. T. (1996). *Constructivism: Theory, perspectives and practice* (p. 228). New York: Teachers College Press.
Gardner, A. (2005). The new calculus of Bedouin pastoralism in the Kingdom of Saudi Arabia. In S. Paulson & L. Gezon (Eds.), *Political ecology across spaces, scales, and social groups* (pp. 76–93). London: Rutgers University Press.
German, L. (2001). *The dynamics of Terra Preta: An integrated study of human-environmental interaction in a nutrient-poor Amazonian ecosystem*. Ph.D. Thesis, University of Georgia, 313 pp.
German, L. (2003). Ethnoscientific understandings of Amazonian Dark Earths. In J. Lehmann, D. C. Kern, B. Glaser, & W. I. Woods (Eds.), *Amazonian Dark Earths: Origins, properties, management* (pp. 179–201). Dordrecht, The Netherlands: Kluwer.
German, L. (2004). Ecological praxis and blackwater ecosystems: A case study from the Brazilian Amazon. *Human Ecology, 32*(6), 653–683.
German, L. (2006). Moving beyond component research in mountain regions: Operationalizing systems integration at farm and landscape scale. *Journal of Mountain Science, 3*(4), 287–304.

German, L., Charamila, S., & Tesema, T. (in press). Managing trade-offs in agroforestry: From conflict to collaboration in natural resource management. In S. Klappa & D. Russell (Eds.), *Transformations in agroforestry systems*. Oxford: Berghahn Books.

German, L., Kidane, B., & Shemdoe, R. (2006). Social and environmental trade-offs in tree species selection: A methodology for identifying niche incompatibilities in agroforestry. *Environment, Development and Sustainability, 8*, 535–552.

German, L., Tolera, T., Alemu, G., & Shemdoe, R. (2004). The role of traditional ecological knowledge, beliefs and practices in NRM: A case study from the Eastern African Highlands. Paper given at the *9th International Congress of Ethnobiology.* Kent, 13–17 June.

Glaser, B., & Woods, W. I. (2004). *Amazonian Dark Earths: Explorations in space and time*. Heidelberg: Springer.

Golley, F. B. (1996). *A history of the ecosystem concept in ecology: More than the sum of the parts*. New Haven, CT: Yale University Press.

Gordon, L. J., Peterson, G. D., & Bennett, E. M. (2007). Agricultural modifications of hydrological flows create ecological surprises. *Trends in Ecology and Evolution, 23*(4), 211–219.

Grove, R. (1997). *Green imperialism*. Cambridge: Cambridge University Press.

Gunderson, L. H., & Holling, C. S. (Eds.). (2002). *Panarchy: Understanding transformations in human and natural systems*. Washington, DC: Island Press.

Hagmann, J., & Chuma, E. (2002). Enhancing the adaptive capacity of the resource users in natural resource management. *Agricultural Systems, 73*(1), 23–39.

Hart, S. C., DeLuca, T. H., Newman, G. S., MacKenzie, M. D., & Boyle, S. I. (2005). Post-fire vegetative dynamics as drivers of microbial community structure and function in forest soils. *Forest Ecology and Management, 220*, 166–184.

Hecht, S. B. (2003). Indigenous soil management and the creation of Amazonian Dark Earths: Implications of Kayapó practices. In J. Lehmann, D. C. Kern, B. Glaser, & W. I. Woods (Eds.), *Amazonian Dark Earths: Origins, properties, management* (pp. 355–372). Dordrecht, The Netherlands: Kluwer.

Holling, C. S. (2001). Understanding the complexity of economic, ecological and social systems. *Ecosystems, 4*, 390–405.

Holling, C. S., & Meffe, G. K. (1996). Command and control and the pathology of natural resource management. *Conservation Biology, 10*, 328–337.

Kato, M. S. A., Kato, O. R., Denich, M., & Vlek, P. L. G. (1999). Fire-free alternatives to slash-and-burn for shifting cultivation in the eastern Amazon region: The role of fertilizers. *Field Crops Research, 62*(2), 225–237.

Knorr-Cetina, K. D. (1981). *The manufacture of knowledge: An essay on the constructivist and contextual nature of science*. Oxford: Pergamon Press.

Knorr-Cetina, K. D., & Mulkay, M. (1983). *Science observed: Perspectives on the social study of science*. London: Sage.

Knox, K. J. E., & Clarke, P. J. (2005). Nutrient availability induces contrasting allocation and starch formation in resprouting and obligate seeding shrubs. *Functional Ecology, 19*(4), 690–698.

Kramp, B. A., Patton, D. R., & Brady, W. W. (1986). *Run wild: Wildlife–habitat relationships*. Albuquerque, NM: U.S. Forest Service, Southwestern Region.

Kull, C. A. (2004). *Isle of fire: The political ecology of landscape burning in Madagascar*. Chicago, IL/London: The University of Chicago Press.

Latour, B. (1990). Postmodern? No, simply amodern! Steps towards an anthropology of science. *Studies in History and Philosophy of Science, 21*(1), 145–171.

Lebel, L., Anderies, J. M., Campbell, B., Folke, C., Hatfield-Dodds, S., Hughes, T. P., et al. (2006). Governance and the capacity to manage resilience in regional social–ecological systems. *Ecology and Society, 11*(1), 19.

Lehmann, J., Kern, D. C., Glaser, B., & Woods, W. I. (2003). *Amazonian Dark Earths: Origins, properties, management*. Dordrecht, The Nethelands: Kluwer.

Leigh, J. H., & Noble, J. C. (1981). The role of fire in the management of rangelands in Australia. In A. M. Gill, R. H. Groves, & I. R. Noble (Eds.), *Fire and the Australian biota* (pp. 471–496). Canberra: Australian Academy of Science.

Li, C. (2000). Population differences in water-use efficiency of *Eucalyptus microtheca* seedlings under different watering regimes. *Physiologia Plantarum, 108*(2), 134–139.

Long, N. (2001). *Development sociology: Actor perspectives*. London/New York: Routledge.

Lowood, H. E. (1990). The calculating forester: Quantification, cameral science, and the emergence of scientific forestry management in Germany. In T. Frängsmyr, J. L. Heilbron, & R. E. Rider (Eds.), *The quantifying spirit in the eighteenth century* (pp. 315–342). Berkeley, CA: University of California Press.

Markakis, J. (2004). *Pastoralism on the margin* (p. 37). London: Minority Rights Group International.

McCullough, D. G., Werner, R. A., & Neumann, D. (1998). Fire and insects in northern and boreal forest ecosystems of North America. *Annual Review of Entomology, 43*, 107–127.

Minnich, R. A. (1983). Fire mosaics in southern California and northern Baja California. *Science, 219*, 1287–1294.

Morgan, G., & Ramirez, R. (1983). Action learning: A holographic metaphor for guiding social change. *Human Relations, 37*(1), 1–28.

Norgaard, R. B. (2004). Learning and knowing collectively. *Ecological Economics, 49*(2), 231–241.

Nye, P. H., & Greenland, D. J. (1960). *The soil under shifting cultivation*. Farnham: Commonwealth Agricultural Bureaux.

Odum, E. (1953). *Fundamentals of ecology*. Philadelphia: W.B. Saunders.

Ortiz, S. (1979). Expectations and forecasts in the face of uncertainty. *Man, 14*(1), 64–80.

Pfund, J. -L. (2000). *Culture sur brûlis et gestion des ressources naturelles. Evolution et perspectives de trois terroirs ruraux du versant Est de Madagascar*, Thesis. Zurich: Swiss Federal Institute of Technology (ETH), and Lausanne, Switzerland: École Polytechnique Fédérale de Lausanne.

Posey, D. A. (1985). Indigenous management of tropical forest ecosystems: The case of the Kayapó Indians of the Brazilian Amazon. *Agroforestry Systems, 3*(2), 139–158.

Pottier, J., Bicker, A., & Sillitoe, P. (2003). *Negotiating local knowledge: Power and identity in development*. London: Pluto.

Pyne, S. J. (1984). *Introduction to wildland fire: Fire management in the United States*. New York: Wiley.

Pyne, S. J. (1997a). *Vestal fire: An environmental history, told through fire, of Europe and Europe's encounter with the world*. Seattle: University of Washington Press.

Pyne, S. J. (1997b). *World fire: The culture of fire on earth*. Seattle: University of Washington Press.

Raintree, J. B. (1996). The Great Eucalyptus Debate: What is it really all about? *RAP Publication* No. 1996/44. Bankok: FAO.

Resilience Alliance (2009). *Resilience*. Available at: http://www.resalliance.org/576.php. Accessed 2 Mar 2009.

Richards, P. W. (1952). *The tropical rain forest*. Cambridge: Cambridge University Press.

Richards, P. (1980). Community environmental knowledge in African rural development. In D. Brokensha, D. Warren, & O. Werner (Eds.), *Indigenous knowledge systems and development* (pp. 183–195). Lanham, MD: University Press of America.

Roe, E. (1991). Development narratives, or making the best of blueprint development. *World Development, 19*(4), 287–300.

Röling, N. G. (1996). Towards an interactive agricultural science. *European Journal of Agricultural Education and Extension, 2*(4), 35–48.

Rumley, R., & Ong, C. (2006). The right tree for a dry place. *Tree water use synthesis 1*. Nairobi: ICRAF.

Sakai, A. K., Allendorf, F. W., Holt, J. S., Lodge, D. M., Molofsky, J., With, K. A., et al. (2001). The population biology of invasive species. *Annual Review of Ecology and Systematics, 32*, 305–332.

Sanchez, P. A., Bandy, D. E., Villachica, J. H., & Nicholaides, J. J. (1982). Amazon Basin soils: Management for continuous crop production. *Science, 216*, 821–827.

Savage, M., & Mast, J. N. (2005). How resilient are southwestern ponderosa pine forests after crown fires? *Canadian Journal of Forest Research, 35*, 967–977.

Scheffer, M., Carpenter, S., Foley, J. A., Folke, C., & Walker, B. (2001). Catastrophic shifts in ecosystems. *Nature, 413*, 591–596.

Scott, J. C. (1990). *Domination and the arts of resistance: Hidden transcripts*. New Haven, CT: Yale University Press.

Scott, J. (1998). *Seeing like a state: How certain schemes to improve the human condition have failed*. New Haven, CT: Yale University Press.

Scott, D. F. (1999). Managing riparian zone vegetation to sustain streamflow: Results of paired catchment experiments in South Africa. *Canadian Journal of Forestry Research, 29*(7), 1149–1157.

Scott, D. F., & Lesch, W. (1997). (1997) Streamflow responses to afforestation with *Eucalyptus grandis* and *Pinus patulu* and to felling in the Mokobulaan experimental catchments, South Africa. *Journal of Hydrology, 199*, 360–377.

Scott, D. F., & Smith, R. E. (1997). Preliminary empirical models to predict reductions in total and low flows resulting from afforestation. *Water South Africa, 23*(2), 135–140.

Shiva, V., & Bandyopadhyay, J. (1987). *Ecological audit of eucalyptus cultivation*. Dehra Dun: Research Foundation for Science and Ecology.

Sillitoe, P. (1988). Knowing the land: Soil and land resource evaluation and indigenous knowledge. *Soil Use and Management, 14*, 188–193.

Sinclair, F. L., & Walker, D. H. (1999). A utilitarian approach to the incorporation of local knowledge in agroforestry research and extension. In L. E. Buck, J. P. Lassoie, & E. C. M. Fernandes (Eds.), *Agroforestry in sustainable agricultural systems* (pp. 245–275). Boca Raton, FL: CRC.

Sivaramakrishnan, K. (1996). The politics of fire and forest regeneration in colonial Bengal. *Environment and History, 2*(2), 145–194.

Stape, J. L., Binkley, D., Ryan, M. G., & do Nascimento Gomes, A. (2004). Water use, water limitation and water use efficiency in a *Eucalyptus* plantation. *Bosque, 25*(2), 35–41.

Swallow, B. M., & Bromley, D. W. (1995). Institutions, governance and incentives in common property regimes for African rangelands. *Environmental and Resource Economics, 6*(2), 99–118.

Tinker, P. B., Ingram, J. S. I., & Struwe, S. (1996). Effects of slash-and-burn agriculture and deforestation on climate change. *Agriculture, Ecosystems and Environment, 58*(1), 13–22.

Tomich, T. P., van Noordwijk, M., Vosti, S. A., & Witcover, J. (1998). Agricultural development with rainforest conservation: Methods for seeking best bet alternatives to slash-and-burn, with applications to Brazil and Indonesia. *Agricultural Economics, 19*(1–2), 159–174.

Trouiller, P., Torreele, E., Olliaro, P., White, N., Foster, S., Wirth, D., et al. (2001). Drugs for neglected diseases: A failure of the market and a public health failure? *Tropical Medicine and International Health, 6*(11), 945–951.

Uhl, C. (1987). Factors controlling succession following slash-and-burn agriculture in Amazonia. *The Journal of Ecology, 75*(2), 377–407.

van den Brink, R., Bromley, D. W., & Chavas, J. P. (1995). The economics of Cain and Abel: Agro-pastoral property rights in the Sahel. *Journal of Development Studies, 31*(3), 373–399.

van Noordwijk, M., Poulsen, J. G., & Ericksen, P. J. (2004). Quantifying off-site effects of land use change: Filters, flows and fallacies. *Agriculture, Ecosystems and Environment, 104*(1), 19–34.

Walker, B. H., Anderies, J. M., Kinzig, A. P., & Ryan, P. (2006). Exploring resilience in social–ecological systems through comparative studies and theory development: Introduction to the special issue. *Ecology and Society, 11*(1), 12.

Warren, D. M. (1990). Using indigenous knowledge in agricultural development. *World Bank Discussion Paper* No. 127. Washington, DC: World Bank.

Wickama, J. & Mowo, J. G. (2001). Using local resources to improve soil fertility in Tanzania. *Managing Africa's soils No. 21*. London: IIED.

Wisheu, I. C., Rosenzweig, M. L., Olsvig-Whittaker, L., & Shmida, A. (2000). What makes nutrient-poor Mediterranean heathlands so rich in plant diversity? *Evolutionary Ecology Research, 2*, 935–955.

Zarger, R. K., & Stepp, J. R. (2004). Persistance of botanical knowledge among Tzeltal Maya children. *Current Anthropology, 45*(3), 413–418.

Zent, S. (2001). Acculturation and ethnobotanical knowledge knowledge loss among the Piaroa of Venezuela. In L. Maffi (Ed.), *On biocultural diversity: Linking language, knowledge and the environment* (pp. 190–211). Washington, DC: Smithsonian.

Part II
Power Dynamics at the "Development Interface"

Chapter 6
"Opting Out": A Case Study of Smallholder Rejection of Research in Western Kenya

Michael Misiko

Abstract Biophysical soil fertility management research, however good the knowledge it generates, has to contend with social processes among smallholders if that research is to help alleviate poverty. This chapter traces the reasons why smallholder farmers in western Kenya "opted out" of the processes of a participatory, community-based soil fertility management research project that was intended to improve their livelihoods. Critical case sampling was used to investigate 16 notable "dissidents" of the action-research processes. In-depth interviews, informal interviews, and participant observation were undertaken among these informants and four focus group discussions were used for follow up and further data collection. Results showed that smallholders' participation in soil fertility management research was shaped by many factors, including: perceptions of long-term vs. short-term benefits; personalities and the local "politics of research"; contradictory policies or practices of research institutions; and the nature of soil fertility technologies that were being researched. These factors had similar influences across gender and age. This chapter suggests that meaningful researcher–smallholder partnerships can be achieved if policies and practices of collaborating institutions are harmonised and research is objectively guided and reviewed against smallholder objectives.

Keywords Agricultural research • Soil fertility • Western Province (Kenya) • Participation–"opting out" • Smallholders

Introduction

Soil fertility is an important livelihood constraint among smallholders (TSBF 2000). The low and diminishing productivity of smallholder farms means there is an urgent need for more and new soil fertility research in sub-Saharan Africa.

M. Misiko (✉)
Learning and Innovation Systems, Africa Rice Centre (WARDA), 01 BP 2031 Cotonou, Benin
e-mail: M.Misiko@cgiar.org

L. German et al. (eds.), *Beyond the Biophysical: Knowledge, Culture, and Power in Agriculture and Natural Resource Management*,
DOI 10.1007/978-90-481-8826-0_6, © Springer Science+Business Media B.V. 2010

Biophysical research on soil fertility management has responded by developing many integrated soil fertility management (ISFM) technologies, including seeds adapted to fertility constraints, cropping systems that (re)build soil fertility, and organic and inorganic fertiliser options (Misiko 2007; Bationo et al. 2006; Bationo 2004; Vanlauwe et al. 2002). In the language of the biophysical researcher, technologies that consistently produce strong results (usually yield increases) under a range of agro-ecological or soil fertility conditions are considered "best bets" and therefore worthy of promotion to smallholders. While many of these technologies have been profitably tested, and even accepted by some farmers (Misiko 2007), such advances in technology development have largely remained unused by smallholders.

This is the background of this study: to understand the disconnect between research processes and the smallholder, even while ISFM research claims to uphold participatory principles. In principle, a participatory technology development process that engages farmers and researchers over multiple seasons will generate new and resilient soil fertility knowledge (Werner 2000; Defoer et al. 2000). The reality is that biophysical science's research still takes precedence in most "technology development" work and the smallholder is not appropriately supported by the research process to innovate and invest (Pijnenburg 2004; Pretty 1995; Chambers 1993). Partnerships between researchers and smallholders frequently meet with only limited success: engagements are mostly short term and marred by widespread farmer withdrawal from the process of soil fertility research.

Conventional analysis of the acceptance or rejection of a technology usually relies on explanations grounded in the technology itself: its cost, labour requirements, yield, market availability, variable uses, uncomplicated nature, divisibility, relationship to household characteristics, or compatibility with policy contexts (Savala et al. 2003; Cohen 1968; Pretty 1995). However, the process of research itself, if not conducive for learning, may result in the withdrawal of smallholders even before they can learn about the benefits that can accrue from the technology being offered. Top down research approaches, for example, are often responsible for the low adoption of technologies that may otherwise appear profitable or desirable to smallholders (Röling 1990; Onduru et al. 2001).

This chapter uses case study material from a community-based learning project in western Kenya to show that it is impossible to understand the generation and "adoption" of new technologies without considering the smallholders' engagement with the research process. Subjective perceptions among farmers about researchers and "research" itself are deeply rooted and more likely to influence decisions to participate in (or apply the findings of) research activities, even in the face of "good" biophysical findings and/or recommendations of proven practices. In most cases, these perceptions are never acknowledged or targeted when farmers are recruited into scientists' research process, which is likely to emphasise "facilitating" participant farmers to adopt new, "best bet" technologies. The objective of this chapter is to explain the rejection of ISFM research processes among smallholders of western Kenya by presenting and discussing selected case studies.

Background to This Study

Between 2001 and 2009, farmers in four sites in western Kenya partnered with researchers at the Tropical Soil Fertility and Biology Institute (TSBF) of the International Centre for Tropical Agriculture (CIAT) to implement a research project called “Strengthening Folk Ecology”. This partnership, here referred to as the Folk Ecology Initiative (FEI), was a community-based research and interactive learning initiative with emphasis on soil fertility (Misiko 2007; Ramisch et al. 2006). The FEI worked to broaden the repertoire of soil fertility management and adaptation strategies available to smallholders in western Kenya. It consciously used an adaptive learning process of dialogue between farmers’ local ecological knowledge (“folk ecology”) with outside knowledge systems to develop a shared, “dynamic expertise” of soil fertility management (Ramisch et al. 2006). The FEI used and studied dialogue between farmers themselves and between farmers and researchers, and studied the effectiveness of collective and hands-on learning procedures such as demonstration trials and farmer’s own experimentation.

As a community-based learning initiative, guided by both researchers’ and farmers’ interests, the FEI evolved considerably in its focus and effectiveness over its 8-year life span. The project documented many successful cases of innovation and improved soil fertility management[1] and also recorded notable failures. This chapter was inspired by these apparent “failures”, especially those “dissident” farmers who had been actively involved in the research process in its initial stages but then subsequently “opted out”. This study investigated the process of rejection of soil fertility research and knowledge among selected smallholders, to explore the underlying causes for disagreement between farmers and a “participatory” project like the FEI.

Methodology

In terms of study sites, participating farmers originated from western Kenya: Emuhaya in Vihiga District; Chakol in Teso District; and Butula and Matayos in Busia District. The sites were purposively selected to follow up on long histories of research working on agricultural (and particularly soil) issues with national and international institutes and NGOs. Although livelihoods in these communities are similar, dominated by subsistence farming and out-migration, there are social and cultural differences between the sites. The FEI involved ethnically distinct communities chosen along an agro-ecological and population density gradient from Vihiga district through to Busia and Teso districts. Ethno-linguistically the sites in

[1] Those are being documented by the author (Misiko) elsewhere (see also Misiko et al. 2008; Misiko 2007; Ramisch et al. 2006).

Vihiga and Busia districts are predominantly speakers of Luyia dialects (a Bantu language with many sub-groupings)[2] while the population in Teso district are predominantly Teso speakers (a Nilotic language). Farmers participated in the FEI as members of groups organised at the village or community level. These typically included 10–25 households, either as part of existing self-help or women's groups or as previously active self-help groups that were reconstituted after the FEI was established. Because of these disparate histories, the farmers' groups referred to themselves by various names, including "Farmer Field Schools" (FFS) and "Research Groups" (RG).

The main challenges against improving soil fertility in western Kenya include tremendous population pressure[3] (especially in Emuhaya) coupled with low incomes and little usage of improved agricultural and environmental conservation technologies (Republic of Kenya 1997a, b). Western Kenya is an area historically neglected by central government authorities, where rural populations contend with poor infrastructure, poor market access, high rates of HIV/AIDS infection, and widespread, semi-permanent out-migration of youth (predominantly young men) (Crowley and Carter 2000; Misiko 2008). Land, labour, and capital shortages frequently limit agriculture in western Kenya (Wangila et al. 1999). In addition to the widespread nitrogen and phosphorus deficiencies reported for western Kenyan soils, agrarian populations face crop pests and diseases, devastating weeds such as *Striga hermonthica,* climatic variability, and marketing problems as manifested in low commodity prices and poor post-harvest handling capacities (TSBF 2000).

The methods used included participant observation to document useful data among "dissidents" who had "opted out" of the FEI. The first visit to these so-called "dissident" informants provided the researcher an opportunity to participate in their activities with the view to *observe* and *informally interview* them. During subsequent visits, *historical recounting* and *in-depth interviewing* were done. Follow up focus group discussions were organised with 13–18 participants in each site, selected from currently active members of the FEI research groups or farmer field schools of which the "dissidents" were formerly members. These focus discussions were specifically meant to discuss the reasons that participants might have for "opting out" of the research activities and possible solutions to them.

Interviewees were sampled based on their history of participation in the FEI. All interviewees had been regular participants in the FEI, had rejected the research process, and I had nurtured good rapport with them. *Purposive sampling* was therefore employed to purposively select from among the identified "dissidents".

[2] Luyia is a diverse community with more than 17 sub-ethnic groups. Butula, Emuhaya and Matayos are predominantly populated by the Abamarachi, Abanyore, and Abakhayo sub-ethnicities.

[3] The population density of Emuhaya was projected to be 1,500 persons per km^2 in 2001, while that of Butula, Chakol, and Matayos was estimated to be about 800 persons per km^2 in the same year (Republic of Kenya, 1997a, b).

Table 6.1 Case-study sample of “dissidents” and focus group discussions

	Interview informants			
Site	Women	Men	Totals	FGD
Butula	2	2	4	1 (15 participants)
Chakol	2	2	4	1 (13 participants)
Emuhaya	2	2	4	1 (15 participants)
Matayos	2	2	4	1 (18 participants)
Totals	8	8	16	4 (61 participants)

Critical case sampling was particularly used in this study. This, a variant of purposive sampling, involved selecting a set of cases or individuals identified by the researcher as being particularly significant: i.e. those who actively resisted research activities or even discouraged other farmers from participating in ISFM research. They were identified with the help of their former group members. This approach was especially efficient and reliable; group members knew “dissidents” and their “subversive” activities. Selection of referred-to interviewees was finally based on their willingness to be interviewed. A total of 16 informants was interviewed (twice) and 4 focus group discussions (FGD) were also held in the 4 sites as shown in Table 6.1.

The selection of 16 informants was adequate given the nature of the study. The aim was to gain a detailed understanding of each case, and to understand the topic of study qualitatively. In the presentation of results and analyses, some information has been concealed due to ethical considerations and real names have not been used.

Understanding the “Opting Out” Process

Those who “opted out” cannot be categorised as one type of people, although there were some commonalities. They were smallholders and many were formerly in some local leadership position. The majority (10 out of the 16 informants) had secondary or post secondary education. They all had cattle, cultivated 0.5–2.0 acres of land, and their annual harvest of maize (*Zea mays* L.) (the staple food in Kenya) lasted an average of 6–9 months. These characteristics show that all those we sampled were not rich farmers, but rather average or slightly above their communities’ average in their assets and social positions.

Before their “opting out”, most of the 16 respondents had been active “frontline” research farmers. They had been actively participating in soil fertility management research activities, especially in villages where research and extension activities were being carried out by TSBF, the Ministry of Agriculture (MoA), International Centre for Research in Agroforestry (ICRAF), and the Kenya Agricultural Research

Table 6.2 Knowledge that farmers reported acquiring from the research process (n = 16)

Type of knowledge	Number of informants
Use of quality manure (improved management of farmyard manure)	16
Use of mineral fertiliser and organic manure combinations, including application of the "organic resource quality" concept	15
Cultivation of root rot resistant bean varieties	14
Livestock related skills	6
Cultivation of *Striga*-tolerant maize varieties	5

Institute (KARI). Ten (63%) were farmer field school (FFS) or research group (RG) leaders, and six (38%) had been on payment by some research institutions as "contact farmers".

All informants said that they had acquired useful knowledge from their involvement in the research process, as shown in Table 6.2. This knowledge covered a range of topics and skills: from the rather technical "organic resource quality" scheme that the FEI had promoted for assessing the fertility potential of various local plant materials and by-products, to various skills for combining organic and inorganic fertilisers, the improved management of livestock manures, and the awareness and husbandry skills needed to cultivate new maize and bean varieties. Furthermore, 15 informants (94%) said they had *actively shared* this new knowledge and the skills gained from participation in formal research with relatives and friends, especially during their active days in the research process. A majority, 12 (75%) of the 16 informants, also reported (and were observed to be) practising soil fertility management that was based on new knowledge that they had acquired from the research. These findings suggest that the knowledge contributions from the FEI were indeed attractive and useful even to these "dissidents". They also dispel the notion that "opting out" was driven by a lack of useful knowledge from the research process.

The sampled "dissidents" provided a variety of reasons for their decisions to stop participating in the research processes, summarised in Table 6.3. As will be discussed below, these reasons hinge not on the quality of the knowledge, skills, or technologies being covered by the research activities, but on the quality of the interaction within the researcher–farmer relationships. While many of the "dissidents" were once close to the researchers and their representatives at the community level (e.g. the community facilitator in Emuhaya), their disenchantment with the FEI grew when feelings of mistrust or misunderstanding developed. The failure of the project to deliver on promises (real or imagined) was frequently interpreted as evidence of a "hidden agenda", fuelled by rumours that stalled project activities had been due to corruption or misappropriation of

Table 6.3 Reasons cited by informants for their decision to "opt out" of the FEI's research process (n = 16)

Reason	Number of informants	Sample commentary
Suspicion that researchers had a "hidden agenda" or were using the farmers "for [researchers'] own benefit"	12 (75%)	"[Researchers] do not complete anything. Even those who come with dedication and with all the good promises, they never complete things properly."
Lack of "facilitation" (the cash allowances as salaries or funds for partnership work paid to "frontline" farmers)	10 (63%)	"[Researchers] did not, or stopped providing me with incentives and funds" (Tom, Emuhaya)
Not included in the 2003 learning tours	9 (56%)	
"No recognition"	7 (44%)	"[Researchers] did not reward me, with money, certificates, or in other ways." (Many informants believed they would be more beneficial to the project if they had been "hired as staff" or otherwise helped to get formal employment".)
Personal differences with the community facilitator	3 (19%)	

resources by researchers or other project members. Farmers who were once paid allowances to organise community meetings or to collect data felt betrayed or underappreciated when such payments ended. Cooke and Kothari (2001) describe similar situations where "participatory" research creates unrealistic expectations of more immediate rewards or benefits "at the grassroots" (such as direct payments, formal jobs, or other advantages), the frustration of which can easily poison the working relationship within a development project as observed in the current study.

Focus group discussions and informal interviews showed that once farmers "opted out" of the research process, their spouses and friends had either followed suit or became negatively critical of their FFS or RG members. Ten (63%) of those who "opted out" and who had been active promoters of soil fertility research turned into distracters of the process. They did not actively promote research activities and would not pass information to other farmers, and often downgraded the usefulness of research efforts by spreading counter-narratives about the FEI and its activities.

Boxes 6.1 and 6.2 summarise representative interviews with two cases of "dissidents".

Box 6.1 Peter (Chakol, Teso District)

Peter is 37 years old. He is married with one wife and seven children. He is hardworking and self-reliant in food production. He is a skilled livestock keeper and has four oxen and a plough. He is usually hired to plough other people's farms and to transport their harvests, thatching grass, building materials, etc. Peter has three parcels of land, all totalling 20 acres. For soil fertility management, Peter relies mainly on livestock manure, household refuse, and rarely on inorganic fertiliser. Most of his bought and hired-in plots of land are planted with cassava, a staple food crop among the Ateso people. He also has many acres of maize, sorghum, and commercially grows groundnuts on a small scale.

During the introduction of the FEI in Chakol, Peter was a "frontline" farmer. He had played a paid role in a previous study, and was a confirmed organiser of other farmers. When the FEI put emphasis on groups as a better alternative for scaling up research findings, he did not have any further paid role, which made him feel "ignored". He confronted the FEI staff several times, and worked with other disgruntled voices to destroy demonstration trials and discourage attendance in so-called "dry" meetings of the groups. His efforts had significant impacts: attendance dropped substantially and that is how *we* noticed his effect. When the researcher approached him for an interview, he accepted and explained all these issues. He said, "*nilijiondoa kwa utafiti kwa sababu hizo, hata hamukunitambua na kunisaidia*" (I *opted out* of research due to these reasons – you did not recognise me and did not help me). Verification interviews showed that he was not well-regarded socially, but he thought many neighbouring farmers did not like him because he had "achieved more" than them. Although after the interview he was willing to resume the participatory process, he insisted that he had been right in his initial course.

He said the most important learning for him while he was active in the research process was how to manage farmyard manure quality. He had heard about new soyabean and groundnut varieties (especially those called "Uganda strip") as among the latest technologies and thought he would adopt them due to their marketability, price, and multiple uses.

Box 6.2 Thomas (Emuhaya, Vihiga District)

Thomas is 45 years old with one wife and five children. He has two cows and two acres of land. He is not self sufficient in food production and his harvest lasts up to 8 months, after which he has to buy food. For soil fertility management he mainly relies on farmyard manure and small amounts of mineral fertiliser during the first (cropping) season (March–July).

(continued)

Box 6.2 (continued)

When the FEI was initiated in Emuhaya, Thomas was already an active FFS member. He had been a regular participant in previous research in his area, until he was left out of the learning tours of June 2003. These however, were only the latest challenge that he had faced. First, he had had several arguments with the community facilitator. Second, he thought there was a conspiracy by TSBF to lock him out of the process; "… why didn't you even visit me to clarify these matters? I had to *opt out.* You have now come because you are failing". He went on to enumerate possible solutions for the FEI's relations with farmers ("If you can listen, then …"): (i) recognise hard work, through visitation, certificates, etc., (ii) "deal with us directly" (i.e. without a local, community facilitator as intermediary), (iii) "allow a sensible selection process" for farmers to go on trips, "let democracy work", (iv) do not work with lineage groups, (v) promote good seed, edible legumes, and "what farmers want, not just anything", and finally, (vi) "give us what is ours" (he said that someone told him that FEI staff had "corrupted farmers lunch money").

Thomas took issue with the farmers who had remained in the research process:

> "I am doing better than many of them now. I think many of these farmers are wasting your time. They are not going to change, they only want to dominate the process and earn immediate praise or money. Look (he showed me his maize plot), this plot is improving. It wasn't like that. I got this fertiliser knowledge (organic-inorganic combination) from research (TSBF) and I really value it. I can always resort to your advice, but not to be part of that current team. But I was advised by (the community's Resource Farmer) that your ideas are now better, and I may think about it."

Unlike Peter, Thomas is less controversial in his village. The researcher interviewed his neighbours, who thought he had been unfairly treated. One informant said, "We saw as if you wanted fewer farmers in your research. Thomas had been a staunch member in your team". His two neighbours contrasted him sharply with another dissident who they thought was "too political," confrontational, and a social misfit.

The two cases, although from totally different communities, had underlying similarities. They were representative of the explanations that both women and men gave, young or old. The two farmers indicated that they appreciated soil fertility research and knowledge but that they disliked the process or experiences they had been subjected to. Follow up studies showed that the second informant was viewed sympathetically by other farmers, and his "opting out" of research influenced many other farmers to think negatively of the project or "opt out" as well. He did not engage in any "subversion" like the first informant, but rather earned support because of what other farmers perceived to be unfair treatment by the project facilitator.

Discussion

The foregoing results show that trust between researchers and farmers is important for the success of soil fertility management research. Even with so-called “best bet” technologies (such as legumes, which were known to yield well under the local conditions), it was still possible for many farmers to “opt out” and influence other farmers to do likewise. These experiences happened *in spite of* extensive planning, and not because of a lack of it. There were several community interviews at the start of the FEI in each site that were aimed at building trust. These initial meetings were consultative with a wide range of potentially interested groups and individual farmers, and were intended to lay a foundation for successful dialogue for the eventual introduction, adaptation, and application of new technologies. However, even “best bet” or “proven” technologies and biophysical recommendations were not good enough to prevent “opting out” of this research process, regardless of extensive planning and participatory procedures.

The cases studies reveal issues relating to the quality of participation in the research process. Even in a supposedly “participatory” project, existing tensions and rivalries within the social context of the FEI would distort the dynamics of the research process, affecting how group members were recruited, informed, or motivated to stay involved. Of further interest were the ways that issues of power and (mis)communication affected the quality of facilitation by the intermediaries in the interactions between researchers and the communities.

Issues Related to Social Context: Lineages and Benefit Sharing

The FEI, like most “participatory” projects, approached the communities with “open hands” and a stated policy that the research process was available to all who wanted to join. While this might seem naively apolitical in retrospect, these were communities where the research team already had experience and the intricacies of local political rivalries and factions were known to be complex. As outsiders, the research team struck a stance that is common to many “participatory” projects (cf. Cooke and Kothari 2001) of believing it is “not our role” to choose who should or should not participate in the activities. However, without knowing and anticipating the social and political challenges within the groups, or facilitating groups to overcome them, the FEI initially stumbled over these local difficulties, which provoked farmers to “opt out” or distance themselves from the process.

The participatory process of building alliances between community members and researchers was, of course, never as complete or as “inclusive” as the researchers wanted, but rather as “exclusive” as participants decided. Because participation was based on the expectation of benefits (Misiko 2001), not all initial participants believed it was a free-for-all affair that was (or should be) open to absolutely “anyone”. The first RGs quickly became knowledge groups, or clubs. FFS were a clear case of voluntary exclusion among non-participating farmers. The feeling among farmers that they could not cope or assimilate to a process that had already moved far ahead was very deterrent. It was simple: original participants invited each other to the process because of friendship or relationships. These original participants formed "clubs" that appeared to non-participants as exclusive, until our approach changed.

Loyalty to lineage or clan was an important factor in the formation (and resilience) of groups (Misiko 2007). The sense of belonging created by such loyalties was a strong instinct for or against participation. Perceived differences between *miliango* ("house"; the Luyia word commonly used for lineage or people descending from a certain ancestor) were long and deeply held, although normally concealed from researchers. For example, some lineages that had strong beliefs in their own superiority would insist that only they would produce leaders and would reject members of "inferior" lineages. The participation of some local facilitators from one clan, to the apparent exclusion of other clans was a sure way to scuttle those clans' participation in any research. The lineage influence was most notable where it inhibited free elections or constructive criticism among members. In one incident, a women's group was found to be dominated by the wives of men of a single clan. In the local cultures (Luyia and Ateso), women were culturally perceived as belonging to the lineage into which they marry. They were also seen as "soft", "less political", and "weak", therefore more malleable and easy to influence. It would, for instance, be difficult for a sister-in-law to oppose her brother-in-law or her husband's close relatives in an election. Women would instead "opt out", or at least become inactive members or simply participate to please their husbands' relatives.

The issue of loyalties to pre-existing social networks or lineages was strongly related to the idea of benefit sharing. Although FEI worked explicitly on soil fertility management, generating "dynamic expertise" was an inherently political process, which confronted different versions of "local" knowledge within a framework of differentiated resources, skills, and authority (Mosse 2001). For example, it is clear that farmers had multiple reasons to participate in a "project" (*mradi*), many of which are only remotely connected to a desire to strengthen their own "folk ecology". Distinguishing "research" (*utafiti*) from "development" (*maendeleo*) is hard enough for researchers increasingly pressed to deliver "impact" from their studies; participating farmers usually assumed that *utafiti* should simply be a process of "educated experts" demonstrating "known facts" in the community (Ramisch et al. 2006). This grew of course from farmers' familiarity with being "taught" passively to follow scientific recommendations under the conventional "transfer of technology" approach. Many development NGOs in the communities also had a history of paying farmers to attend meetings (known as "lunch" or "sugar"), paying for collective work, or providing free inputs. These payments are today implicit in the term "*mradi*" and given ironic names in local vernacular like "facilitation" or "empowerment". As discussed by the "dissidents" (Table 6.3) the perceived failure of FEI to pay such "facilitation" has been a frequent source of contention between farmers and researchers, although other participants decried such expectations as "bribing us to do our own work".

Even the use of collective experimentation on plots managed by the farmer groups to test and showcase ISFM technologies raised issues of benefit sharing. Collective plots were preferred by the researchers and farmers in the FEI because they were based on partnerships, and were democratically managed. However, many conflicts arose due to poor sharing of harvests from these plots. In spite of the lengthy planning meetings and clear-cut farmer–farmer agreements, in Butula, one host farmer took all the produce from a collectively-managed farm. As a consequence, many farmers stopped participating in the monitoring and evaluation sessions of the demonstration trials on this farm in subsequent seasons, while some withdrew their group membership altogether. This may indicate that participation, if not guided aptly, can drive many smallholders out of research processes.

The politicisation of activities that biophysical researchers might have considered to be "only" rather banally about knowledge-generation can be shown from the controversies generated by cross-site exchange visits. After the FEI had been running for several seasons, farmers were keen to visit the other project sites to learn from other participating farmers. When these farmer exchange visits were organised under the FEI in 2003, FFS and RG members voted to select who would be included in the learning tours. Almost all farmers wanted to be included, but only a very few could be sponsored by the project, which paid for travel, accommodation, and meals. Although this selection process was democratic, the result was not popular since a vast majority were excluded from what was not only a potential learning activity but also something clearly viewed as a prestigious and lucrative "recognition" offered by the project. Focus group discussions later showed that these exchange tours were (and long remained) a source of significant discontent among many of the farmers who had not been selected.

Finally, "opting out" in relation to the (non-)sharing of benefits had a gendered dimension. In the early seasons of the FEI, many women's groups did not participate strongly. These groups had affiliated with the FEI strategically as a "project" that might eventually bring "development" or tangible benefits, but the women in these groups mainly geared their collective activities toward more immediate income generation. All women who were interviewed (as "dissidents" or in the focus groups) belonged to more than three groups and their preferred groups were non-research in orientation. Other studies have also shown that in western Kenya, women's collective organisations are an important generator of cash income where women's (and men's) opportunities for paid labour are scarce (Abwunza 1995).

Many of the reasons that farmers "opted out" of the research activities were deeply personal and not easily cited, based on circumstances hidden from (and well outside of) the "normal" process of biophysical science research. Indeed, many of these decisions (if they were known to researchers at all) might at first glance be dismissible as "gossip" rather than as signs of systemic challenges or communication failures within the participatory process. There were very dramatic and sometimes sensational stories[4] about informants and even institutional staff told by

[4] For instance, the so-called "*Tephrosia*-babies" in Chakol. This is a notorious story of how between 1997 and 2002, certain project staff slept with local women in plots of *Tephrosia* sp. and impregnated them. Another disgraceful story was when in 2003 a local girl "eloped" with another project's staff. We (the FEI) had to bear the blame, since we were the most visible "outsiders" working there and the average farmer did not really distinguish between research projects funded by different agencies.

farmers. Some of them touched on sex (including incest and adultery), sorcery or witchcraft, duress, etc. Anthropological ethical considerations (Marshall 2003) may not allow publication of details of such stories, yet they were cited by many "dissidents" as part of the underlying story of how "trust" in researchers or their principle agents was built or (more likely) undermined. Such stories were only divulged as off-the-record stuff, since knowledge of sorcery or adultery is so deeply cultural it is usually never "objectively" clarified, especially to perceived outsiders. The reality of witchcraft and perceived misconducts in this African rural context was often sufficient to override any biophysical research outcomes among farmers.

Whilst soil fertility research may appear neutral with regards to religion, the way researchers conduct themselves inadvertently can (and did) cause damaging perceptions among farmers. For instance, in 2002, biophysical soil sampling procedures were undertaken in Chakol without sufficient awareness among the local farmers. Since the motives for this collection were unknown to all but a few, this was interpreted as an act of snatching local livelihoods by researchers. This story began to spread fast that the FEI was a "cult", one which would use the sampled soils to bewitch the local farms to ruin any productivity. Soils are the property of the clan, and clans have historical mistrusts of each other and of outsiders' interests in their land that may not be easy to erode.

These selected social issues discussed here suggest that collaborative field research is a complex venture. Doing long-term collective experiments is clearly risky in terms of managing expectations, and clarifying benefits that can accrue to the farmer. Even with full knowledge of the participants about the process, there was always a need for the research team to understand each context and to seek effective means to communicate. The greatest challenge was inconsistency of participation, and therefore the lack of full knowledge among farmers on the FEI process, and its potential and real benefits. Regular participants formed regular patterns of sharing – of knowledge, of contacts, of memory – and formed "clubs" as explained above. They had regular access to project communication, which can never be over-stated. To better reach not only these regular participants, but also to attract people who had been previously excluded, such as those considered "dissident", or simply unaware of the FEI, we developed the "Resource Farmer" concept, to ensure reasonable access to the marginalised as fast and qualitatively as possible. Groups that had suffered low participation or high rates of "opting out" – due to leaders who had been appointed by lineages, or who were self-appointed on the basis of their closeness to previous projects – were facilitated to select more appropriate and broadly accountable leaders. This did not avoid local politics, but made better use of them, to elect men and women who were truly acceptable to the majority of group members. Indeed, this process generally resulted in the "right" people who were seen as resources to their communities and who organised regular events with high attendance.

Issues Related to Facilitation

The facilitation of the interactions between researchers and smallholders in western Kenya relied heavily on the use of intermediaries[5] who were either nominated or self-selected as suitable individuals to represent the communities' interests and voices to the project. Issues relating to the quality of facilitation involved both *who* those facilitators were (i.e. their personal qualities or personalities, but also their perceived interests and identities) and *how* they interacted with both community members and the research team.

A community-based facilitator is seen by researchers as "accessible to farmers most of the time" (Savala et al. 2003, p. 151). Such a facilitator can mobilise farmers to attend events, participate in research co-experiments, organise trainings, facilitate local farmer–farmer debates, etc. For these to occur, a facilitator must possess the necessary skills and be acceptable to the community, both men and women. The initial community facilitator in Emuhaya was himself an outsider and an employee of the Ministry of Agriculture. Moreover, many of those who "opted out" of the research process there regarded his role as one that could easily have been filled by locally available talent. The community facilitator was therefore held in low esteem, or viewed suspiciously as being "planted" for "hidden" reasons. Men saw him as more of an indicator of the "dominance" of research interests over local peoples' interests, while women saw him as part of an insensitive research agenda that did not recognise them. While ostensibly promoting FEI, most farmers mistrusted his words and actions and believed him to be working on "hidden" agendas. The low participation and declining attendance in this site prompted the researchers to investigate and subsequently re-configure the farmers' groups under more appropriate, local leadership to regain the trust and confidence in the research process.

Even when the research institutions linked to the villages were using local people, if these "contact-farmers" had a poor reputation within their communities, their work would be difficult to accept even if they were fronting desirable technologies. For example, in 2002, it was impossible to convince farmers to attend sweet potato varieties screening exercises in Emuhaya due to the personality of the link farmer who had been identified for this topic. This was in spite of the fact that farmers were the ones who had requested for those potatoes. The link farmer was seen as a corrupt, incestuous impostor who was too divisive politically. Any alliance with him therefore drew wrong conclusions from farmers and discouraged participation.

[5] The various names (e.g. "contact people", "community facilitator", "Resource farmer") reflect the terms that were used in the different sites, some of which originated from previous projects or relationships. For example, the "community facilitator" in Emuhaya was a paid, government employee who had been employed by a previous project to support agricultural extension on ISFM topics in the community. The "Resource Farmer" concept was an FEI term coined later in the project as an alternative model for a more participatory, egalitarian relationship between the researchers and group members.

Interestingly, the very reliance of the FEI on "participatory" processes met with resistance and frustrated many of the interviewed "dissidents". For example, the explicit emphasis on collective activities posed a serious difficulty for many of the informants who had "opted out". Many of these informants had been appointed in past projects as "contact farmers" and often acted as point-men for R&D institutions in the training and visit (T&V) approach (Holmberg 1992). This disruption of the former status quo meant that all farmers were now equal participants. This denied former "contact farmers" of the usual leadership and apparent benefit positions, which drove them out of the process. Participatory research indeed aims to subvert or transform such local cultures of entitlement, however it was not expected that when former leaders were disenfranchised they would work to frustrate the activities of the project, as illustrated in the cases above.

Beyond the roles and identities of the local intermediaries within the project, if the training, facilitation skills, and personal attributes of other frontline persons (e.g. extension agents, or biophysical researchers themselves) are inadequate or inappropriate for community facilitation, then inadvertent flaws can result. Besides these skills, policies of the different institutions working among smallholder farmers were often not harmonious. There were more than two institutions working in each of these sites and some of these institutions provided lunch and meeting allowances to farmers. Farmers interpreted these allowances as payments for participation. As mentioned above, such payments had a long history and farmers had come to perceive them as obvious, and therefore expected from all research institutions working in these sites, regardless of best bet technologies or whichever benevolent mission each was undertaking. Allowances were basically cash meant to compensate farmers' time to attend an event. In the economics of opportunity cost, it makes sense. However, in social development, where the FEI was seeking partnerships this was not sustainable or desirable. Sustainable partnerships aimed at changing livelihoods cannot be based on bribery of target populations, but rather on collaboration. The sort of balanced, reciprocal orientation that the FEI was seeking is not yet entrenched in the thinking of either the farmer or (indeed) many research & development (R&D) practitioners. While we advocated for collaboration, farmers demanded money, basically a "bribe" to attend research events like other institutions did.

While the FEI and indeed its parent institution TSBF-CIAT considered (perhaps overly optimistically) that knowledge and useful recommendations would ultimately be the best incentives for participation, there were needs that smallholders perceived as immediate, such as the day's food, money allowances, seed and fertiliser handouts, medicine, certificates, and employment. Soil fertility management is a longer term venture, and the slow nature of processes such as nitrogen fixation and phosphorus build-up in the much-depleted soils of western Kenya work against any good innovations or biophysical recommendations. In this case, these immediate needs were necessarily linked to the adoption of longer term soil fertility innovations. Such perceptions would be critical in determining, for instance, whether farmers would forgo a political meeting or market prayers to attend a research event. Many local smallholders simply "opted out" of research if their short term needs were not also acknowledged or met.

The clash of short term and longer term farmer needs was evident in 2002, for instance, when local farmers proposed cereal–legume rotation for the groups' collective experiments. This technology was strongly supported by all the participating groups, mainly because these rotations initially appeared to provide more immediate benefits than the other ISFM technologies that had been tested in the first seasons. However, it soon became clear to them that meaningful benefits of nitrogen fixation by legumes could not be realised within one crop rotation season. Many participating smallholders therefore lost interest or focus after only the first crop season. The longer term working nature of many soil fertility technologies resulted in many participants "opting out" of the FEI process. For instance, the introduced legume mucuna (*Mucuna pruriens*) could not be cooked or sold, unlike common bean that was part of the regular local diet. In spite of its regularly being scored by smallholders as the legume that most increased maize yields in the collective experimentation plots, mucuna was not actually planted by many farmers (Misiko 2007). After several seasons, local interest in mucuna resumed when it was observed to have suppressed the parasitic weed *Striga* in the collective plots, but this effect (like its enhancing of soil fertility) was longer term and the plant was still largely viewed as a waste of time (Misiko 2007).

While a few of the ISFM innovations were spontaneously scaling out by the end of the FEI – e.g. improved farmyard manure, use of mineral fertiliser in combination with organic manures, or new legume (groundnut and soyabean) varieties – the widespread "adoption" of knowledge or ISFM technologies was not achieved during this study. Technologies were labour-intensive or expensive and many of the technologies on offer were considered as "inconvenient" (Misiko 2007). Many of the "loyal" participants were merely tolerating the research process or continuing with it to show solidarity with the FEI team due to reasons beyond research (Ramisch 2010). For them, being part of the research process had become a ritual, being part of a knowledge "club". But in reality, they were not implementing research knowledge. Because many perceived other ventures as better uses of their time, it would take a mere pretext for them to "opt out" of the research process. Soil fertility improvement as a reward was not convincing, especially in the short term.

There were many farmers, especially women, who dropped out of the research process due to reasons beyond those mentioned. Many meetings would sometimes only have men and no women. Participant observation revealed that to participate was a complex venture, and not just an input–output benefits type of analysis. Many participants initially travelled for kilometres to agreed-upon research venues. But it took too long for them to realise tangible benefits, or they were discouraged that planning meetings took too long. Many women were simply too busy and sometimes sent proxies, i.e. participation through one's spouse, children, or other representative (*mwakilishi*). Many other farmers preferred to respect cultural taboos, e.g. not to be seen always sharing the same platform with in-laws. Other farmers were shy and they did not express themselves, especially before researchers, but also in the presence of "eminent locals" including fathers in-law, chiefs, etc. Such disadvantaged farmers were left out of the research process, and never got to criticise researchers about how the process was done. A critical farmer is more useful in the research process and is more useful than polite ones, but this was only realised later.

Being open and forthright was critical in making it possible for farmers to question research procedures.[6] There were farmers who strove to do *exactly* what scientists did: apparent "conformists" in contrast to the "dissidents". Ironically, they were the least innovating group members and their crops often performed poorly compared to the crops of farmers who (like the "dissidents") adapted technologies to local conditions without the perceived "need to please researchers". As mentioned by Thomas in Box 6.2, many of the participating farmers were not necessarily better soil managers even after being closer to the biophysical research processes and having received first-hand recommendations.

Implications for Research and Conclusions

Most of the informants said that they did not actively discourage other farmers from ISFM research. Indeed it was not straightforward that the community would even listen or adhere to their advice or criticisms. Nevertheless, their family members and other allies had stopped attending soil fertility management trial events or research activities. A few of the "dissidents" resorted to working with area administrators (in two sites) or with "alternative" research institutions that offered lunches and allowances. They used such opportunities to discredit the FEI's research with significant success. They accused the FEI of being "exploitative" and "dry" – i.e. not providing direct benefits or development to the communities in the ways that other institutions did. This message in itself was spontaneous "scaling out" of an opposite nature, which required intervention to counteract. Unfortunately, it took longer to be noticed and was only later tackled by researchers through Resource Farmers, who had the credibility and the means to convince the communities that these dissenting opinions were misled. This is not the stuff biophysical science is meant to do.

Even activities led by social scientists to promote knowledge exchange within the FEI (e.g. the exchange learning tours and other facilitated, "participatory" interactive events) were also no perfect panacea. Participatory measures may involve exclusion at some level, either by design or default. It is not just the gains that are important, but rather the process involved too. In the words of one informant, "… if research measures are like bad-tasting medicine, then there are many individuals who will remain sick". Like herbal *medicine* that *heals*, biophysical processes of soil fertility management or recommendations may be preferred

[6] When farmers visited on-station experiments, the detailed and expansive nature of the replicates were surprising to them. This "overly careful" design was even considered confusing, since replicates and treatments are typically scattered randomly by them and not easily compared side-by-side. Farmers seem to learn better by comparing fewer plots, and gaining deeper understanding about relevant and/or manageable procedures (Misiko 2007).

especially when adapted to work within the local logic of farmers' goals and indigenous understandings. Nevertheless, such "medicines" will not work if they are only applied through research groups that operate exclusively like clubs or syndicates.

It is not just the good technology, recommendation, or how to follow the "correct" biophysical procedures, but rather the hidden issues that scuttle life out of a project. On the whole, there is need for more openness through participatory monitoring and evaluative interludes in soil fertility management research. This can allow for reviewing of any processes through open contestation and criticism from smallholders. Such openness may address political, cultural, and historical issues (i.e. past research practices) that make rural western Kenya complicated for research. Nevertheless, there is need for more policy changes and economic investment in the region to address the massive human and environmental pressures. Western Kenya has become a melting pot for many problems, including HIV/AIDS, malaria, poverty, and climate change. There is a tremendous impact on the very social fabric that is meant to hold the community together.

Given the ever-changing dynamics at the local level, influenced by beyond-project circumstances, research work must always be founded on solid development principles. Natural resource management (NRM) research and knowledge should always be promoted as a development solution to – and not as *the priority* "problem" for – smallholder farmers. The politics and issues at the heart of "opting out" fundamentally revolve around *poverty*, so rife among smallholders, and the perceived irrelevance or inability of projects to combat it. Lessons in this chapter inspired the FEI in its later stages to gear its research toward activities with broader livelihood relevance than simply soil fertility improvement, addressing, for example, the income generation that women's groups and self-help groups had been seeking when they first affiliated with the project. This reorientation, along with the clearer attention to the quality of group leadership under the Resource Farmer concept, offered a much more meaningful and sustained sharing of integrated farmer–researcher knowledge beyond the original project idea. This included collaborating with other projects to build smallholder resilience on: (i) *Striga* weed, (ii) adaptation to too much rain or drought such as through improved seed from the International Maize and Wheat Improvement Centre (CIMMYT) and the International Institute for Tropical Agriculture (IITA), (iii) promotion of local insurance systems through an adaptive credit scheme called SCOBICS at the Kenya Forestry Research Institute, and (iv) addressing market/price oscillation, e.g. through training in soyabean processing to add value. More and explicit partnership efforts need to be placed on smallholder resilience in a troubled financial and climatic world.

This chapter shows that even when well run, participation was not in itself sufficient to address smallholder concerns. Participation did not replace the need for good technologies, for functioning markets, alternatives to failed policies, etc., but was rather fundamental in influencing smallholder perceptions of biophysical programmes. Farmers felt *respected* based on the *quality* of their participation. Such participation can be judged by how broadly and deeply the smallholders are involved to enhance their capacity to manage risk and vulnerability through a gender and poverty lens (FAO et al. 2008).

Acknowledgements I would like to acknowledge the assistance of farmers in western Kenya, the International Development Research Centre (IDRC), the Rockefeller Foundation, Wageningen University and Research Centre, and the TSBF Institute of CIAT. Perceptions documented here were observed among some farmers; this document does not wish to generalise all observations. The author takes full responsibility for any omissions, inaccuracies, and analyses.

References

Abwunza, J. M. (1995). 'Silika' – To make our lives shine: Women's groups in Maragoli. *Anthropologica, 37*(1), 27–48.

Bationo, A. (Ed.). (2004). *Managing Nutrient cycles to sustain soil fertility in sub-Saharan Africa*. Nairobi: Academic Science.

Bationo, A., Hartemink, A., Lungu, O., Naimi, M., Okoth, P., Smaling, E., & Thiombiano, L. (2006). African soils: Their productivity and profitability of fertiliser use. Background paper presented at the *African Fertiliser Summit,* 9–13 June 2006. Abuja, Nigeria.

Chambers, R. (1993). *Challenging the professions: Frontiers for rural development*. London: Intermediate Technology Publications.

Cohen, Y. (Ed.). (1968). *Man in adaptation: The cultural present* (2nd ed.). Chicago: Aldine.

Cooke, B., & Kothari, U. (Eds.). (2001). *Participation: The new tyranny?* (p. 247). London: Zed Books.

Crowley, E. L., & Carter, S. E. (2000). Agrarian change and the changing relationships between toil and soil in Maragoli, Western Kenya (1900–1994). *Human Ecology, 28*(3), 383–414.

Defoer, T., Budelman, A., Toulmin, C., & Carter, S. E. (2000). *Building common knowledge: Participatory learning and action research*. Amsterdam: Royal Tropical Institute.

FAO, IFAD, & WB. (2008). *Gender in agriculture sourcebook*. Rome/Washington, DC: Food and Agriculture Organisation, International Fund for Agricultural Development/World Bank.

Holmberg, J. (1992). *Making development sustainable: Redefining Institutions, Policy and Economics, International Institute for Environment and Development*. Washington, DC: Island Press.

Marshall, P. A. (2003). Human subjects protections, institutional review boards, and cultural anthropological research. *Anthropological Quarterly*, 76(2), 269–285.

Misiko, M. (2008). An ethnographic exploration of the impacts of HIV/AIDS on soil fertility management among smallholders in Butula, western Kenya. *NJAS, 56*(3), 167–177.

Misiko, M, P. Tittonell, J.J. Ramisch, P. Richards and K.E. Giller (2008). Integrating new soyabean varieties for soil fertility management in smallholder systems through participatory research: lessons from western Kenya. *Agricultural Systems*, 97, 1–12.

Misiko, M. (2007). Participatory analyses of the "Strengthening 'Folk Ecology' Project" activities: A report on the January–March 2007 fieldwork. Nairobi: TSBF-CIAT. (mimeo).

Misiko, M. (2001). The potential of community institutions in dissemination and adoption of agricultural technologies in Emuhaya, Kenya. M.A. Thesis, University of Nairobi.

Mosse, D. (2001). 'People's knowledge', participation and patronage: Operations and representations in rural development. In B. Cooke & U. Kothari (Eds.), *Participation: The new tyranny?* (pp. 16–35). London: Zed Books.

Onduru, D., De Jager, A., Gachini, G., & Diop, J. (2001). Exploring new pathways for innovative soil fertility management in Kenya. *Managing Africa's Soils, 25*

Pijnenburg, B. (2004). Keeping it vague: Discourses and practices of participation in rural Mozambique. Ph.D. Thesis, Wageningen University.

Pretty, J. N. (1995). *Regenerating agriculture: Policies and practices for sustainability and self-reliance*. London: Earthscan.

Ramisch, J. J., Misiko, M. T., Ekise, I. E., & Mukalama, J. B. (2006). Strengthening ‘folk ecology’: Community-based learning for soil fertility management, western Kenya. *International Journal of Agricultural Sustainability, 4*(2), 154–168.

Ramisch, J. J. (2010). Experiments as ‘performances’: Interpreting farmers soil fertility management practices in western Kenya. Chapter 15 in M. Goldman, P. Nadasdy, & M. D. Turner (Eds.), *Knowing nature, transforming ecologies: Science, power, and practice*. Chicago, IL: University of Chicago Press.

Republic of Kenya. (1997a). *Busia District Development Plan 1997–2001*. Nairobi: Government Printer.

Republic of Kenya. (1997b). *Vihiga District Development Plan 1997–2001*. Nairobi: Government Printer.

Röling, N. (1990). The agricultural research-technology transfer interface: A knowledge systems perspective. In D. Kaimowitz (Ed.), *Making the link: Agricultural research and technology transfer in developing countries* (pp. 1–42). Boulder, CO: Westview Press.

Savala, C. E. N., Omare, M. N., & Woomer, P. L. (Eds.). (2003). *Organic resource management in Kenya: Perspectives and guidelines*. Nairobi: Forum for Organic Resource Management and Agricultural Technologies.

Tropical Soil Biology and Fertility Programme (TSBF). (2000). *The Biology and fertility of tropical soils: Report of the Tropical Soil Biology and Fertility Programme 1997–1998*. Nairobi: TSBF.

Vanlauwe, B., Diels, J., Sanginga, N., & Merckx, R. (Eds.). (2002). *Integrated plant nutrient management in sub-Saharan Africa*. Wallingford: CABI.

Wangila, J., Rommelse, R., & deWolffe, J. (1999). *Characterization of households in the pilot project area of western Kenya*. Nairobi: ICRAF (mimeo).

Werner, J. (2000). *Participatory development of agricultural innovations: Procedures and methods of on-farm research* (p. 193). Eschborn: GTZ.

Chapter 7
Natural Resource Management in an Urban Context: Rethinking the Concepts of "Community" and "Participation" with Street Traders in Durban, South Africa

May Chazan

Abstract Natural resource management has traditionally been conceptualized in rural contexts, yet as processes of urbanization accelerate, it is increasingly important to understand the effects of environmental management efforts underway in urban centers. This chapter examines "participatory" and "community-based" approaches to natural resource management in an urban context. It explores the effects of Durban's Warwick Junction Urban Renewal Project from a feminist political ecology perspective, based on ethnographic research with street traders carried out in South Africa between 2004 and 2007. The end of apartheid resulted in the decentralization of responsibility for the management of the urban environment and informal economy. Warwick Junction was a pilot project for a new participatory, area-based approach to urban development in the eThekwini (Durban) Municipality and has won international acclaim for engaging community participation and for improving human wellbeing, security, and livelihoods.

Ten years later, however, research in Warwick Junction has revealed that multiple forms of control, authority, inclusion, and exclusion exist within the street trading "community", some preexisting the urban renewal effort, rooted in gender, age, and traditional hierarchies with linkages to rural areas, and others emerging as new forms of power and legitimacy connected to the urban management process itself. This chapter illustrates how differential access to resources (in this case, access to trading space, infrastructure, and services) manifest as a series of political, economic, social, and ideological struggles. The Warwick Junction case study demonstrates how even the most "successful" of community-based urban management efforts can result in an uneven distribution of benefits. The chapter calls for a more nuanced understanding of the heterogeneity of "communities" and a closer examination of how power operates in "participatory" development projects.

Keywords Community heterogeneity • Informal economy • Livelihoods • Natural resource management (urban) • Participation

M. Chazan (✉)
Carleton University, Department of Geography and Environmental Studies,
Loeb Building Rm B349, 1125 Colonel By Drive, Ottawa, Ontario K1S 5B6, Canada
e-mail: mchazan@connect.carleton.ca

L. German et al. (eds.), *Beyond the Biophysical: Knowledge, Culture, and Power in Agriculture and Natural Resource Management*,
DOI 10.1007/978-90-481-8826-0_7, © Springer Science+Business Media B.V. 2010

Introduction

Over the last decade, the rural–urban scales have tipped: for the first time in history, more than half of the world's population lives in urban areas. In 1950, there were 86 cities in the world with a population over one million; by 2015 there are predicted to be at least 550. Cities have absorbed nearly two thirds of global population growth since 1950, expanding by a million babies and migrants each week (Davis 2004).

This new reality is predominantly a result of rapid and dramatic transition taking place in developing countries, in the global South (Piracha and Marcutullio 2003). Urbanization in the South is driven by a complex set of social, economic, political, and environmental factors, including globalization, neoliberal economic policies, environmental change, changes in agricultural subsidies, and rising unemployment levels, among others (Davis 2004). For some, moving to cities is providing opportunities for meaningful employment, social or economic advancement, and increased political engagement. For others, those who Davis (2004) calls the "informal proletariat", it has meant living alongside growing numbers in overcrowded conditions, with inadequate shelter, sanitation, services, and infrastructure. Such substandard urban conditions have also been associated with increased crime, drug use, and violence (Martens et al. 2000), and many researchers highlight the stresses of urbanization on already impacted environments (Piracha and Marcutullio 2003).

Two related trends have become central to urban research and development efforts. First, there has been a global move toward decentralization, with a transfer of responsibility for the urban environment from central agencies to municipal governments. This has not always been accompanied by financial empowerment and thus often manifests as "partnerships" between municipalities and private sector service providers. Second, alongside decentralization, increasingly complex forms of urban governance are emerging, with more actors involved (or desiring to be involved) in decision-making, including "local" voices and international corporations (Piracha and Marcutullio 2003). However, how decentralization and "participatory" urban development efforts are playing out in specific places remains unclear (Hickey and Mohan 2004). Achieving healthy, safe, democratic, equitable, and sustainable cities is a complex, but crucial, task.

While natural resource management (NRM) has traditionally been conceptualized in rural contexts, it is increasingly important to understand the effects of environmental management efforts underway in urban centres. This chapter provides a critical examination of "participatory" and "community-based" approaches to natural resource management in an urban context. It explores the effects of Durban's Warwick Junction Urban Renewal Project from a feminist political ecology perspective, based on "participatory" ethnographic research with street traders carried out in South Africa between 2004 and 2007.[1]

---

[1] This research was carried out in partnership with the Heath Economics and HIV/AIDS Research Division at the University of KwaZulu-Natal in Durban. It was funded by Canada's International Development Research Centre (IDRC) Ecohealth Training Awards and the Social Science and Humanities Council of Canada.

The issues raised in this chapter parallel a multitude of practical and conceptual concerns for NRM in rural areas, while also highlighting the importance of extending our analyses into the urban sphere. The chapter begins by outlining a conceptual framework for considering integrated and participatory approaches to NRM in urban contexts. It then draws upon this framework to examine the history of the Warwick Junction renewal project and its differentiated effects. The chapter closes with a critical look at the concepts of "community" and "participation" in Warwick Junction, as well as the wider implications of these concepts for NRM practice and policy.

Natural Resource Management in Urban Contexts: A Conceptual Framework

The Warwick Junction Urban Renewal Project (WJURP) is a vibrant and acclaimed example of NRM in an urban context, and it is the focus of the analysis offered in this chapter. The conceptual framework for this analysis lies at the intersection of three growing bodies of scholarship, which lend insights into both urban NRM and debates in NRM more broadly: ecosystem approaches to urban development, feminist political ecology, and critical perspectives on participation.

While NRM is most often considered in rural contexts, accelerated processes of urbanization have resulted in *urban* environmental management now being on research, policy, and practitioner agendas. New concepts and approaches have been devised, many of which grapple with similar issues as rural NRM efforts. For example, in both urban and rural contexts, development practitioners and environmental planners face challenges around implementing integrated approaches that consider the interactions between the biophysical, cultural, social, and economic dimensions of the "environment", as well as around engaging "community participation" in development and management processes.

One recent development in this regard is a shift toward "ecosystems approaches"[2] to urban development (Marcotullio and Boyle 2003). These depart from the previous

[2] Ecosystems frameworks have been applied to urban contexts by a number of international organizations, including: (1) Canada's International Development Research Centre's 'Ecosystem Approaches to Human Health', which adopt a multi-dimensional definition of human health and by aims to identify ecosystem management options that simultaneously maximize human health and encourage sustainable development. From this perspective, well being depends on the dynamic interactions between all living (including humans) and non-living things. This approach also promotes transdisciplinary, participatory and equity-oriented research methods; (2) The United Nations University's 'Urban Ecosystem Analysis', which considers the scales of urban activities (both how processes at multiple scales affect urban environments and how urban activities can have impacts outside of where they take place), as well as interrelationships between social and biophysical factors within urban environments; and (3) The World Health Organization's 'Healthy Cities Programme', which attempts to address a broad range of urban health stresses relating to infectious diseases, air pollution, drug abuse, and violence within cities. This approach places emphasis on participatory approaches to municipal planning.

emphasis on single-issue studies to consider the interconnections between social, economic, and environmental systems. In an urban context like Warwick Junction, such an ecosystem approach implies recognizing that social and economic change is intimately linked with the physical environment, and thus if the goal is to improve livelihoods and reduce crime, interventions must include simultaneous physical and social inputs, such as building infrastructure, improving lighting, improving sanitation, providing training and education, improving policing, and so on. These ecosystem approaches also tend to move away from rigid management models to encourage participatory approaches to urban development (Marcotullio and Boyle 2003).

Understanding the linked social and environmental dimensions of urban systems, and promoting wider participation in development processes, has unveiled the complex struggles people and groups face in negotiating for (and making claims on) land, resources, and access to services. To this end, political ecology as a field of study has contributed to a growing dialogue around resource struggles, environmental management, and development processes. Political ecologists examine contests, both material and symbolic, over land and resources. Like ecosystem approaches and NRM, political ecology has traditionally focused on rural contexts. Recently, a growing body of urban political ecology has emerged (e.g., Heyned 2006; Mustafa 2005), offering new ways of examining struggles within cities, over access to housing, services, water, food, and land, as well as over entitlement and citizenship. We will see that in Warwick Junction, one of the key areas of contestation is over the valuable resource of "space" – that is, trading spaces in the market, and thus potential livelihood opportunities.

Political ecology emerged as an approach to understanding environmental degradation in the late 1980s, in large part as a critique of the prevailing explanations that associated environmental problems with rapid population growth, local management practices, and the "backwardness" of poor peasantry. Political ecologists sought to debunk these assumptions, illustrating how environmental degradation is linked into broader social, political, and economic processes, such as land inequality, poverty, political and military repression, social and cultural marginalization, and promotion of certain models of economic and national development (e.g., Blaikie and Brookfield 1987; Watts 1983). They showed ecological concerns as caused by structural political–economic forces at multiple scales. In urban settings, these would include the broader forces of rapid and deregulated urbanization, historical dispossession, lack of service provision, social inequalities, and lack of employment, among others. Most recently, political ecologists have examined the role of discourses in framing – and thus constituting – environmental problems, and have placed emphasis on how struggles are differentiated among various social groups (e.g., Braun and Castree 1998). This chapter further draws on feminist approaches to political ecology in that it seeks to understand the gendered dimensions of such struggles.

A number of scholars in the area of participatory development have also contributed to understanding the complexities of struggles over development, access, and political voice, seeking to add nuance to the very central concepts of "participation" and "community" (e.g., Cooke and Kothari 2001; Hickey and Mohan 2004).

They have shed light on the intricacies of power relations operating through participatory practices and discourses. This body of scholarship is expanded upon further in the final sections of this chapter.

These three overlapping schools of thought have informed the analysis that follows. The urban renewal initiative undertaken in Warwick Junction can be considered an ecosystem management strategy. By transforming the social *and* ecological conditions of the area, this development effort aimed to improve both human well-being and the quality of the urban environment (Forget and Lebel 2001). The renewal project was integrative – it sought to improve both the physical urban environment (e.g., building infrastructure and waste removal) and intervene in a number of related social, economic, and cultural arenas (e.g., reducing crime, improving livelihoods, supporting traditional practices, and improving access to services). Indeed, the project explicitly linked a number of environmental and socio-cultural interventions[3]. It also attempted to engage public participation in the process, and is considered a success story in this regard (Nesvag 2002). Yet, we will see that struggles over land (trading spaces), service access, livelihoods, democratic rights to the city, and political voice in Warwick Junction, as well as the socio-environmental changes that have taken place, need to be contextualized within both "local" and broader historical, social, and political-economic processes. This requires an investigation of the power relations driving the conditions in Warwick Junction.

Warwick Junction: A Window into NRM in an Urban Context

> You need to be careful with assumptions around marginalization. For some, having access to space to trade has really changed their lives … People selling things like cigarettes actually make a lot of money; this is lucrative.
>
> – Richard Dobson 2004, lead planner for WJURP

> I'm part of the committee. On the committee I think everybody's satisfied … but not everybody can be satisfied in this world.
>
> – Cigarette seller in Warwick Junction 2004

Warwick Junction History: Contest and Renewal

In postapartheid South Africa, economic globalization, rising unemployment, and increased population mobility have resulted in growing numbers living and working in "informal" and impoverished urban conditions. Among them, there are an

[3] For example, an old abandoned highway overpass was cleaned up and stairs built to access it. This was then turned into a trading market for hebalists and traditional healers, providing them with trading spaces, livelihood opportunities, and the legitimacy to be in the market (under apartheid, it was considered illegal not only to engage in informal trading, but also to openly sell traditional medicines). This is clearly an instance of integrated and linked physical, social, and cultural intervention.

estimated half-million street traders in South Africa and 20,000 in Durban. The majority of street traders earn well below the poverty line and 70% are women (Charmes 2003).

Warwick Junction is the largest trading and transport hub in Durban, an Indian Ocean port city of just under three million people. A bus station, train station, and several minibus taxi ranks are located in this area, which lies just outside the central business district. An estimated 8,000 people sell fresh produce, prepared foods, alcohol, second hand clothing, electronics, cigarettes, household items, and crafts, or offer services such as hairdressing, shoe repair, tailoring, and pay telephones, to 500,000 daily commuters. Warwick Junction is home to the largest *muthi* (herbal medicine) market in southern Africa; approximately 700 people sell herbal remedies and some are also traditional healers (Dobson 2004). Some have municipal permits and secure trading sites; others trade without permits on the peripheries of the area or as itinerants. Most traders reside primarily in the city (on the streets of Warwick Avenue, in informal settlements, or in the townships) but come from the surrounding rural areas and maintain close ties to their homes.

A brief history of the area reveals that Warwick Junction is a contested space where different forms of poverty, livelihood, displacement, control, and citizenship are constantly being negotiated. From 1900 to the end of the 1930s, it developed as a vibrant working class neighborhood and a "racially mixed" trading area. From the late 1930s until the end of the 1970s, however, apartheid legislation was harsh. Under the Group Areas Act, passed in 1950, "blacks" and "Indians" were not allowed into the central business district without permission. The residents of Warwick Junction, many of whom were antiapartheid activists, resisted this imposed segregation, making it a politically important area (Grest 2004).

Then, in the 1960s, Durban City bylaws comprehensively outlawed trading, labeling traders as "illegal intruders". In 1973, the Natal Ordinance was passed, restricting hawking within 100 m of any formal business, and outlawing traders from staying in one location for more than 15 min (Nesvag 2002). The 1970s were characterized by forced removals and some municipal services were discontinued (Grest 2000).

In the final decade of the apartheid regime, from the mid-1980s to the mid-1990s, the South African government could no longer uphold the geographical segregation that had characterized the previous 40 years of the country's history. Repression was replaced with deregulation. The collapse of social control meant that people previously denied access to the city began to stake claims. Many "blacks" who had been restricted to rural "homelands" migrated into the cities seeking employment; many began trading goods and services in the central train and bus stations. Minibus taxis "invaded" and Warwick Junction became the site of intense trade and taxi activity (Grest 2000). A series of struggles ensued, over land and livelihoods, over political voice, and over democratic rights to the city.

Street trading organizations formed to lobby the local government for permission to trade, access to municipal space, and the provision of infrastructure. Local business owners and residents organized against informal traders and taxis (Grest 2000). These organizations were often in conflict with one another (Dobson 2004).

Formal apartheid controls were replaced by new forms of informal controls, resulting in arbitrary “takeovers” of trading areas, extortion, informal supply cartels, price fixing, protection rackets, and mafias (Nesvag 2002). Crime and conflict intensified, propelled by political instability and a city council that lacked the legitimacy to regulate trading conditions. The period from 1993 to 1996 was “anarchy” in Durban’s streets (Nesvag 2002), until finally, fears of repelling investors motivated intervention (Grest 2004).

Two years after the transition of government, in 1996, the new Ethekwini (Durban) government commenced a pilot urban renewal project in Warwick Junction, which was then considered to be the most dangerous and impoverished part of the inner city. Responsibilities for urban development and management of the informal economy were decentralized (Skinner 2004). Within the Durban local government, the Informal Trade Department was formed to devise and implement trading legislation (Nesvag 2002).

The new constitution mandated “public participation” in all development efforts. However, the new City Council could not effectively negotiate with the multiple existing trading organizations and related networks, all of which were competing for legitimacy. It thus created an umbrella organization, the Informal Traders Management Board (ITMB), which subsumed most other organizations (Grest 2004). The ITMB became the main negotiating body with whom the municipality would work to manage the area (Grest 2004). Alongside this, the Self Employed Women’s Union (SEWU), an independent traders’ organization, became an important mobilizing force and watchdog body, lobbying for better conditions for women traders (Skinner 2004).

The renewal project was based on an “area-based management” plan, which was a shift from previous line function operations to a multisectoral approach – an integrative or “ecosystem” approach. This meant municipal health, informal trade, transport, and police departments working together (Dobson 2004). The WJURP began as a “scrub up” in 1996 (ibid.). By 1997, the new muthi market was created on an unused overpass, shelters were built, and elevated walkways connecting various market areas were under construction (Nesvag 2002). Warwick Junction was given a public profile and the project administration positioned in a renovated warehouse in the area (Grest 2000). The renewal project established a permit system, leasing pavement spaces to traders on a “first-come first-serve” basis; spaces were quickly filled and have remained saturated.

In 2001, the pilot project expanded to encompass nine other area-based renewal sites; the WJURP has become the model for a larger Inner Thekwini Renewal and Urban Management Programme (iTrump). An informal economy policy was launched in Durban in 2002, prioritizing the creation of properly planned, well-managed markets through the provision of services and infrastructure, the improvement of working conditions, the management of informal trade, and the capacity building of informal trading committees (Lee 2004).

The renewal project has improved security and cleanliness in Warwick, and it is once again a vibrant residential and trading area, serviced with two public health clinics, an ambulance depot, churches, schools, nongovernmental organizations

(NGOs), social centres, and a police satellite station (Dobson 2004). Warwick Junction was transformed in less that one decade to the point where it is touted as a tourist attraction and Durban has won international acclaim for the success of this project (Grest 2004).

Yet, crime, decay, and poverty have not disappeared in the area, nor, as we will see from recent research, have the benefits of the project been shared evenly. In Warwick Junction and beyond, the effects of new liberalized approaches to urban and informal economy management are uneven, and overall conditions for street traders remain poor (Lund 2002).

Uneven Development and Uneven Access

Eight years after the start of the Warwick Junction renewal project, I embarked on ethnographic research with street traders to investigate what conditions underpin their vulnerabilities to South Africa's new and growing HIV/AIDS epidemic. This study, conducted between 2004 and 2007, was based on a qualitative methodological framework. It included repeated in-depth interviews with 20 street traders, as well as focus groups and interviews with health care providers, traditional healers, municipal officers, and trading committee leaders, with 65 participants in total. Four rounds of follow-up interviews with traders were conducted at six monthly intervals after the original research. In addition to findings related to the effects of HIV/AIDS on traders (documented elsewhere, see Chazan and Whiteside 2007; Chazan 2008), the process and findings of this research revealed that the effects of the renewal have been highly differentiated.

Early in the research process, an unevenness in access to trading space and livelihood security became apparent. Prior to departing for South Africa, I planned to involve "the street trading community" in all aspects of the research. Based on preproject reading, I understood there to be a successful process of public participation underway in the market, via the ITMB. I envisioned partnering with the ITMB to make my work accountable to traders. This initial plan was, however, somewhat simplistic.

In early discussions with traders, many accused the ITMB of unfair allocation of space, intimidation of young people, and discrimination against foreigners. One man told about his recent forced removal from his trading space. During the conversation, we were surrounded by committee members and decided to end our discussion prematurely. Initial walks through the market also revealed an age–gender pattern to space occupancy, with women and youth in the least secure spaces on the market peripheries. In addition, I was informed by certain municipal and ITMB officials that all traders in Warwick Junction hold permits. Yet, in my first "on the ground" encounters, I met numerous people selling goods on the pavement "illegally" – so many that I spent a great deal of time seeking out permit-holders, eventually finding them in sheltered areas, in the train station, and on the *muthi* bridge. To some extent, permit-holders appeared to be benefiting more from the renewal than nonpermitted traders, who feared harassment (from police, lay security forces, and the ITMB), eviction, and loss of their livelihoods:

> The Forum intimidates traders in the Berea Station. They push customers around on purpose, and if there's a problem at a table, they give warnings and then can suspend people. This man [pulls friend over] was trading right out here yesterday, and he was hit and kicked by the Forum, assaulted by the man in charge of the entire Berea station, and they took his stuff away. This is not right. No one has the right to assault another person. They never asked him to move, just started hitting him. And people feel they can't talk about it because it will jeopardize their space here. That's intimidation. (Itinerant candy bar seller 2004)

These early encounters illuminated a myriad of tensions. I was increasingly aware of the heterogeneity and internal factions within the market – there was not the kind of trust I had previously anticipated. I could therefore not align myself with the ITMB, as this would have posed a threat to many potential participants. I decided to include nonpermitted traders centrally in the research, as they appeared to be experiencing disproportionately less security and access to basic infrastructure. These preliminary findings guided the sampling strategy for the subsequent research: I selected participants according to gender, age, and levels of "inclusion" or "exclusion" in market structures, focusing predominantly on traders who were trading without permits, outside formal spaces, not represented by trading committees, and in less lucrative or socially recognized trades.

My initial observations of heterogeneity within Warwick Junction were reinforced throughout the research. Indeed, analysis of ethnographic data collected over a 2-year period showed participants' shared experiences clustered largely according to age[4] and gender (for detailed age–gender analysis see Chazan and Whiteside 2007).

This analysis revealed younger people with less access to secure spaces than older traders. All of the younger traders in this study worked for someone else or as itinerants, none held permits, and all were subject to various forms of control. The "trolley pushers", for example, who sell food items out of shopping carts in the taxi ranks and intersections, had obtained their "illegal" spaces through personal networks. Their trolleys were owned and governed by informal managers, generally older men and often relatives or friends with origins in the same rural areas. Likewise, many young women cooking curries were in fact "fronting" (i.e. selling outside on the pavement for older traders inside the nearby formal market area). One young curry-cooker told how the trading committees and police harass curb-side cookers, and how committees impose price controls on her. Another young woman, this one selling pinafores, worked in her older boyfriend's space and wished to obtain her own permit in order to gain independence from him. By contrast, all of the older traders in the study worked for themselves and most had permits.

---

[4] Note that "old" and "young" classifications here are not based on an age threshold, but rather on life stage and "generation". Older traders are those who have grown children and grandchildren, while "younger" traders tended to either not yet have children or have pre- or school-age children. This was the classification that emerged naturally in the study largely due to the way these life stages affect traders' family positions and responsibilities.

As Emmanuel Dlamini, president of the ITMB, explained:

> There's a big problem with our young people. They feel like they don't have access to higher education. They drop out of school. There's a loss of hope, and so they are turning to street trading. But this is causing conflict with the elders who are established and who control the space. The lack of space and opportunities for these young people makes them transient. They become the trolley pushers. (Dlamini 2004)

Indeed, with the market saturated (both in terms of space and customer demand) and unemployment rising, many older and more established traders perceive newcomers as a threat to their livelihoods.

The research also indicated that women, both younger and older, tend to be in more dangerous and less lucrative trades than men. There is a high level of division of trades along gender lines. Produce sellers, for instance, are predominantly women. They tend to have disproportionately insecure trades because of the short shelf life of fruit and vegetables. Produce not sold simply perishes and profits are lost. By contrast, men tend to occupy many of the more lucrative and secure trades, such as selling electronic equipment and cigarettes.

In addition, women tend to be more exposed to workplace health hazards (such as pesticides, unsafe cooking equipment, and animal refuse) than men; they were more concerned about losing their spaces; and they expressed more difficulties accessing information and health services. Women very clearly reported more calls on their time and resources than men because they take on noticeably greater levels of family responsibility. Compared to their male counterparts, they also had less access to capital, and thus fewer chances for economic advancement.

Uneven Participation and Political Voice

In Warwick Junction, there is a clear association between uneven access to space, livelihood, and security, and differentiated levels of participation and political voice. As Patrick Mcnube, the Area Manager for the renewal project at the time, explained:

> The ITMB only represents *actual* traders. Barrow boys, cardboard collectors, and the likes are on their own. The barrow boys have their own supervisors elected in the rural areas; these are ethnic, traditional leaders. If they get complaints back home, then the barrow boys can be suspended. Trolley pushers are on their own too, because they are seen as a threat to people trading at tables. There's animosity, so they don't belong to the ITMB. They are mostly fronting. The hairdressers too are mostly foreigners, some legal and some illegal, and they're not represented. (Mcnube 2004)

Research in the market showed youth over-represented in these peripheral trades. Many young traders expressed that they could not report their grievances because they trade illegally. They feared leaving their spaces unattended and risking their livelihoods, as they have no negotiating power, protection, or recourse.

Furthermore, despite the fact that 70% of traders in Warwick Junction are women, with growing numbers of youth and immigrants, ITMB members are predominantly middle-aged and older Zulu men (Dlamini 2004). According to Dobson, representation of women in the ITMB is "starting to adjust, but it is still male-dominated" (Dobson 2004).

Women's unequal voice in negotiations could partially explain their minimal access to the renewal project's new infrastructure and their disproportionate exposure to workplace hazards. On top of this, intense family pressures means women often do not have the means or the time to organize for better conditions – and thus many female traders expressed that they could not get involved in any of the trading committees, including SEWU.

Thus, multiple forms of power and control operate in the market, resulting in uneven access to space, struggles over livelihood, and differentiated exposure to workplace hazards such that the benefits of the renewal project appear to be uneven. This differentiation appears to be linked to age–gender inequalities in political voice and participation in local development processes.

Understanding Uneven Development and Participation: Power Relations in Context

Examining the reasons behind these patterns revealed that authority, legitimacy, and control in the market are both a consequence of the Warwick Junction urban development and based on "older" power relations that link into the broader political economy. Understanding the unevenness in development and participation requires a closer examination of the history of the trading institutions, the effects of the renewal project, and the societal context more generally.

New forms of power and legitimacy have been generated through the urban management process in Warwick Junction, both as a result of the formation of the ITMB during the initial renewal project, and as an effect of the project's subsequent expansion. The ITMB's role as a "public" interest group has been questioned because it was put in place by the municipality, and because its leadership is selected according to some combination of democratic choice, self-appointment, and personal networks. The research revealed that when the ITMB formed, the president was self-appointed; 10 years later, he still held the presidential position (Grest 2004). In addition, the umbrella committee was initially made up of traders, but many have now "graduated" to become small business owners, some benefiting significantly from the collection of committee dues (Dobson 2004).

Moreover, the expansion from the WJURP to the iTrump took place with limited human and financial resources, and the result has been progressive withdrawal of the municipality from management in Warwick Junction (Grest 2000). The iTrump increasingly relies on the ITMB to solve trading grievances – a sort of "outsourcing" in management (Dobson 2004). With unemployment rising and urban migration accelerating, "established" traders look to the ITMB and affiliated lay security forces to protect their market share (Dlamini 2004). Meanwhile, the

Self Employed Women's Union (SEWU), the most transparent watchdog body, disbanded in August 2004 due to internal conflict (Skinner 2004). These changes have led to a concentration (and at times abuse) of power among trading committee members.

Yet, to explain the uneven development and participation based only on the processes of urban management and the new structures it created would be to oversimplify what is a complex and dynamic situation. The axes of control we see in Warwick Junction are also shaped by power relations and social norms that extend well beyond the market.

In considering who has benefited the most and who the least from the renewal project, Richard Dobson, one of the lead planners for the original renewal project, expressed:

> There is a gendered division of labour … This is a macro question. Women are the back stop providers. They take care of the needs of the family; they have to bring in money. Women are survivalists. It's hard to know, but it may be that they do the worst jobs out of desperation, or that they see the gaps where men don't want to do the work and they dig out their own niches. (Dobson 2004)

Dobson very clearly highlights how power relations operating from societal through to household levels intermingle with politics in Warwick Junction. Thus, it is important to understand the differentiation within the market in the context of processes taking place at multiple scales –within Warwick Junction, at the societal level, and within households – as well as their interactions.

At the market level, we have seen that power is exerted through trading space security and representation in negotiating bodies. Older people control the allocation of space, while young traders have little access and minimal institutional protection. Power dynamics result in women and young traders worrying about leaving their spaces and being harassed. This in turn has consequences for participating in negotiating processes.

At the macro level, traders' social, economic, and political opportunities are influenced by rising unemployment, urbanization, and a history of racialized and gendered inequalities in education. Traders do not have adequate social protection. Despite many positive societal changes (e.g., the granting of political rights, social transfers, and basic services), many feel disillusioned. Dlamini's earlier insight into why young people are "turning to street trading" speaks to the macrodrivers of their dispossession: rising unemployment and lack of access to education draw young people into precarious work.

At the household level, power manifests as control over resources and decision-making. Although women in this study assume disproportionate family and financial responsibilities, men are reported to control family resources and have greater access to family assets in almost every case. As Dobson asks, "how can women secure an income when they so often have to hand their money over to men? There's a continual drain." (Dobson 2004)

Furthermore, channels of control in Warwick Junction, which have been formed and are continuously recreated through the urban management process, interact with “preexisting” (but also dynamic and continuously negotiated) power relations operating from the broader political economy through to the family. For example, household structures – with women as the “back stop providers” – shape or reinforce the political economy of Warwick Junction and the division of trades. Women do the worst jobs at least partially because immense family responsibility leaves them no other choice. It was indeed evident that many more women than men trading in Warwick Junction continue to maintain very close ties to their rural family homes, sending money home regularly; their ties to multiple “homes” and larger family networks means increased draws on their time and resources. Likewise, household dynamics are shaped by macro structures: household gender relations are constructed within a historical legacy of family fragmentation and gender inequality. Conditions where men lived away from home and women were dependent on them for remittances have had lasting impacts on gender roles, responsibilities, and control over resources (Campbell 2003).

Summary of Research Findings

In moving toward an examination of the implications of the Warwick Junction case study for NRM efforts more broadly, the key findings of this research can be summarized as follows:

- The conditions in Warwick Junction are a result of specific historical contests, South Africa’s and Durban’s rapid transition, and particular “local” development strategies.
- The urban renewal project – an example of urban NRM – has been a tremendous benefit to some, but the effects have been uneven. Women and youth remain on the peripheries of the market and have the least access to the project’s new infrastructure and services.
- The market’s complex division of labor and power became increasingly evident through the research, operating along multiple axes – by gender, age, trade, formality of permit, location of trading site, ethnicity, inclusion in trading committees, traditional hierarchies, and place of origin.
- Uneven development appears to be linked to uneven participation. Access to the committees and social structures involved in negotiating traders’ conditions and rights has also been differentiated, predominantly by age and gender.
- Understanding the unevenness in the effects of this seemingly successful “participatory” project requires an understanding of how power has been reconfigured by the development process itself, as well as of broader societal structures. Constraints resulting from differing family responsibilities and livelihood opportunities, as well as feelings of powerlessness, intermingle with politically charged structures in Warwick Junction to marginalize many traders, especially women and youth.

Implications for NRM: Rethinking "Community" and "Participation"

The dynamics at play in Durban's Warwick Junction illustrate a number of concepts and debates which are central to NRM practices. As indicated at the start of this chapter, these concepts draw from and build on three overlapping areas of research: political ecology, ecosystem frameworks, and critical perspectives on participatory development.

A political ecology approach suggests that the conditions in Warwick Junction are driven by factors beyond the individual or collective actions of impoverished citizens – they are a consequence of societal forces, such as the history of apartheid, the rapid transition, the recent democratization of space, deregulated urbanization, and rising unemployment, liberalization and informalization of the economy. Discourses also shape perceptions of the area as "degraded" and "derelict", most obviously discourses around "informality" (framing traders as temporary and transitional rather than as legitimate and growing in numbers) and "renewal" (requiring cleaning up, regulation, management, and intervention). Amidst these powerful processes, struggles over livelihood, legitimacy, democracy, and hope are being waged – Warwick Junction's prime trading space, its pavement, has become a highly sought-after resource.

Recent efforts to develop and manage this resource have adopted an integrative, or "ecosystem", approach, recognizing the significant interactions between the physical, social, cultural, and economic dimensions of the urban environment. They have also involved public participation in development processes. These efforts have had some beneficial impacts: livelihoods and security have improved for many, and there have been notable improvements in the urban environment.

Yet, experiences of this changing space have been differentiated – the research in Warwick Junction illustrated that the trading "community" is heterogeneous and that there is competition within and between various groups in the market. These findings resonate with a number of concepts emerging among critics of participatory development. One of the major critiques of "participatory" approaches lies in how "community" is conceptualized and defined. Indeed, Guijt and Shah (1989) suggest that simplistic understandings of "community" as homogeneous, static, and harmonious can conceal power relations and mask biases.

Watts' (2004) study lends insights into the changing conditions in Warwick Junction and develops the concept of "community" in a way that could have wider implications for NRM. In an examination of how conflicted communities have formed around oil extraction in the Niger Delta, he interrogates the "romance" of "community" and shows how communities, paradoxically, can be divisive. He describes the active role of resources, in this case competition for oil, in *making* and *remaking* communities, suggesting that the formation of new communities may be a product of the modernization project of oil extraction. He analyzes oil and land as catalysts for claims-making, over rights, access, control, identity, and voice, and thus as generators of new "governable spaces". He also illustrates how part of the struggle over oil is tied to its symbolic significance, in providing hope of a more prosperous life, but how such hope stands in contrast to the reality that oil extraction has led to increasing civil strife and a downward spiral into poverty for many.

There are many parallels to be drawn in thinking about "community" and resource management in Warwick Junction. In the market, we see communities made and remade around struggles over urban space, livelihood, and citizenship. We see a modernist development project creating new forms of control, new divisions, new sites of claims-making, new social groupings, and new "governable spaces". Like oil, urban space in Warwick Junction is also a symbol – of hope for a better future, employment, democracy, and redistribution, with a vesting in entrepreneurship and access to greater markets as the path to development. But, as with oil, this is deceptive because informal trading has not proven to be a panacea to unemployment or a path to redistribution. Indeed, while a small number of traders have gone on to "graduate" into business owners, and trading has been (relatively) lucrative for some, the great majority remain in survivalist positions, with inadequate social protection, and with their incomes shrinking as the market becomes increasingly saturated.

Cooke and Kothari (2001) raise the question of whether "participation rhetoric" masks continued centralization in the name of decentralization; whether the language of "empowerment" is more honestly employed out of concern for managerial effectiveness. While their assertions resonate to some extent with the situation in Warwick Junction, the Warwick Junction research also suggests that centralization in management is not always disempowering or "bad", at least not for all people. The renewal project was in part an effort to regulate and control traders. It established a permit system and created a negotiating structure with which the municipality could communicate. This had the effect of concentrating power within a (not always coupled or harmonious) municipality–ITMB regulating body, while at the same time generating new divisions among street traders. Yet, "participation" in the project was also, by some accounts, quite successful, and given the conditions in the market prior to the renewal project, it is important not to discount this. One could argue that some form of central management was required in order to gain enough stability to facilitate a participatory, albeit uneven, process. Thus, there is a need to examine how power operates, and how management, participation, and decentralization play out, in specific contexts.

Moreover, placing too much emphasis on the capacity of "local" NRM strategies to generate equitable, secure and healthy conditions may obscure macrolevel injustices and inequities. Hickey and Mohan (2004) call for a broadening of the participatory development agenda to examine the relationships between participation in development, governance, the changing roles of states, and processes of democratization. They look at how existing power structures affect levels of participation, what makes participation difficult for some groups, and the effects of institutional histories on these processes. They also suggest that the locus of transformation may well be beyond the individual or the "local", requiring structural and the institutional changes.

Indeed, in Warwick Junction we have seen that the effects of the renewal project were tied to macrogender inequalities, rising unemployment, lack of educational opportunities, and household dynamics, as well as to the history of Warwick Junction and the evolution of the municipal government and ITMB. For traders, transformation relies both on the municipality and associated trading committees, and on changing gender norms, redressing colonial and apartheid history, and generating formal employment.

A number of overarching "lessons" for NRM emerge from this analysis, as well as from attempts to add sophistication to the concepts of "community" and "participation":

1. Engaging community participation is an important dimension of devising NRM strategies. However, communities are heterogeneous and there is a need to reflexively examine how power relations operate within and between them.
2. New communities can form around struggles over resources, both in urban and in rural contexts. These communities can be divisive, can be sites of claims-making, and can exclude certain individuals and social groups. The power of resources in this production of community lies not only in the potential for material benefits associated with preferential access, but also in the symbolic dimension of resources that provide hope for the future. This may be especially true in resource poor contexts.
3. The creation of institutions in participatory resource management strategies can generate new divisions within and among existing communities. As such, "participation" can result in a concentration of power. This can have the effect of centralizing rather than decentralizing power. Indeed, "participatory" practices are not beyond the ruse of power, and there is a need to continuously examine axes of control and authority in all development and NRM efforts.
4. Transforming resource inequities requires critical and reflexive local strategies as well as addressing macro level drivers and injustices.

Conclusions

With the end of apartheid in 1994, a number of processes converged in South Africa. The desegregation of urban areas and the lifting of restrictions on population mobility, together with rising unemployment and the globalization of South Africa's economy, resulted in many rural South Africans seeking livelihoods in urban and periurban areas. In Durban, many have taken up street vending in Warwick Junction, the largest trading and transport hub in the city. The end of apartheid has also resulted in the decentralization of responsibility for urban environmental and informal economy management. In 1996, the eThekwini (Durban) Municipality selected Warwick Junction – then considered to be the most degraded and derelict part of the city – as a pilot project for a new integrative approach to urban development. The project has since won international acclaim for its success in engaging community participation and in improving the wellbeing, security and livelihoods of street traders.

A decade later, however, research in Warwick Junction revealed that multiple forms of control, authority, inclusion, and exclusion exist within the street trading "community", some pre-dating the urban renewal effort, rooted in gender, age, and traditional hierarchies with linkages to rural areas, and others emerging as new forms of power and legitimacy connected to the urban management process itself. Not all traders have had access to the committees and social structures involved in negotiating for traders' conditions and rights. Furthermore, the effects of the renewal project continue to be differentiated, with women and youth remaining on the peripheries, and having least access to the project's new infrastructure and services.

With urbanization accelerating throughout much of the global South, there is a need to extend NRM concepts beyond the rural sphere; to begin to think about how NRM concepts, practices, and policies apply in urban settings. The Warwick Junction renewal provides one clear example of an integrated urban NRM project. It provides an opportunity to critically examine the central concepts of "community" and "participation", based on recent empirical research.

The research presented in this chapter illustrates how differential access to resources (in this case, access to trading space, infrastructure, and services) manifests as a series of political, economic, social, and symbolic struggles. It also demonstrates how even the most "successful" of community-based urban management efforts can result in an uneven distribution of benefits. Clearly, there is a need for a more nuanced understanding of the heterogeneity of "communities" and for a closer examination of how relations of power operate in "participatory" development projects.

Acknowledgements I would like to extend my sincere thanks to all those in Warwick Junction and in Durban who participated in this research, especially S'bo Radebe, Ntombu Thula, Sihle Sithole, and Phumzile Cele for their assistance with the fieldwork. I would also like to acknowledge Caroline Skinner, Jeremy Grest, Tim Quinlan, Nina Veenstra, Alan Whiteside, Fiona Mackenzie, Mike Brklacich, Ben Hodson, and Beverly Kraft, for their personal and professional support. This research was supported and funded by the International Development Research Center, the Social Science and Humanities Council, and the Health Economics and HIV/AIDS Research Division.

References

Blaikie, P., & Brookfield, H. C. (Eds.). (1987). *Land degradation and society*. London: Methuen.

Braun, B., & Castree, N. (Eds.). (1998). *Remaking reality*. London: Routledge.

Campbell, C. (2003). *Letting them die: How HIV prevention programmes often fail*. South Africa: Double Storey Books.

Charmes, J. (2003). *Street traders and their associations in South Africa*. Geneva: International Labour Office.

Chazan, M. (2008). Seven deadly assumptions: Unpacking the implications of HIV/AIDS among grandmothers in South Africa and beyond. *Ageing and Society, 28*, 935–958.

Chazan, M., & Whiteside, A. (2007). The making of vulnerabilities: Understanding the differentiated effects of HIV and AIDS among street traders in Warwick Junction, Durban, South Africa. *African Journal of AIDS Research, 6*(2), 162–175.

Cooke, B., & Kothari, U. (2001). *Participation: The new tyranny?* London: Zed Books.

Davis, M. (2004). Planet of slums: Urban involution and the informal proletariat. *New Left Review, 26*, 5–34.

Dlamini, E. (2004). Personal communication. Warwick Junction Urban Renewal Project Office, Durban, 23 Sept 2004

Dobson, R. (2004). Personal communication. Warwick Junction Urban Renewal Project Office, Durban, 29 Sept 2004.

Forget, G., & Lebel, J. (2001). An ecosystem approach to human health. *International Journal of Occupational Environmental Health, 7*(2), S1–S38.

Grest, J. (2000). Urban citizenship and legitimate governance: The case of the Greater Warwick Avenue and Grey Street Urban Renewal Project, Durban. Presented to *South African Planning History Study Group Millenium Conference on Planning for Reconstruction and Transformation.* Durban, 29–30 May 2000.

Grest, J. (2004). Personal communication. Department of Political Science, University of KwaZulu-Natal, Durban, 06 Oct 2004.

Guijt, I., & Shah, M. (1989). *The myth of community: Gender issues in participatory development*. London: IT.

Heyned, N. (2006). Green urban political ecologies: Toward a better understanding of inner-city environmental change. *Environment and Planning A, 38*(3), 499–516.

Hickey, S., & Mohan, G. (Eds.). (2004). *Participation: From tyranny to transformation?* London: Zed Books.

Lee, S. (2004). Assessing the vulnerability of women street traders to HIV/AIDS: a comparative analysis of Uganda and South Africa. Health Economics and HIV/AIDS Research Division. Internet source: www.nu.ac.za/heard/papers.

Lund, F. (2002). Social security and the changing labour market: Access for non-standard and informal workers in South Africa. *Social Dynamics, 28*(2), 177–206.

Marcotullio, P. and G. Boyle (2003). *Defining and ecosystem approach to urban management and policy development*. UNU/IAS Report.

Martens, P., McMichael, A. J., & Patz, J. A. (2000). Globalisation, environmental change and health. *Global Change and Human Health, 1*(1), 4–8.

Mcnube, P. (2004). Personal communication. Warwick Junction Urban Renewal Project Office. Durban, 01 Dec 2004.

Mustafa, D. (2005). The production of an *urban* hazardscape in Pakistan: Modernity, vulnerability and the range of choice. *Annals of the Association of American Geographers, 95*(3), 566–586.

Nesvag, S. (2002). The development of mass street trading in Durban: The case of *muthi* trading. In B. Freund & V. Padayachee (Eds.), *(D)urban vortex*. South Africa: University of Natal Press.

Piracha, A., & Marcutullio, P. (2003). *Urban Ecosystem Analysis: Identifying Tools and Methods,* UNU/IAS Report.

Skinner, C. (2004). Personal communication, Durban. School of Development Studies, University of KwaZulu-Natal. Durban, 12 Nov 2004.

Watts, M. (1983). *Silent violence: Food, famine and peasantry in Northern Nigeria*. Berkeley, CA: University of California Press.

Watts, M. (2004). Antinomies of community: some thoughts on geography, resources and empire. *Transactions of the Institute of British Geographers, 29*, 195–216.

Chapter 8
The Deliberative Scientist: Integrating Science and Politics in Forest Resource Governance in Nepal

Hemant R. Ojha, Naya S. Paudel, Mani R. Banjade*, Cynthia McDougall, and John Cameron

Abstract Viewing resource management essentially through a biophysical lens has provided too restricted a perspective for understanding complex political processes surrounding forest management. The case of community forestry in Nepal demonstrates a range of experiences of complex political processes, including conflicts and collaboration, especially between technical forest officials and local forest dependent people. Despite innovative legislative and institutional frameworks already in place, community forestry in Nepal still experiences the effects of techno-bureaucratic control. Such control is manifested in the entire range of processes related to planning, management, and monitoring of forestry activities. To understand this situation, we apply the conceptual lens of deliberative governance, that is, governance whose arrangements have been devised from both scientific and local knowledge.

This chapter provides practical examples to offer insights into the application of deliberative governance in forestry practices. We identify how different aspects of managerialist, techno-bureaucratic domination (legitimated by principles of positivist science) are deliberatively challenged by local people, civil society activists, and action researchers to improve governance practices. We also identify situations and deliberative processes through which forest managers themselves begin to realize the limits of an antideliberative scientific approach, and apply more reflexive

H.R. Ojha (✉), N.S. Paudel, and M.R. Banjades*
ForestAction Nepal, G.P.O. Box: 12207, Kathmandu, Nepal
e-mail: hojha@wlink.com.np; nspaudel@gmail.com;
mrb@forestaction.wlink.com.np; mrbanjade@gmail.com
* Currently Ph.D. Scholar at Australian National University, Canberra, Australia

C. McDougall
Centre for International Forestry Research (CIFOR)
e-mail: c.mcdougall@cgiar.org

J. Cameron
Institute of Social Studies (ISS), Postbus 29776, 2502 LT Den Haag (NL), The Netherlands
e-mail: cameron@iss.nl

L. German et al. (eds.), *Beyond the Biophysical: Knowledge, Culture, and Power in Agriculture and Natural Resource Management*,
DOI 10.1007/978-90-481-8826-0_8,

and deliberative approaches to knowledge and decision-making in forest management. In doing so, we eschew taking an absolute position for or against indigenous knowledge or scientific enterprise, but seek to demonstrate that neither technocratic prescription nor reliance on local knowledge alone is adequate for sustainable management of forests. What is needed, as Fischer (1998) argues, is a deliberative engagement between the claims to knowledge by both scientists and citizens. In our experience, this deliberative process provided a foundation for less constrained dialogue, greater collaboration, and mutual learning in the direction of more evidence-based decision-making. This approach is however not free from challenges related to power and techno-bureaucratic control.

Keywords Deliberative governance • Community forestry • Doxa • Knowledge, contestation of • Nepal

Introduction

This chapter challenges the hegemony of biophysical sciences as the sole basis for policy formation and designing practices in resource management. There has been widespread concern that scientific practice has remained overly reductionist and driven by professional and bureaucratic power (Backstrand 2004; Ojha 2006). We share poststructuralist concerns that "science" has been used to advance the interests of particular cultural groups called scientists (Lyotard 1993), rather than to inform and catalyze democratic governance. Yet we do not reject science, but seek to explore how science and power relations can be jointly leveraged to transform institutions and policies.

We conceptualize "deliberative governance" as a process that seeks to forge more effective dialogues between scientists and citizens. We emphasize "deliberation" (as opposed, say, to the more generic term "participation") to draw attention to the political complexity of stakeholders "inquiring and learning together in the face of difference and conflict … arguing *and* acting together" (Forester 1999, p. ix) for the management of natural resources. The idea is not to relegate political decisions around forest management to the logic of science alone, but to advocate a "dialectical clash" between scientific and citizen worldviews (Fischer 1998), through which the two sets of actors can advance the knowledge-based and political frontiers of governance toward a synthesis. Deliberation that pools knowledge to (re)define relations of power may be understood as deliberative governance. In this chapter, the concept of deliberative governance (Habermas 1996; Fischer 1998; Forester 1999) is further developed with the ideas of Bourdieu (2004), linking culture, knowledge, and power in the context of social inequality.

The potential and challenges of improving forest resource management practices through the integration of science and local knowledge are demonstrated through the experience of an Adaptive Collaborative Management (ACM) research activity in the context of Community Forestry (CF) in Nepal. This CF experience reveals the complexity of conflict and collaboration between local forest dependent people and techno-bureaucratic forest officials, and the increasing influence and mediation of other actors, such as development agencies, nongovernmental organizations (NGOs), and market players. For these diverse actors, the forests of Nepal are a highly contested space (both materially and symbolically): a resource for subsistence livelihoods for some of the world's poorest groups (at least in material wealth) and a hub of conservation in a highly fragile Himalayan environment. In this context, forest governance is largely influenced by two conflicting worldviews and corresponding types of knowledge: local knowledge of forest dependent communities and the techno-bureaucratic knowledge of government forest agencies.

Through the past 50 years of modernization and development in Nepal, scientific and bureaucratic mindsets have dominated forest governance practices. As described in the following section, this dominance suppresses the legitimacy of other knowledge claims by relying on the symbolic power of "scientific" knowledge, beliefs, and practices, all of which are nurtured in a historically feudal system of governance, and reinforced by a West-centric, science-dominated, modernist, and state-controlled development approach (Robbins 2000; Phuthego and Chanda 2004; DeWalt 1994). In the early 1980s, the perceived failures of techno-bureaucratic approaches (which emphasized the exclusion of local forest dependent people) to actually protect forests (Gilmour and Fisher 1991) led to CF practitioners challenging the hierarchical approach and a gradual opening of deliberative spaces for local people (Ojha 2006, 2008; Hobley 1996). Today, a relatively more democratic program of CF in Nepal continues to engage local forest dependent citizens (about one-third of the total population) and forest officials, from local level forest management up to national level policy processes (Malla 1997). Yet, while local people's rights over forests are now enshrined in some of the world's most progressive forest legislation (GON/MFSC 1995; Kumar 2002), in a highly stratified society like Nepal certain groups of elites such as high caste groups continue to control resources without facing much resistance or deliberative challenge from forest dependent people (Ojha 2008), most of whom are poor and disadvantaged.

In this chapter, we document practical lessons and conceptual insights with regard to deliberative governance as a means to reconfigure forestry management practices. The potential and limitations of active efforts to improve deliberative approaches have been analyzed in previous research (Ojha et al. 2009; Ojha 2008; Banjade and Ojha 2005). Here we describe practical experiences, including the views of the people directly involved. We identify how different aspects of techno-bureaucratic domination are being deliberatively challenged in the causes of more sustainable and inclusive forest governance within the CF system. We demonstrate that neither technocratic prescription nor reliance on local knowledge is adequate for inclusive and sustainable management of forests.

Techno-bureaucratic Doxa and Deliberative Process: A Conceptual Overview

Common Approaches and Gaps

The most common approaches to understanding the problems of forest governance, such as institutional and property rights theories (Ostrom 1999), analyze the relations between the physical attributes of forests and associated stakeholders, and the interactions between stakeholders, who are presumed to be rationally behaving individuals under economic rational choice models. While these approaches have expanded our knowledge of how people and natural resources interact, they have often been framed in an ahistorical and objectivist fashion (Mosse 1997; Cleaver 2004) and do not adequately address the deliberative processes around resource governance practices. Our approach does not see actors as rationally behaving individuals but rather as culturally constrained agents, always contesting for resources, power, and knowledge in their respective social arenas of governance.

A second, more critical approach is that of political ecology, which has made significant contributions to bringing power into the centre of governance analysis. But our literature review indicates that there is still limited dialogue between political ecology and the sociology of power to better explain how power is enacted in practice. Despite wide ranging political ecological approaches from structural (Blaikie and Brookfield 1987) to poststructural (Peet and Watts 1996) camps, these approaches are either overly deterministic (as in the case of structural political ecology) or too relativist and discursive in their analyses of governance. While we share political ecology's concerns over power and cross-scale explanatory frameworks for analyzing resource control and management practices, we expand the frontiers of analysis to understand how power and interactions are enacted through linguistic, symbolic, and communicative processes.

We argue that local-level forest governance practices should be seen as affected by a wide range of forces operating at different scales. Our approach consists of understanding deliberative practices among actors in governance by exploring structural as well as agency aspects. We have developed this approach more fully in our research elsewhere, including Cameron and Ojha (2007), Ojha (2006, 2008) and Ojha et al. (2005, 2009). We outline this approach below for the purpose of this chapter.

Key Concepts: Doxa and Symbolic Power

The notion of deliberative governance is juxtaposed with the ideas of Bourdieu (2004) to explore a sociocultural logic of how techno-bureaucratic practice is reproduced in the field of forest governance (Box 8.1). We consider the power of neo-hegemonic cultural codes in stifling material change, using Bourdieu's (1984, 1990, 1998) notions of "doxa" and "symbolic power". Doxa refers to the internalized worldviews and unquestioned assumptions that people bring to a field of action. Doxa both shapes and limits deliberative possibilities, including learning among social actors (Crossley 2003; Hayward 2004). This implies a need for understanding the possibilities of doxa opening up for deliberative engagement. Two aspects of change may lead to deliberative engagement – self-reflexivity (a social agent reflecting upon her or his own mindset) and cognitive crisis (a condition in which the internalized doxa of a person is seen to be in mismatch with social conditions).

Box 8.1 Examples of deliberative closure through techno-bureaucratic doxa in forest governance

- Nonimplementation of, or intentional delay in implementing, regulatory provisions that devolve state power to the people, such as registration of new Community Forest User Groups (CFUGs)
- Reducing or twisting the rigour or original spirit of a legislative act through specific regulation
- Interpreting and projecting regulatory implementations that involve transfer of state power to local level, as if the transfer were the result of the actor's own generosity, mercy, or patronage
- Creating unnecessary difficulties in order to discourage the political agency of the people, such as by issuing unnecessary instructions on forest harvesting or extra legal requirements
- Selective interpretation of regulatory provisions according to foresty officials' own interests
- Invoking the necessity of government intervention in cases of failure of markets or civil society coordination (for example: elite capture of community forestry and interregional equity in benefit-sharing)
- Threatening physical violence or physically assaulting radical citizens who question the power of forestry officials – such as by armed forest guards
- Discouraging and derecognizing civil society networks that could challenge the legitimacy of bureaucratic hegemony

Source: Adapted from Ojha (2008)

From this perspective, in this chapter we also consider that scientists and their practice of science have over time become part of a “techno-bureaucratic” doxa, with internalized sets of norms, beliefs, and perceptions and a dominant position in the wider political economy of the developmental state. While the dominance of the particular, “scientific” approach to knowledge generation within international development has contributed to human knowledge of the physical world and technological leaps, it has tended to promote claims to universal technical knowledge (Scott 1998), ignoring local values, perspectives, and knowledge (Escobar 1995). The fabric of state and nonstate institutions evolved in such a way that currently sociopolitical issues are either increasingly being handled by technical experts of the government or are left to the logic of the market, thus minimizing the space for deliberative civic engagement. A critique of such techno-bureaucratic dominance is growing (Fischer 2003), with a drive for deliberative approaches to governance where both science and local people’s knowledge can both be brought to bear on the processes of governance.

“Symbolic power” is a form of power that operates through language, symbols, and prestige, possession of which enables a dominant doxa to legitimate and reproduce its dominance (Bourdieu 1991). The concepts of doxa and symbolic power are interrelated: a dominant doxa maintains its position not only through the economic force of the elite (in this case, techno-bureaucratic) actors who espouse it, but also through symbolic force that maintains the “naturalness” of the prevailing order (Hayward 2004). In the latter, even the social agents most disadvantaged by this order tend to consider the prevailing order as natural, with resistance being confined to a limited discursive sphere. The power relations are thus grounded in the system of symbols, and may be hidden from cognition and comprehension. Since “symbolic power is creating things with words” (Bourdieu 1998, p. 138), it literally determines who is listened to in decision-making: disadvantaged groups who lack such symbolic legitimacy are excluded from discourse and from shaping its outcomes (Bohman 2000, p. 138).

The Integration of Knowledge Worlds Through Deliberation

While there are emerging thoughts in support of integrating scientific and local knowledge (e.g. Phuthego and Chanda 2004; Robbins 2000; Buck et al. 2001; Chapter 5), we argue a useful approach to this question of integration is “deliberation”. Box 8.2 presents key principles of deliberation, which essentially entails communicative interaction that facilitates sharing of knowledge and has the potential to change predeliberation stances and preferences of the participating actors.

Box 8.2 Key values of deliberation

- Deliberation is a communicative interaction aimed at making decisions, maintaining coordination, co-learning, and organizing practices.
- Deliberation may involve processes of transformation rather than mere aggregation of preferences.
- Deliberation enhances the quality of decisions by pooling diverse knowledge systems.
- Deliberation legitimizes choices or decisions, including enactment of coercion and restrictions.
- Difference is an important resource for deliberation.

Source: Ojha (2008), Young (1997)

This chapter therefore critiques the ways in which scientific claims are made to achieve "deliberative closure" in decision-making, with varying degrees of reflexivity and doxa. It explores how citizens' voices on natural resource governance may increase through more open, deliberative processes (Bohman 1999; Forester 1999; Fischer 2003). The research presented here identifies diverse situations in which deliberative closure is enacted by techno-bureaucratic doxa. In most situations of deliberative closure, the expert knowledge is packaged in terms of mandatory procedural requirements, relieved of the need to face the questions of the affected citizens engaged in practical discourse. When scientific practice is integrated with bureaucratic administration by establishing a technical forest service as part of government bureaucracy, an authoritative power-knowledge nexus is created which minimizes space for the political agency of people affected by forest governance. In contrast, the deliberative approach sees experts as advisors to public decisions rather than only the makers of decisions (Reich 1990).

Research Action and Deliberative Innovations

Community Forestry in Nepal

Decentralized approaches to forest governance are becoming increasingly common in the developing world. With rich experiences over the past three decades, Nepal's Community Forestry (CF) program is considered a globally significant innovation in this regard (Kumar 2002). The innovations encompass legal and regulatory development, institutions of participation, benefit-sharing mechanisms, development of community based forestry enterprises, and measures adopted for biodiversity conservation. Under the program, by the end of 2008, more than 16,000 Community Forest User Groups (CFUGs) were organized nationally, with legal rights to manage over a million hectares of forest, thus bringing about one third of the country's population under CFUG membership. There are even emerging claims that CF is flourishing in the country and nurturing democracy at the grassroots (Ojha and Pokharel 2005; Rechlin et al. 2007), despite a prolonged insurgency and political upheavals. The three decades of practice have clearly demonstrated success in terms of enhancing flows of forest products, improving livelihoods opportunities for forest dependent people, strengthening social capital, and improving ecological conditions of forests (Dev et al. 2003; Ojha and Kanel 2005; Subedi 2006).

Despite widespread expansion and notable successes of CF in Nepal, there are concerns that the anticipated livelihood benefits of the CF programme have not been realized (McDougall et al. 2008; Malla 2000, 2001). One of the reasons for this is the reported continued domination of forest officials in the day-to-day management of forests, hence limiting the role of local forest dependent people to proactively manage forests for their own livelihoods (Malla 2001; Nightingale 2005; Ojha et al. 2005; Paudel et al. 2008). Some have even argued that this power struggle is increasing and that there has been a bureaucratic "backlash" (Shrestha 2001) or "betrayal" (Mahapatra 2001), putting the principle of CF "in danger" (Shrestha 1999).

In order to address this tension, several Nepali and international organizations collaborated in the undertaking of a multi-year, multiscale research project entitled "Improving livelihoods and equity in community forestry in Nepal: The role of Adaptive Collaborative Management (ACM)". The part of the research project presented in this chapter was conducted by the Nepali nonprofit research organization ForestAction. The project as a whole was led by the Centre for International Forestry Research (CIFOR) and funded primarily by the International Development Research Centre (IDRC). Other collaborating research partners were NewERA and the Environmental Resources Institute.

The research took place in five districts. Palpa and Nawalparasi districts lie in Nepal's western administrative region, Lalitpur in the Kathmandu valley lies in the central region, and Dhankuta and Morang in the eastern region. Morang and Nawalparasi are predominantly low lying, fertile plains (*terai*) while the other study sites are in the country's mid-altitude (1,000–4,000 m.a.s.l.) hill regions (*pahad*) (cf. Chapter 4, where research was conducted in the hills of Kaski district, western region). In all these sites, a diverse range of social agents control and access different aspects of the diverse and economically valuable forest ecosystem, acting through civil society, markets, and state politics. Economically, these women and men range from landed elites to landless poor farmers, from timber traders to poor artisans, and from shop owners to agricultural laborers. Culturally they range from high caste Brahmins to low caste "untouchables", including indigenous groups, new settlers, and ethnic minorities (Ohja 2006). This chapter limits itself to analyzing the interaction between local communities and forest officials in the process of CF management.

Research Methodology

The research focused on developing or enhancing deliberative processes within and across three different levels: (a) the *local level* where local forest users were directly engaged to protect, manage, and use forest resources, (b) the *meso level* of the district and subdistricts, which includes both government and non-government actors involved in the implementation of various forest sector policies, and (c) the *national level*, where critical learning from field activities fed into national policy making processes through informal channels. The aim was to identify, develop, and critically assess institutional arrangements and deliberative processes that affect CF governance and management, especially at the CFUG level.

The methodology combined participatory action research and social science assessment. To enable understanding and assessment of situations, changes, and causal connections, the research team undertook extensive social science background studies, interim and final assessments, as well as ongoing observation by field researchers. The participatory action research was used to strengthen governance and explore and enhance deliberation between local forest users and technical forestry staff of the Forest Department. In the participatory action research, the lead facilitation roles were played by local actors from the CFUGs and meso level organizations (district forest offices and/or NGOs), selected by the CFUGs and trained in facilitation by the research team. Initially ForestAction researchers also played active facilitation roles; this shifted to more of an on-site coaching and backstopping role as the local change agents got established. The Nepali word *sangat* summarizes how ACM researchers worked with local people – as a "day-to-day companion" to explore, analyze, reflect, and incite, rather than to preach and prescribe. *Sangat* also provided additional symbolic power to the local communities to counter-balance the knowledge and power that forest officials seemed to be drawing from their more expansive social networks with outsiders.

Figure 8.1 depicts a schematic representation of the approach we used in transforming techno-bureaucratic closure in deliberative processes. The left side of the diagram depicts the power relations within the CFUGs and between CFUGs and other actors (mainly forest officials), understood through the lens of perceived patterns of techno-bureaucratic domination. The middle section shows strategies used to enable CFUG-forest bureaucracy deliberation in the participatory action research, while the right hand side of the figure outlines anticipated outcomes.

Relating this back to this chapter's conceptual framework of doxa and symbolic power, the strategies reflected the researchers' belief that improving deliberative practices requires an understanding of how symbolic power is operating and how doxic claims to closure are being reproduced. Most of the pre-intervention decision-making processes described in this chapter were permeated by what Bourdieu would call a high level of symbolic domination. The researchers, perceived to be dominant social agents, were relatively uncontested in their knowledge claims and

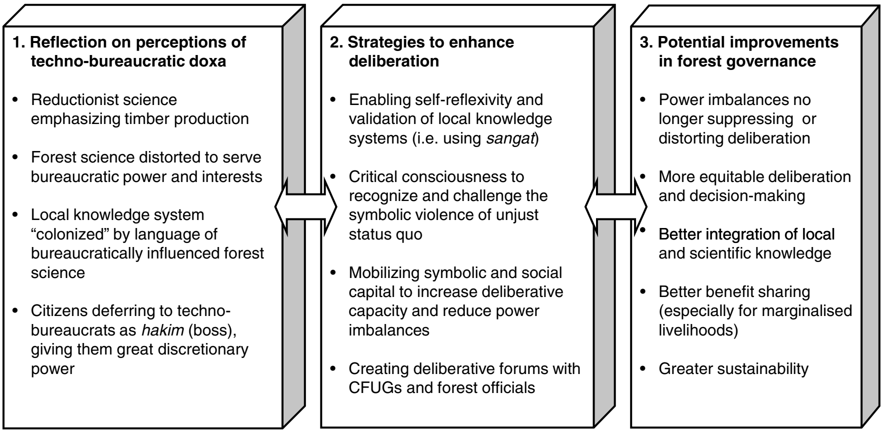

Fig. 8.1 Framing transformation: Lenses, strategies, and potential outcomes

thus exercised decision-making power based upon them. The dominated agents could not easily express their positions within unequal power relations and hence felt little sense of a cognitive crisis, which is often seen as a precursor to deliberative engagement (Ojha 2006). The dominated actors' sense of their own agency is constrained by a "fatalistic" doxa, justifying a passive approach to unequal power relations and powerlessness as normal and religiously ordained. For instance, local people, especially the disadvantaged groups, often see forests as government assets where *hakim* (public officials considered as bosses) have discretionary power to exclude citizens.

In this framework, levels of (mis)recognition of symbolic power can be seen as comprising four steps (see Fig. 8.2). The steps correspond to four levels of agency, with both critical awareness and action increasing as we move up the steps. We suggest critical awareness involves questioning the unequal distribution of symbolic capital through its recognition as a social construction and not a "natural" state, a doxic position we characterize as "misrecognition". We have labeled these steps as fully "misrecognized", "recognized but not challenged", "recognized and challenged" but not yet transformed, and ultimately "recognized, challenged, and (in the process of being) transformed". These four levels of increasing recognition correspond to increasing demands for deliberative improvement from below and increasing determination to act defiantly if these demands are not met. Therefore the interventions described in this chapter can be seen as external efforts to enable increased recognition of the socially constructed techno-bureaucratic doxa, while at the same time enhancing reflexivity within fatalistic doxa of disadvantaged community groups. This diminished misrecognition of power relations is a necessary condition for deliberative challenges to unequal power structures.

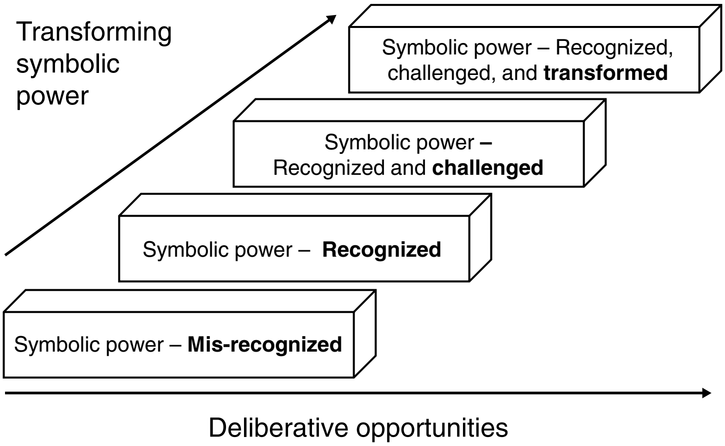

Fig. 8.2 Relationship between symbolic power and deliberation

Deliberative Processes and Outcomes: Case Examples

In this section, we describe four examples of deliberative processes (summarized in Table 8.1) used to challenge and transform various aspects of techno-bureaucratic domination in forest governance in the context of Nepal's community forestry programme. These cases are chosen to demonstrate diverse aspects of techno-bureaucratic doxa, different strategies of deliberative processes applied to transform them and resulting in varied outcomes. The four cases also represent diverse socio-ecological contexts of Nepal.

Challenging Techno-bureaucratic Control in Forest Management Planning in Lalitpur

In Lalitpur, a cluster of eight CFUGs had formed a common forum for regular sharing to enhance effectiveness of forest management and to work together on common issues. Amidst concern for the expiring Operational Plans (OPs), in May 2006 the leaders organized one of a series of meetings in a government built Forest Range Post office situated inside the forest. This was one of the ACM research sites and one of the coauthors, an ACM researcher, participated in the meeting. Since it was a public holiday, there were no rangers but only the forest guard who opened the meeting room as agreed previously with the ranger. This formal meeting of CFUG leaders without the presence of a ranger was the first of its kind in the nearly decade-long history of the CFUGs.

Table 8.1 Summary of governance practices, technocratic doxa, and deliberative action in the four case studies

Aspects of forest governance (study site)	Nature and extent of techno-bureaucratic domination	Key actors and deliberative processes	Outcomes of deliberative processes
Forest management planning (Lalitpur)	Forest rangers used their symbolic power and attempted to resurrect control over planning process, insisting upon technocratic management. This created limited opportunities for forest utilization and provided little sense of ownership by local people	ACM Researchers, CFUG network, CFUG leaders, forest rangers, local change agents. Facilitation of reflective meetings by CFUG leaders with support from ACM researchers who also provided trainings on legal, institutional and procedural aspects of CF	Increased deliberative confidence of local people, revision of operational plan accommodating the views and concerns of local groups. Increased deliberative response of technical foresters to the concerns of local forest user groups
Construction of fireline and removal of trees (Nawalparasi)	DFO and forest rangers took action against CFUG for not fully complying with DFO's authority	ACM researchers, CFUGs, forest officials, local change agents. CFUG leaders engaged in several deliberations within CFUG and with forest officials with some procedural assistance from the ACM researchers	Increased ability of forest users to argue against techno-bureaucratic domination, increased self-reflexivity of technical foresters
Forest harvesting (Morang)	CF operational plan prepared by the forest officials was not understood by the CFUG. The latter could make little managerial and legal sense out of the operational plan	ACM researchers, local change agents, forest officials, CFUG leaders. CFUGs discussed the annual harvest level and devised mechanisms for negotiation with forest officials	More active use of forest products by renegotiating operational plan and harvesting practices
Forest harvesting and thinning (Dhankuta)	Protectionist focus on forest and marginalization of poorest groups	ACM researchers, CFUG leaders, government officials, disadvantaged groups (fuelwood sellers), local change agents. A series of intragroup meetings of fuelwood sellers, with CFUG leaders and in multistakeholder fora	Allowing firewood selling groups to cut firewood within the sustainable limit

This novel freedom from the rangers' presence could be observed both before and during the meeting. Before the beginning of the formal meeting, participants were enjoying the sunshine outside, joking about the District Forest Officer (DFO) and rangers and their lack of knowledge of local realities and practical needs. This happy mood carried over as the secretary of the host CFUG began the meeting and quickly brought criticisms of government officials to the fore. A leader, putting his views on this agenda, stated:

> In the name of community forestry, the government has made us *gothala* (a slave responsible for taking care of cattle). We are told to protect and develop the forest, but when it comes to utilisation, *ban hakims* (forest officials) become the true *malik* (owners) of the community forests. They dictate everything – when to harvest, what to harvest, how to harvest. And if we present options that better suit our needs, then they point to the one or the other provision of the OP (operational plan) about which we had little idea and say when it was prepared. (All quotes are translated from Nepali)

When one of the researchers queried whether the communities were simply being asked to follow the rules of their own OP, many leaders stood up, shouting lines at the researcher such as, "Who says we made the OP? It was the ranger who made the OP. We were never consulted. Many of the users had not understood the actual statements of the OP. This was no more than *tamsukama andhako lepche jastai* (a blind man signing on a debt agreement)."

The researchers attempted to turn this immediate response of the villagers toward more deliberative reflection to explore why and how they had failed to challenge the assumptions and interests (i.e. the technocratic doxa) of forest rangers during the actual practice of preparing or implementing the OPs. It was revealed that most of the OPs were prepared 5–7 years before, when the level of literacy and general awareness among the local people was very low. At that stage of the CF program in Nepal the rangers were being encouraged to hand over as many forest patches as possible to local communities. They could also get "TADAs" (travel and daily allowances) and some additional money for each OP finalized. With this incentive on the one hand and a preset official target of handover on the other, the rangers wrote many of the OPs on their own, based on their formal forestry knowledge without much deliberation with the local people. Consequently local needs, management knowledge, and specificities did not enter into the OP. The technical conventions in which the rangers had been trained guided the design of the OPs and remained unchallenged.

Discussion on the diverse ways through which rangers dominated the process of formulation of the OPs was the main element of the meeting, as this kind of techno-bureaucratic domination was affecting all the CFUGs present. The ACM researchers helped shape this discussion of the symbolic power of forest officials, drawing links between experiences and with other background information, and also helped facilitate strategies within the CFUGs to more effectively deliberate with forest officials in revising the OPs. In the meeting, while the CFUGs network decided to approach the ranger and the DFO for help, they strongly felt that they themselves should be actively involved in preparing new OPs and that their knowledge, needs, and local specificities should be properly addressed. The meeting ended with a plan of action to speed up the revision process.

Following this meeting the leaders of the local CFUGs began to meet regularly. The ACM researchers persuaded them through critical questioning and coaching to increase interaction among themselves and to work cooperatively on a larger scale to reduce the risk of being divided and ruled. With renewed enthusiasm and increased confidence they also went to see the DFO. They were able to convince the DFO that they needed to revise the old OPs which had lost their legal legitimacy after the end of the stipulated period of the plan. Although it was opposed by the DFO initially, he gradually became positive on the issue. The DFO however, asked them to consult with the local ranger, get his technical support, and prepare new OPs before submitting them to him for approval.

As part of regular ACM-based interactions, another meeting of local leaders was organized in the same Range Post two months later, this time with the ranger. The researcher coauthor, who had participated in the previous meetings, observed a marked change in the relations between the ranger and CFUG leaders. Many of the leaders were confidently voicing their concerns regarding the impractical provisions of the existing OPs and were arguing for immediate revision. In response, the ranger acknowledged the need to revise the OPs to reflect the needs and priorities of the local forest users, although he argued that he did not have "manpower" to support the groups. At the end of the meeting, when the coauthor asked one of the leaders how they were able to discuss so openly and confidently with the rangers this time, he replied:

> We already saw his [the Ranger's] *hakim* the DFO (a senior officer who is vested with huge discretionary power, and often poses a threat to sub-ordinates and clients), and spoke to him. He [the ranger] is only his *karinda* (assistant). This is also because now we know more than the ranger on the OP. Now he cannot cheat us. This is largely because of your *sangat* [collaborative interactions]. Through your ACM program we came to know the forest rules and the OP, we saw how other people are managing the forests and we got an opportunity to talk to senior forestry officers.

In a later meeting with the forest ranger about his perceptions of the changing dynamics, the coauthor was told, "whenever you [the research team] are here in the meeting their voice becomes louder. They perceive you as their people." One of the participants, a local ACM activist, pointed out, "The ranger becomes approachable in front of researchers. In other occasions he dominates us." This illustrates how expansion of local CFUG social capital – through the links with researchers coming from outside and having seemingly superior status – helped to countervail the symbolic power of the forest officials, and thus enhanced deliberation over forest governance issues.

In this way project researchers were able to improve deliberation between the local forest users and forest officials. They created fora, helped to reveal local people's submissive stance toward techno-bureaucratic doxa, enhanced reflexivity on the part of the forest ranger, and helped the ranger to visualize alternative world views and appreciate local knowledge. The researchers created a form of associational power, ameliorating the gap between the rangers and the local people in an actual deliberative setting. But the researchers had clearly become more than just a catalyst in this process and had created some undesired deliberative dependence on both sides.

Challenging Discretionary Power of Techno-bureaucratic Doxa in Chautari CFUG, Nawalparasi

An experience from Chautari CFUG in Nawalparasi illustrates another dimension of techno-bureaucratic doxa relating to the use of discretionary power to constrain CFUG independence. As the chairperson of the CFUG (Mr. X) told one of the coauthors, "These forest officers have become autocratic; they have become more powerful than the king." Mr X's tussle with the DFO began when the CFUG had received permission in April 2006 to fell some trees that created hurdles in the fireline – a trail in the forest to control fire and to facilitate forest management or harvesting activities inside the forest. In the process, two of these felled trees interlocked with other standing trees, causing a risk to passersby. Since there was an immediate need to minimize the risk, those trees had to be felled as well.

However, the DFO perceived this as noncompliance with the permission and as a challenge to his authority. He immediately took action against the CFUG, sending a staff member to inspect the field and asking for *spastikaran* (a letter asking to clarify reasons for doing something, usually as a first step toward prosecuting an offender). Most importantly, he ordered the CFUG to stop all forest management activities, including all the usual harvesting operations as specified in the agreed OP. One of the area's rangers defended the DFO's action to the researcher as "necessary to ensure sustainable management" of the forest, blaming the CFUG leaders for not fully following the principles of "scientific forest management" during fireline construction. He added that local people were not the right people to understand, appreciate, and apply forest science in their everyday practice and agreed that some discretionary power should be vested with government forest officers to ensure forest science is properly followed in management practice.

The DFO's action led to fuelwood shortages in the village. At an urgent mass meeting of the forest users (assembly) in June 2006, anger over the DFO's action was expressed with statements such as: "If firewood collection is prevented, we do not need this forest. Rather burn it," or "Let the DFO manage this forest. Why should we bother conserving this forest if he dictates us in our every step?" The coauthor researcher was present during this mass meeting, and found that even those members who usually opposed the chairperson were fully supporting the CFUG action to fell the trees and were unanimously against the DFO's action against the CFUG.

The open discussion on the crisis and their shared perspective on the issue can largely be attributed to the critical social learning and increased awareness on the legal and ecological aspects of forest management under ACM activities for the previous two and a half years. Local people had frequent interactions with the researchers through *tole* meetings (meeting at hamlets), *tole* representative meetings, reflection and planning workshops, and general assemblies. As some of the researchers were foresters by profession, they could enhance the quality of interaction by enriching the information and arguments with forestry science. This also increased the legitimacy of the researchers among the forest officials, including the DFO. That helped bring local people and the DFO in closer deliberative engagement, though there was little direct attempt by the researchers in this particular case.

While the conflict was ongoing, a new DFO, who had received ACM orientation training and was enthusiastic for its application, was transferred to Nawalparasi as a regular transfer process within the Forest Department. In a meeting with the researchers the DFO shared his strategy to resolve the case: "I will seek the response of all the local people. If the event was transparent and if there was no ill intention behind it, I will help resolve this case." The level of critical awareness among local people on forest science and on the respective roles of the DFO and CFUG had also made it difficult for the DFO to impose any sanctions without deliberation. The CFUG's association with the ACM research process and its institutions, as well as the national CFUG federation (FECOFUN) and other civic movements, was also important.

Almost all CFUG members were invited to an emergency assembly, were informed about the situation, and their views on the problem sought. They unanimously confirmed that the trees were felled as the immediate solution to minimize the risk to passersby and involved no ill intention on the part of the CFUG. They also clarified that the felling of those additional trees would not have any significant impact on forest condition. Here, the frequent interactions between the two parties (CFUGs and the forest officials) allowed them to reflect upon and rethink their positions and finally negotiate to move forward.

Challenging Restrictive Science and Ineffective Forest Harvesting, Chautari CFUG, Morang

In 2003, the government of Nepal made it mandatory to include a forest inventory in the OPs, without which CFUGs were not allowed to extract forest products from the community forests. A CF inventory includes estimation of growing stock, annual increment and prescriptions for annual harvest for different forest products such as timber, fuelwood, fodder, and other nontimber forest products. In this context, Chautari CFUG requested Morang DFO to provide the necessary technical support in revising the OP, seeing this as a purely legal requirement of the government's and not something useful to them. The DFO assigned a ranger for the inventory and the CFUG had to pay Rs. 15,000 (about USD 200) cash for his service charge in addition to providing accommodation and meals during the ranger's field work.

In this way, the revision of the OP became solely the job of the technical forester without any deliberation with the CFUGs who could have provided rich local knowledge. Moreover, the political objectives of the CFUG in governing forests were undermined when technical processes were controlled by the forest officials. None of the CFUG members looked at the prescriptions made in the OP for the annual harvest of forest products, yet now the CFUG needed annual permission from the DFO for timber extraction. The CFUG had to repeatedly offer *chakari* (sycophancy – a common way of pleasing authorities in Nepal), repeatedly request the service as a favor, and commit to paying *prabhidhik bhatta* (technical allowance) before the ranger would come and mark trees for felling.

Partly because of their own fatalistic doxa, and partly because of the way the symbolic power of forest officials is constructed in the field of governance in Nepal, the CFUG accepted the knowledge of the ranger as "scientific" and "legitimate". Although the OP allows annual cuts of standing trees, the DFO and ranger allowed the CFUG to harvest only dead and fallen trees. The origin of this decision was never explained or framed in a way meant to be understood by the members and leaders of the CFUG. This illustrates that the discretionary, techno-bureaucratic power of DFO staff is the key to deciding the harvest level rather than any actual, technical calculation. When they investigated the community forest, ACM researchers found that in most years the total quantity harvested was significantly lower than the allowable harvest stated in the OP. When the chairperson was asked why this was the case, he said, "We don't know how much we can harvest. The DFO only allowed us to harvest fallen and dead trees. In some years, depending on the block and natural factors (such as a storm), we can extract more timber than in other years."

In the name of "science", DFO staff were not following the prescription made in the OP. They were rather using their bureaucratic power to (mis)interpret forest product harvesting. When asked why this situation prevailed, a ranger answered, "If we allow CFUGs the prescribed quantity to be extracted from the forest, it is likely that more trees would be cut contributing to the depletion of forest. If we allow only dead and fallen wood to be taken out we will be on the safe side."

In such a context of techno-bureaucratic domination, ACM researchers trained local facilitators to facilitate deliberative and reflexive processes within the CFUG in 2004 and remained there for about 2 years. They started questioning and challenging the existing institutions and processes such as OP preparation. Two of the coauthors together with local facilitators directly facilitated meetings of the CFUG Executive Committee (EC), *tole* (hamlet) and assemblies, and organized sensitizing workshops[1] that critically reviewed the roles and rights of CFUGs, particularly the preparation of CF management plans. They also organized reflective meetings with service providing organizations including representatives of DFOs to discuss the roles of different organizations in CF.

During these deliberative processes, researchers came to realize that dead wood would no longer be available in significant quantities from late 2006 when the CFUG would harvest from the last remaining block of forest. In a meeting of the EC at the end of 2005, when asked how they were going to harvest timber after they finished extracting from the last block, the secretary responded, "We went through the OP and found that we can extract timber as mentioned in the OP. We discussed it in our earlier meeting. We are thinking about it but could not decide how we should actually move forward." In subsequent meetings, the researchers helped

[1] Research facilitators used critical causal questions such as: Who has the ultimate power in community forestry? Who prepared the OP and constitution? Who should prepare these documents? What is in these documents? Are they following the provisions of OPs and Constitutions? What does the information in the inventory mean? These questions helped them reflect upon their own practices as well as prompting users and leaders to critically review the OP and constitution.

them to understand the calculation of the allowed prescribed amount of wood for harvest. Then they started challenging decisions made in the name of forest science, discussing with the ranger how they would get timber after the last block's cutting if the DFO only allowed harvesting the dead and fallen trees. In a meeting with the researchers, EC members explained their desire to challenge the techno-bureaucratic doxa as follows:

> We doubt the prescription made in the OP; there must be a greater quantity of annual harvest than has been prescribed in the OP [they had prescribed a very minimal quantity as annual allowable cut]. Moreover, they [DFO staff] have cheated us until now by not allowing us to harvest mature trees within the harvestable limits prescribed in the OP. Thanks to you people for making us aware of this aspect (*hamro ankha kholi dinu bho*).

What was useful here was the ways deliberative practitioners questioned the villagers, made them more conscious about inquiring, probing, reflecting, and discussing as individuals or *toles* with representatives and with other stakeholders. They read the OP and constitution and reflected upon the provisions therein. The deliberative processes helped to improve the confidence of users as legitimate managers of the forest, to make sense of the legal documents, to understand the technical calculations and terms used in the OP (through which forest officials were manipulating the harvesting practices), and hence enabled them to challenge the techno-bureaucratic domination with reasoned arguments.

Challenging Protectionist Forest Science and Damage to Livelihoods of Socioeconomically Marginalized Groups, Handikhaka CFUG, Dhankuta

Handikharka CFUG in Dhankuta has been formally managing a forest close to the District headquarters where there was, and still is, a significant demand for fuelwood and charcoal. Most of the local stakeholders were concerned that the forest was being heavily depleted, but felt unable to make improvements. Since local elites wanted to reduce immigration into the area and the DFO wanted to shift the role of forest protection to the local people, their interests converged around adopting an OP for the CF oriented toward protection (e.g. of drinking water sources and preventing landslides) rather than creating benefits and supporting livelihoods of forest users. These objectives were supported by local elites who were less dependent on CF for fuelwood, fodder, or leaf litter.

The CFUG is highly differentiated by class, caste/ethnicity, and occupation, and by widely varying dependence on forest resources. Before the ACM research started in 2004, the CFUG had a very strict leadership but weak internal governance. Poor people, who did not own land or had very low landholdings, and hence depend on the CF for forest products for their livelihoods (home consumption and sale of firewood) were totally sidelined. Firewood sellers (*daure*) were restricted from forest use but they challenged the existing power elites and continued their livelihood strategy of illicit firewood cutting and sale in the Dhankuta bazaar (local market). They were frequently harassed by the CFUG executive committee and local leaders, who enforced strict rules of forest protection through forest patrols to control illicit cutting. The patrol teams always reacted aggressively to firewood sellers even if they had no alternative livelihood options. In a discussion with firewood sellers, one woman said, "There were many cases of confiscation of our sickles, rope, *namlo* (load-carrying strips of rope), and our firewood at the *dhat* (check post) while we tried to carry fire wood to the bazaar." Another woman added, "No one recognized our problems. We were always blamed as 'forest destroyer's. Everyone wanted the forest completely protected. Firewood collection and sale was defined as illegal".

When the ACM project started in 2004, a series of initial discussions at meso level helped illustrate how none of the actors (at various levels) really understood how they could balance the issues of forest protection and optimal use of the forest resource for livelihood improvement by the poor. There was a challenge to transform presuppositions on the part of powerful actors (including DFO, donors, and local elites) that firewood sellers were the "enemy of the forest". The project promoted deliberative processes to bring the subordinated knowledge of *daure* into the CFUG and District level decision making processes. During the discussion of the *daure* group one of the women expressed:

> We were also enthusiastic to participate in the General Assembly of the CFUG in the past but when we participated we were blamed repeatedly as forest destroyers and were humiliated. It forced us to leave the venue before reaching any decision. Such assemblies were nothing but a venue to get scolded.

Tole representatives and representatives of the *daure* group started putting their agenda in other planning fora, with the proactive support of the Executive Committee to pressurize the CFUG leadership to give emphasis to their livelihood agendas. The issues and insights from these deliberative processes were taken to meso level meetings. Frequent interaction at both levels sparked interest in institutionalizing the deliberative processes for more active management of forest for a new purpose – to contribute to the livelihoods of the poor, mainly the *daure* group.

The willingness of local village elites and meso level stakeholders to apply a more deliberative approach resulted partly from the use of reflective tools such as heterogeneity analysis, which provided opportunities to reflect upon inequalities in the area and to search for greater equity in decision making and benefit sharing. The executive committee proactively undertook wealth ranking of all CF users and identified those whose livelihoods were "critically" forest dependent. They prepared a collective vision and monitoring mechanisms and planned accordingly. They shared their plans with different meso level organizations including the DFO. With the realization of pro-poor plans of forest management, they developed different strategies for firewood sellers.

The first outcome of the ACM process was the provision for firewood sellers to collect firewood. For extracting firewood, firewood sellers were trained in forest management by the DFO with the purpose of combining scientific methodologies of firewood harvesting with local livelihood support. Similarly, they developed a self-monitoring mechanism. In addition, they received capacity building in off-season vegetable farming in their home gardens, vegetable seeds, irrigation, and other technical support, including forming savings and credit groups.

At the end of the first cycle of the deliberative process (mid-2006), the researchers reflected upon the changes jointly with the EC members and firewood sellers. Members of both groups expressed their satisfaction with the increase in deliberative processes over the past 2 years:

> We are very grateful to the CFUG. Our occupation is recognized now and we can proudly say that we are firewood sellers. We are planning to diversify our livelihood strategy because we have now learnt some more livelihood alternatives. If we had learnt this earlier, we could have jointly explored livelihood options and could have left selling firewood if we had realized that firewood selling could not be a sustainable option for us. [*Daure* woman]

Similarly, the CFUG chairperson stated:

> I previously thought that this [ACM] process is time taking and would not materialize significant benefits. But now, I am satisfied that we are using forests also for firewood sellers who were previously considered as destroyers. I think it will take time to make every user aware, but firewood sellers and recent leadership have given a livelihood focus to perceptions of CF management.

The deliberative intervention provided a platform for different stakeholders to understand each other and reflect upon their respective positions, knowledge, and approaches for more open structures and processes. More specifically, they discussed openly their previous doxa on forest protection, which had alienated the firewood sellers from the Handikharka CFUG. In this case, improved deliberation enabled the (re)inclusion of a previously excluded group and promoted a shift away from techno-bureaucratic approaches to forest management.

Transforming Techno-bureaucratic Doxa into Deliberative Processes

The four case studies provide a range of insights into the specific ways through which techno-bureaucratic doxa permeates a form of forest management that is formally (legally) participative. In all cases, forest officials initially used the symbolic power associated with forestry science to limit CFUGs' room for discretion and maneuvre in CF management. In a more detailed study of various community based forestry programs in Nepal, we found that technocratic domination in policy making, programme planning, and implementation is still the rule rather than the exception (Ojha et al. 2008). The following key lessons are identifiable in the dynamics between techno-bureaucratic doxa, symbolic power, and deliberation in Nepal's community forestry.

First, effective deliberation between local citizen groups and techno-bureaucratic agencies requires citizen groups to have strong internal deliberative engagement, connected to diverse networks of learning and symbolic power at different sociospatial scales. This means encouraging discourse and reflexivity at four interrelated scales: deliberation among meso level stakeholders, between meso level stakeholders and CFUG, among various groups within a CFUG, and among the members of marginalized subgroups within a CFUG. When these deliberations at multiple scales were linked formally and informally through diverse channels of communication, it became more possible for the involved actors to challenge and reconstruct the existing techno-bureaucratic approaches to forest management. This evolution, however, was not always free from problems such as dependency on the researchers for a considerable period.

Second, while science is certainly relevant to forest governance (even in so-called participatory approaches) it should be employed to stimulate discussion rather than close deliberation. Liberating scientific analysis from the techno-bureaucratic envelope for use within larger political goals of local communities can have empowering effects on preexisting power relations. For instance, local people often lacked basic technical skills to estimate the harvestable amount of timber, and this ignorance was misused by forest officials in the form of what local CFUGs termed *jal-jhel* (tactics) by forest officials. When local groups were empowered through training in scientific language and some measurement techniques, it helped them to have more effective deliberative engagement with forest officials. However, science and local knowledge operate in significantly different ways and there is a need to recognize the differences and commonalities while promoting deliberative integration (Chhetri 1999). While scientific practice rests on clearly defined roles and functions and formal rules and organizations, local people operate in more fluid and flexible institutions, as their role in natural resource management is just one among many (Sillitoe 1998). While these differences can both deepen and broaden the knowledge used in natural resource governance, bringing both more and less formal decision-making processes into meaningful, evidence-based, deliberative interaction is a great challenge.

Third, deliberative process must start from an appreciation that one's own position is legitimate. People started questioning their submissive, fatalistic doxa only when they recognized themselves as legitimate citizens having legal control over the particular patch of community forest. The research team was instrumental in challenging local people's fatalistic doxa, for example through reflection, critical questioning, legal awareness, and deliberation, until they grew confident of this right and could decisively challenge techno-bureaucratic domination.

Fourth, the economy of symbolic capital is critical for effective deliberative engagement, as is enhancing the deliberative agency among forest dependent communities. The ACM research process strengthened the social networks of the poor and forest users through, for example, linking a CFUG with the research and policy community and to the national level forest users' federation. This social capital was recognized as symbolic power by forest officials, who then became more open to deliberative engagement with local communities.

This also enhanced the self-confidence of local communities in becoming more active in deliberative engagement with forest officials.

Fifth, the association between scientists and local elites may tend to reinforce the existing social inequality among different groups of local people (Vernooy and McDougall 2003), and thus reduce the opportunity for deliberative forest governance. Structural inequality among local people means that some are more able to invest resources and time to generate "formal" knowledge. So we recognize it is important not to be utopian about existing local deliberative processes in civil society. As such, when deliberative processes operate at a local level and require investment of time or local resources they are therefore more likely to draw the involvement of local elites, who are likely to be better able to reap the benefits of participation (e.g. status, information, stipends, or other benefits). In such situations, the role of external change agents like the ACM researchers is critical to empowering marginalized groups to challenge the nexus between local elites and techno-bureaucrats that limits deliberative space in governance.

Sixth, the scope for deliberation is also related to timing and the "surprises" or apparent contradictions that emerge from time to time in any social fields of practice. If the efforts of deliberation are targeted at such times and spaces of "crises", when the rules of the dominant doxa are being questioned by others' experiences, then the possibilities for improved deliberation are higher. This was true in the case of Dhankuta CFUG, where both local leaders and meso level stakeholders were worried over the passiveness of the CFUG in the face of increased responsibilities. In Lalitpur and Nawalparasi, support from deliberative research was delivered at a time when local CFUGs had a feeling of crisis – termination of the OP (Lalitpur) and the risk from accidentally fallen trees (Nawalparasi). This indicates that instead of emphasizing incremental change only through participatory tools and techniques within existing structures, it is worth looking for crisis – and hence opportunities – to push for more rapid change.

Conclusion

Despite the proliferation of participatory approaches to forest governance, the entrenched and culturally self-reproducing techno-bureaucratic mindset (doxa in Bourdieu's language) continues to drive forest management practices. This tends to undermine efforts for greater deliberation, unless there is serious reflexivity among the techno-bureaucratic/scientific practitioners (as Bourdieu (2004) suggests) or increased deliberative confidence among ordinary citizens (Fung 2005). In such situations, collective self-organization and proactive deliberative actions on the part of citizen groups can challenge technocratic hegemony and hence democratize governance. Long term deliberative interventions at different levels, among diverse groups, with techniques aimed at increasing reflexivity and dialogue, can eventually transform power relations – from the state of "misrecognition" to one in which power is deliberatively challenged and continuously renegotiated. These processes are not linear and straightforward, and follow complex pathways.

The case of Nepal's community forestry suggests that the techno-bureaucratic doxa of government officials enact multiple codes for deliberative closure – such as emphasis on protection rather than sustainable use of forests, promotion of timber-oriented silvicultural principles in forest management over other uses, and deploying the "scientific method" to pursue political goals. The power of technical knowledge is further enhanced by the structure of governance, in which political decision makers seek out technical opinions for decision-making. Civic movements and "participatory" development have at times challenged such power relations but are inscribed within the symbolic structure (the language and codes of knowledge) of the techno-bureaucratic doxa, thus tending to reproduce rather than transform the techno-bureaucratic domination in forest governance.

The cases of deliberative interfaces between citizens (forest users) and forest technicians presented in this chapter indicate that techno-bureaucratic domination can be challenged and transformed when (a) continuous deliberations and learning are promoted, (b) external social and symbolic capital can be mobilized in support of the poor and marginalized groups, and (c) local forest dependent citizens are oriented in the language of forest science and present their concerns using its technical language. In such processes, there is a visible role of external change agents who not only challenge the submissive mindsets of citizens and the techno-bureaucratic doxa of officials, but can also augment symbolic capital in favor of the marginalized so that the latter can be further empowered in deliberative processes. But questions remain as to the sustainability of externally influenced deliberative processes, and the extent to which they can become institutionalized into local systems of resource governance in the absence of continued external reinforcement.

References

Backstrand, K. (2004). Scientisation vs. civic expertise in environmental governance: Eco-feminist, eco-modern and post-modern responses. *Environmental Politics, 13*(4), 695–714.

Banjade, M. R., & Ojha, H. (2005). Facilitating deliberative governance: Innovations from Nepal's community forestry program – A case study in Karmapunya. *Forestry Chronicle, 81*(3), 403.

Blaikie, P., & Brookfield, H. (1987). *Land degradation and society*. London: Methen and Co Ltd.

Bohman, J. (1999). Democracy as inquiry, inquiry as democratic: Pragmatism, social science, and the cognitive division of labor. *American Journal of Political Science, 43*(2), 590–607.

Bohman, J. (2000). Practical reason and cultural constraint: Agency in Bourdieu's theory of practice. In R. Shusterman (Ed.), *Bourdieu: A critical reader*. Oxford/Massachusetts: Blackwell.

Bourdieu, P. (1984). *Distinction: A social critique of the judgement of taste*. Cambridge, MA: Harvard University Press.

Bourdieu, P. (1990). *In other words: Essays towards reflexive sociology*. Cambridge, MA: Polity Press in association with Blackwell.

Bourdieu, P. (1991). *Language and symbolic power*. Cambridge, MA/Oxford: Polity Press.

Bourdieu, P. (1998). *Practical reason: On the theory of action*. Cambridge, MA: Polity Press.
Bourdieu, P. (2004). *Science of science and reflexivity*. Cambridge, MA/Oxford: Polity Press.
Buck, L. E., Wollenberg, E., & Edmunds, D. (2001). Social learning in the collaborative management of community forests: Lessons from the field. In E. Wollenberg, D. Edmunds, L. Buck, J. Fox, & S. Brodt (Eds.), *Social learning in community forests*. Indonesia: SMK Grafika Desa Putera.
Cameron, J., & Ojha, H. (2007). A Deliberative ethic for development: A Nepalese journey from Bourdieu through Kant to Dewey and Habermas. *International Journal of Social Economics, 34*(1/2), 88–102.
Chhetri, R. B. (1999). The rhetoric and realities of people's participation in conservation and development in Nepal. In R. B. Chhetri & O. P. Gurrung (Eds.), *Anthropology and sociology of Nepal – Cultures, societies, ecology and development* (pp. 192–211). Kathmandu, Nepal: SASON.
Cleaver, F. (2004). The social embeddedness of agency and decision-making. In S. Hickey & G. Mohan (Eds.), *Participation – From tyranny to transformation? Exploring new approaches to participation in development* (pp. 271–277). London/New York: Zed Books.
Crossley, N. (2003). From reproduction to transformation: Social movement fields and the radical habitus. *Theory, Culture & Society, 20*, 43–68.
Dev, O. P., Yadav, N. P., Springate-Baginski, O., & Soussan, J. (2003). Impacts of community forestry on livelihoods in the Middle Hills of Nepal. *Journal of Forest and Livelihood, 3*(1), 64–77.
DeWalt, B. R. (1994). Using indigenous knowledge to improve agriculture and natural resource management. *Human Organization, 53*(2), 123–131.
Escobar, A. (1995). *Encountering development: The making and unmaking of the Third World*. Princeton, NJ: Princeton University Press.
Fischer, F. (1998). Beyond empiricism: Policy inquiry and post-positivist perspective. *Policy Studies, 26*(1), 129–146.
Fischer, F. (2003). *Reframing public policy: Discursive politics and deliberative practices*. Oxford/New York: Oxford University Press.
Forester, J. (1999). *The deliberative practitioner: Encouraging participatory planning processes*. Cambridge, MA/London: MIT Press.
Fung, A. (2005). Deliberation before the revolution – Toward and ethics of deliberative democracy in an unjust world. *Political Theory, 33*(2), 397–419.
Gilmour, D. A., & Fisher, R. J. (1991). *Villagers, forests and foresters: The philosophy process and practice of community forestry in Nepal*. Kathmandu, Nepal: Sahayogi Press.
GON/MFSC. (1995). *Forest Act 1993 and Forest Regulations 1995*. Kathmandu, Nepal: Government of Nepal.
Habermas, J. (1996). *Between facts and norms – Contributions to a discourse theory of law and democracy*. Cambridge, MA: MIT Press.
Hayward, C. R. (2004). Doxa and Deliberation. *Critical review of international social and political philosophy, 7*, 1–24.
Hobley, M. (1996). *Participatory forestry: The process of change in India and Nepal*. London: Rural Development Forestry Network, Overseas Development Institute.
Kumar, N. (2002). *The challenges of community participation in forest development in Nepal*. Nepal: World Bank.
Lyotard, J. F. (1993). *Political writings*. London: University College London Press.
Mahapatra, R. (2001) Betrayed: Nepal's forest bureaucracy prepares for the funeral of the much hailed community forest management programme. *Down to Earth, 9*(22), 20–22.
Malla, Y. B. (1997). Sustainable use of communal forests in Nepal. *Journal of World Forest Resource Management, 8*, 51–74.
Malla, Y. B. (2000). Impact of community forestry policy on rural livelihoods and food security in Nepal. *Unasylva, 51*(202), 37–45.
Malla, Y. B. (2001). Changing policies and the persistence of patron–client relations in Nepal: Stakeholders' responses to changes in forest policies. *Environmental History, 6*, 287–307.
McDougall, C., Ojha, H., Banjade, M., Pandit, B. H., Bhattarai, T., Maharjan, M. (2008). *Forests of learning: Experiences from research on adaptive collaborative approach to community forestry in Nepal*. Bogor, Indonesia: CIFOR.

Mosse, D. (1997). The symbolic making of a common property resource: History, ecology and locality in a tank-irrigated landscape in South India. *Development and Change, 28*(3), 467.

Nightingale, A. (2005). "The experts taught us all we know": Professionalization and knowledge in Nepalese community forestry. *Antipode, 37*, 581–604.

Ojha, H. (2006). Techno-bureaucratic doxa and the challenges of deliberative governance – The case of community forestry policy and practice in Nepal. *Policy and Society, 25*(2), 131–175.

Ojha, H. (2008). *Reframing governance: Understanding deliberative politics in Nepal's Terai forestry*. New Delhi: Adroit Publishers.

Ojha, H., Cameron, J., & Bhattarai, B. (2005). Understanding development through the language of Habermas and Bourdieu – Insights from Nepal's Leasehold Forestry Program. *International Development Planning Review, 27*(4), 479–497.

Ojha, H. R., Cameron, J., & Kumar, C. (2009). Deliberation or symbolic violence? The governance of community forestry in Nepal. Accepted by *Forest Policy and Economics*, *5–6*(11), 375–382.

Ojha, H., & Kanel, K. (2005). 25 years of community forestry in Nepal – A review of fourth national workshop proceeding. *Forest and Livelihood, 4*(2), 56–60.

Ojha, H., & Pokharel, B. (2005). Democratic innovations in community forestry – What can politicians learn? *Participation, 7*(7), 22–25.

Ojha, H. R., Timsina, N. P., Kumar, C., Banjade, M. R., Belcher, B., Chhetri, R. B. (2008). Community-based forest management programmes in Nepal: An overview of contexts, policies, practices and issues. In H. R. Ojha, N. P. Timsina, C. Kumar, M. R. Banjade, & B. Belcher (Eds.), *Communities, forests and governance: Policies and institutional innovations from Nepal*. New Delhi: Adroit Publications.

Ostrom, E. (1999). Self-Governance and Forest Resources. Occasional Paper 20. Bogor, CIFOR.

Paudel, N. S., Banjade, M. R., & Dahal, G. R. (2008). Handover of community forestry: A political decision or a technical process? *Journal of Forest and Livelihood, 7*(1), 27–35.

Peet, R., & Watts, M. (1996). *Liberation ecologies: Environment, development, social movements*. New York: Routledge.

Phuthego, T. C., & Chanda, R. (2004). Traditional ecological knowledge and community-based natural resource management: Lessons from a Botswana wildlife management area. *Applied Geography, 24*, 57–76.

Rechlin, M., Burch, W. R., Hammett, A. L., Subedi, B., Binayee, S., & Sapkota, I. (2007). Lal Salaam and Hario Ban: The effects of the Maoist insurgency on community forestry in Nepal. *Forests, Trees and Livelihoods, 17*(3), 245–254.

Reich, R. B. (1990). *Public management in democratic society*. Englewood Cliff, NJ: Prentice-Hall.

Robbins, P. (2000). The practical politics of knowing: State environmental knowledge and local political economy. *Economic Geography, 76*(2), 126–144.

Scott, J. (1998). *Seeing like a state: How certain schemes to improve human condition have failed*. New Haven, CT/London: Yale University Press.

Shrestha, N. K. (1999). Community forestry in danger. *Forests, Trees and People Newsletter, 38*, 33–34.

Shrestha, N. K. (2001). The backlash – Recent policy changes undermine user control of community forests in Nepal. *Forest, Trees and People Newsletter, 44*, 62–65.

Sillitoe, P. (1998). The development of indigenous knowledge – A new applied anthropology. *Current Anthropology, 39*(2), 223–252.

Subedi, B. P. (2006). *Linking plant-based enterprises and local communities to biodiversity conservation in Nepal Himalaya*. New Delhi: Adroit Publishers.

Vernooy, R., & McDougall, C. (2003). Principles for good practice: Reflecting on lessons from the field. In B. Pound, S. Snapp, C. McDougall, & A. Braun (Eds.), *Managing natural resources for sustainable livelihoods: Uniting science and participation* (pp. 113–141). London: EarthScan/IDRC.

Young, I. M. (1997). Difference as a resource for democratic communication. In J. Bohman & W. Rehg (Eds.), *Deliberative democracy: Essays on reason and politics* (pp. 383–406). Cambridge, MA/London: MIT Press.

Chapter 9
Common Property Regimes: Taking a Closer Look at Resource Access, Authorization, and Legitimacy

Andrew Fuys and Stephan Dohrn

Abstract Understanding common property regimes, i.e., the systems and institutions through which access to shared natural resources is governed, is critical to ensuring that these resources are used in equitable and sustainable ways. With an estimated five billion hectares of natural resources managed through such tenure regimes, the significance of the commons cannot be understated. Where common property regimes are strong, they provide the rules and enforcement mechanisms that allow rural people to access natural resources in ways that increase livelihood opportunities (such as grazing, fishing, or the collection of forest products for household use or sale), while ensuring environmental sustainability. Where these regimes are weak or undermined by their nonrecognition by more powerful actors, households and communities may lose access to the unique benefits offered by the commons – such as secure access to water and pasture in drought-prone environments, or the means to sustain resources for community use through protection against outside encroachment. When the commons are eroded through their privatization or government appropriation, many of these benefits – often critical for reducing poverty and vulnerability – are lost. This chapter presents a synthesis of findings from case studies on common property from 20 countries, which considered a diversity of resources including forests, rangelands, and fisheries. It highlights a variety of sources of authority for common property regimes, illustrates the different ways through which individuals and groups gain access to natural resources through these tenure regimes, and discusses key challenges and adaptations that were observed in the case studies.

A. Fuys (✉)
Church World Service, 475 Riverside Drive, Suite 700, New York, NY 10115, USA
e-mail: ajfuysland@yahoo.com

S. Dohrn
http://sustainableteams.org and http://almeidadohrn.com
e-mail: stephan@sustainableteams.org

L. German et al. (eds.), *Beyond the Biophysical: Knowledge, Culture, and Power in Agriculture and Natural Resource Management*,
DOI 10.1007/978-90-481-8826-0_9,

Keywords Collective action • Common property regimes • Decentralization • Development projects • Legitimacy

Introduction

In many parts of the world, poor rural people depend on the commons – shared resources such as forests, rangelands, or aquatic bodies – for their livelihoods. At the same time, as local and global economies grow ever more interconnected, the demand for natural resources, including for those resources that are managed collectively, grows ever more intense. Understanding common property regimes, i.e., the systems and institutions through which access to shared natural resources is governed, is critical to ensuring that these resources are used in equitable and sustainable ways. With an estimated five billion hectares of natural resources – more than one-third of the world's land area – managed through such tenure regimes, the significance of the commons cannot be understated (ILC 2008).

A large body of literature provides examples of the equity, efficiency, and sustainability functions of common property regimes, and how access to resources via common property can sustain and even enhance the livelihoods of rural people (Di Gregorio et al. 2008; Meinzen-Dick et al. 2006; Ostrom et al. 1994). The social, economic, political, and environmental contexts in which these regimes operate, however, are rapidly evolving, placing new and increasing pressures on common property systems. In light of this reality, in 2005 the CGIAR's Collective Action and Property Rights Initiative (CAPRi) and the International Land Coalition (ILC) reached out to their respective networks that comprise a diverse set of researchers, practitioners, and organizers, in order to collect snapshots of how the commons are being managed and – perhaps most importantly – whether and how common property regimes are adapting to meet the challenges of their changing environments.

This chapter presents findings from this effort, based on a synthesis of 41 case studies that were contributed from 20 countries in Africa, Asia, Europe, and Latin America (Fuys et al. 2008). These studies, written from both local and national perspectives, considered a diversity of resources including forests, rangelands, and fisheries. While the resulting synthesis of these cases is broad, its intention is to serve as a starting point for drawing out patterns and emerging concerns with regard to the broader goal of securing access and rights to resources through common property regimes. Just as this volume's title, *Beyond the Biophysical*, calls attention to the institutional foundations of environmental management, this chapter seeks to illustrate one of the most fundamental of institutional factors shaping natural resource management – property rights and tenure regimes, and the multiple sources of legitimacy that underlie these systems.

In this chapter, we highlight a variety of sources of authority for common property regimes, and illustrate the different ways through which individuals and groups gain access (and rights) to natural resources that are shared or held in common. We begin by reviewing key concepts from the literature on common property regimes, and briefly outlining the methods used in this cross-country, cross-resource synthesis. This is followed by a second section, which discusses customary rights. The third section considers statutory law as a direct source of access, while in the fourth section the role of state reforms such as ongoing trends in decentralization is addressed. Projects as sources of access are considered in section five. In all these sections, the factors that hinder effectiveness of common property institutions are illustrated and examples from case studies are provided.

Overview of Key Concepts

Property rights have been defined as "the capacity to call upon the collective to stand behind one's claim to a benefit stream" (Bromley 1991; Meinzen-Dick and Di Gregorio 2004). In the context of natural resource management, these rights are the basis for individuals, families, or groups to access, extract, manage, exclude others from, or transfer (e.g., through sale, lease, inheritance, or other forms of disposal) given resources (Hess and Ostrom 2003; Meinzen-Dick et al. 2005). In other words, they underpin the actions that people take, individually and collectively, to benefit from the resources in their surrounding natural environment.

Tenure systems are the institutions – legal, social, political – that define and manage how these resource rights are distributed and enforced within a given society. Tenure systems are often grouped into four main categories, namely: (1) public (state ownership); (2) private (individual or corporate ownership); (3) communal; and (4) open access (collective tenure without institutions to regulate access) (FAO 2002). While this categorization oversimplifies the great diversity of tenure systems, this chapter largely focuses on examples that would fall under the third category, as common property may be considered "a formal or informal property regime that allocates a bundle of rights to a group" (Hess 2006).

The term *common property regime* represents a set of institutions, regulations, and management practices subject to collective decision-making. In this sense, it refers to the kinds of tenure institutions that exist, not the resources themselves (Dietz et al. 2002). By comparison, the term *common pool resource* (also referred to as CPRs) refers to natural resources whose physical characteristics or economic uses make individual ownership or control difficult.

It is important to note that while common property regimes are defined primarily in terms of collective rights, they may also represent a range of different rights for both individuals and groups such as access, withdrawal, management, exclusion, and alienation (Schlager and Ostrom 1992). As the case studies illustrate, these multiple rights to the same resource may also be exercised differently at different times and often by different actors. Examples include postharvest access to farm fields by herders, the breakdown of territorial borders among the Karamojong of northern Uganda during wet seasons, access to individually-controlled fruit trees by other community members during the dry season in Muzarabani District, Zimbabwe, and collection of bamboo by upland residents on individually-owned lowland farms in northern Thailand. In some cases there is a distinct spatial element, such as when fallow land adjacent to private farmland is treated as individual property, while contiguous land in fallow is treated as common property. The shifting nature of rights over time and space is captured by the "tenure niche" concept (Bruce 1995). In one case from Ethiopia, the author identifies the existence of "fuzzy access rights," in which hierarchies among different users are reflected in asymmetrical access rights, i.e., primary, secondary, and tertiary rights to use rangeland and water that may vary depending on social and ecological circumstances (Aredo 2005a).

Property regimes are also distinct from property ownership. Thus, common property regimes are not synonymous with *communal tenure*, which refers more broadly to community-based tenure systems, in which some form of collective authority (e.g., an extended family, clan, or other social grouping) holds allocation rights (Bruce 1995). Resources under communal tenure may, in practice, be used and controlled individually or collectively (Otsuka and Place 2001). Within communal tenure, some portion of land and resources may be managed as common property, as was depicted in a number of the case studies.[1]

Our focus on the property rights systems that govern the commons is deliberate, and selected for several reasons. First, unambiguous and secure property rights are thought to provide incentives to individuals and groups to manage resources sustainably and also to reap the benefits of their investments. Studies from different parts of the world are increasingly demonstrating the link between rights to the commons and resource sustainability (see Agrawal 2001, for a review). Similar work increasingly reveals how common property regimes may improve rural livelihoods by securing household and community access to common pool resources for consumptive use or for sale (see Meinzen-Dick et al. 2006, for a review).

Second, and equally significant, many of the world's natural resources, such as fisheries, wildlife, rangelands, or forests, can be classified as common pool resources. Two of the defining features of common pool resources are the difficulty of exclusion (i.e., limiting potential beneficiaries from using/benefiting from a resource, either through physical means such as fencing or by imposing social restrictions) and their substractability (i.e. one person's consumption of a resource unit makes it unavailable to the next person). Because the nature of the resource makes exclusion difficult, the resource may be overwhelmed by multiple users, including unauthorized ones. Because they are substractable, there is often competition for use and access. Common pool resources thus face the problems of sustainable management and use, which have often been illustrated in an exaggerated fashion by the "tragedy of the commons" metaphor (Hardin 1968). Where common pool resources do exhibit rapid degradation from overuse, it is generally due to the

[1] In Segun Guillermo Valera, a *campesino* community in Peru, common-use land managed as common property makes up 79 percent of the community's total area, with the remaining 21 percent managed by individual families (Burneo 2005). Similar examples were provided by cases from Cameroon, India, Nepal, South Africa, and Zimbabwe.

existence of an "open access" regime, in which no instruments exist for clarifying tenure or restricting access.

A large body of scholarly work indicates that assigning clear property rights to a common pool resource can assist in mitigating susceptibility to overuse and the likelihood of under-provision[2] that is so widespread in the use of common pastures, fisheries, and forests (Ostrom et al. 1994). Clear designation of property rights under such "restricted access" regimes has been shown to solve the exclusion problem by identifying and clarifying the "owner" of the resource, thereby enabling unauthorized users or nonowners to be excluded. Those with the authority to use the resource then have the incentive to invest in improving that resource (e.g. by delaying extraction or investing in increased productivity), because they anticipate appropriating benefits from the resource in the future. This solves the provision problem. Common property regimes, i.e., institutions for collective management by a well-defined group of owners, are a promising institutional option for the management of common pool resources. In recent years, scholars have demonstrated that where resources users have exclusion rights and are able to devise and enforce their own norms and rules for access, use, management, and maintenance, common pool resources have been managed sustainably (Ostrom 1990).

Methodology

The case studies that were contributed to the initiative in 2005 were based on a study framework prepared by CAPRi and ILC in collaboration with the FAO Land Tenure Service. This approach sought to allow for comparisons of cases across countries and resource-types, and identified two sets of questions related to common property regimes. The first focused at the community level (e.g., kinds of common property tenure arrangements that exist, and their sources of legitimacy), and the second at the level of national laws and policies (e.g., whether laws recognizing common property systems exist, and if so whether and how they are implemented).[3] An electronic discussion forum on the commons involving case study authors and other participants also took place as part of this initiative and generated additional input that has been incorporated into this chapter.

[2] Under-provision here refers to potential overconsumption, i.e., where individuals or households that access the commons consume resources at a level that is less than optimal for the group as a whole. This reflects the challenge set forth in the Prisoner's Dilemma, in which the absence of norms to govern resource consumption within the group provides a negative incentive to individual users to overconsume, because they have no assurance that other individuals will not also overconsume. Common property regimes address this challenge by establishing norms and enforcement mechanisms that prevent overconsumption, allowing group members to instead use resources at a level that would be optimal for the group as a whole (see Ostrom et al. 1994, pp. 9 and 61).

[3] The complete framework, as well as the case studies which were contributed, is available at www.landcoalition.org (Fuys et al. 2008).

Common Property Regimes and Resource Access

The case studies indicated a number of ways through which access to the commons may be determined, including through group membership, formal permission granted by the state, organized community action, or (increasingly) through natural resource management projects. Customary law and practice continues to be the most common source of legitimacy for these access rights, although in some countries discussed in the cases, state legal frameworks also recognize collective resource rights.

Access Through Customary Institutions

Customary law and practice forms the basis of group tenure and collective resource management in many parts of the world. According to a recent UNDP discussion paper, more than 90% of the rural population in Africa – a significant portion of which would be considered resource-poor – accesses land and natural resources via customary tenure systems (Wily 2006). Many cases demonstrate the authority of customary institutions in the regulation of common property regimes. In at least 28 of the 41 cases contributed to this study, there are indications of some level of reliance on customary authority (both with and without state support) for regulating access to forests, fisheries, and lands that are managed through common property systems.

Customary systems generally have a collective element to resource management, e.g., forms of group decision-making that determine access and use rights of individuals, or joint use and management of resources in common areas. In at least 14 of the cases, rights to access the commons are based on some form of group membership, including ethnicity, village affiliation, or residency. In some cases, outsiders are excluded from accessing the commons under all circumstances. In others, exclusion of outsiders is a seasonal condition, such as in pastoralist settings where exclusion may occur in either the dry or rainy season. A few cases described the flexibility of customary authorities to negotiate access with outsiders, such as migrant farmers.

One common factor in customary-based common property regimes, according to the cases, is the significant role that group identity plays in managing access to land and resources. Group identity can be conferred in different ways, often based on lineage, clan affiliation, or long-term residency. In the case study from India's Meghalaya state, rights to communal lands are derived through residency, which is itself a function of clan affiliation. Land and resource allocation and distribution is governed by recognized customary institutions and is often restricted to members who share a common lineage. The rights of constituent families or individual members are recognized and allocated on a long-term basis, with limitations placed on land transactions. Transfer is limited to inheritance within families and no sales are allowed – particularly to outsiders. The duration of rights is often determined by evidence of continuous use (Kumar and Nongkynrih 2005).

Lineage-based access to the commons was most commonly described in cases from Africa – e.g., Cameroon, Ethiopia, South Africa, and Zimbabwe (Mbog 2005; Unruh 2005; AFRA 2005; Mgugu 2005) – but also in studies from India, Peru, and Scotland (Kumar and Nongkynrih 2005; Guzman 2005; Seki 2005).

Beyond providing the basic rules that determine who can access what resource, when and with what responsibility, customary institutions provide the foundation for norms of reciprocity among subsets of users having authorized access to resources. Land access in pastoralist areas of Ethiopia is cemented by reciprocal social practices, e.g., exchange of milk and animals for land access, or "bond friendship" in which households keep cattle on their land on behalf of herd owners, in exchange for keeping a portion of livestock products (Aredo 2005a). In some cases, this mutual exchange has such a long tradition that the livelihoods of different family groups have become highly interdependent.[4]

Customary institutions may also provide authorization for access to the commons by noncommunity members. Because of the connection of common property rights to ancestral or lineage-based claims, migrants and other newcomers may face difficulty gaining access to land and other natural resources. In the Chabe community of Benin, migrant farmers and herders have gained access to common land following negotiation with the *agani*, family groups which are native to the area and who control decisions on land allocation. Migrant farmers were allowed to borrow land from the Chabe lineages, while transhumant herders were provided with areas for seasonal settlement. However, any interventions on the land that may confer more permanent rights, such as tree planting, are restricted from pastoralists and migrant farmers. Implementing negotiated agreements is difficult, however, in part because of different concepts of land rights held by migrant farmers and pastoralist herders, creating the need for *agani* to facilitate negotiation between the two groups (Dangbégnon 2005).

How do customary institutions manage access to resources via common property regimes? As described in the examples above, *group identity* and *respect for customary authorities* may play a role in deterring violations of collective tenure arrangements. Compliance is more often than not based on collective respect for local authorities, more than the possibility of punishment for infringements. However, among Somali pastoralist communities where clan affiliation is strong, grazing rights are also enforced via collective guilt and group deterrence (Unruh 2005). The practice of collective (clan) guilt as opposed to individual guilt and responsibility for infractions, along with the threat of punishment and retaliation by opposing clans, helps to leverage collective responsibility against rule infractions by any given clan member. In other examples, such as the case study from Saigata village in India, material sanctions serve to enforce the collective interest.

[4] Reciprocity was also evident in a study of irrigation as common property in Japan, even though the common property institutions in this case were based on a statutory framework rather than customary laws. Among Japan's collective irrigation associations, rules concerning common water resources are rarely violated, in part because reciprocity and group identity are strong norms in rural Japanese society (Sarker 2005).

Village forest committees set fines that are "graduated" (adjusted in severity) to fit the nature of the offense (Ghate 2005).

Religious norms and beliefs also play a role in ensuring adherence to rules governing the commons. In several cases, use and access to the commons is restricted by local religious institutions, both in terms of kinds of use (such as prohibitions in northern India on collecting leaves in the spring season) or where resources may be accessed (such as the delineation of sacred forests in the Halimun area of West Java, Indonesia, and in the Himachal Himalaya region of India) (Galudra 2005; Santosa et al. 2005). Violation of religious norms can cause an individual to be shunned, with social and/or economic consequences.

Dialogue between groups is also fundamental in establishing rules and resolving conflicts. In the Chabe case from Benin, local leadership encouraged different groups staking claims to the resource to negotiate boundaries, which has led to an agreement and peaceful coexistence of hunter and herder groups in the area (Dangbégnon 2005). Among the Karamajong cluster in Uganda, dialogue between the elders of different groups allows them to define rules for conflict management. However, more and more pastoralists ignore the rules and decisions agreed under customary systems, contributing to an increase in armed conflict (Mwebaza 2000).

Within customary-based common property systems, balancing the rights of the individual and the group in an equitable manner may be a challenge. While group rights may serve to protect the rights of the group as an entity, women's rights or the rights of lower castes may be constrained. Women's access to the commons is often indirect, through male relatives, i.e., husbands or sons (see, for a Kenyan example, Karangathi 2005). This form of secondary access may serve to protect and maintain rights for women (albeit restricted) under two conditions: (a) as long as they are married and their husband is alive, and (b) for as long as the land managed as common property is not individualized.

At least eight case studies identified the loss of influence on the part of customary institutions as a source of pressure on common property regimes. In some, such as Zimbabwe, customary systems for natural resource management are not legally recognized by the state. The Communal Areas Forest Produce Act of 1987 allows only limited use of forest products for subsistence purposes, restricting use for economic benefit, and there is little in the existing legal framework that supports community control and/or management of land and land-based resources. This illustrates how pressure on common property regimes may be rooted in the imposition of statutory law at the expense of customary institutions. This case reflects the challenges presented when, as is often the case, customary systems have little or no legal standing relative to state-backed systems. This creates difficulty for resource users to defend their rights to the commons as established under customary tenure, particularly if other groups or interests – such as commercial entities that seek to develop land or exploit natural resources, or state institutions that seek to conserve resources or make them accessible to tourism – bring forth resource claims that have backing under state law. Such claims are made by both private actors (individuals and commercial entities) and state agencies, and contribute to legal or *de facto* privatization of the commons.

Common Property Regimes and Roles of the State

In 14 cases, or about one-third of the total, the state plays some role in supporting or recognizing access to resources held under common property regimes. Only in some of these cases, however, do statutory laws exist that explicitly recognize common property regimes. Japan, Peru, Scotland, South Africa, and Uganda are among those that do. In other cases, forms of state action (often informal) have taken or are taking place which provide some degree of state recognition of common property regimes. At least 11 case studies proposed that further reforms be undertaken, in order to provide a legal and policy framework that is more supportive of common property regimes.

In the statutory legal systems described in the case studies, written titles are the most common form of proof of land rights. In some countries, though, there are now laws that allow for certification of communal property, through which the common property rights of community associations are recognized. In Scotland, the 2003 Land Reform Act similarly provides for communities of small-scale farmers known as “crofters” to make collective purchase of land that has been cultivated under customary practice (Seki 2005). Uganda’s 1998 Land Act provides a framework for group ownership, including a process to form and register Communal Land Associations (Obaikol 2005). This does not mean, however, that resource users necessarily manage communal land as common property; communal titles may be provided for land that is, in practice, individually used and managed. Within these communal lands, individuals have also established their separate parcels, in accordance with customary law and practice.

Some statutory laws recognize collective rights, but only of certain groups or in certain areas. In India, the Recognition of Forest Rights Act, passed in 2006, provides state protection for ownership rights of tribal communities (Ghate 2005). In 1997, the Philippines passed a similar bill, the Indigenous Peoples Rights Act, which recognizes the rights of indigenous communities to ancestral lands and provides a framework through which these land claims may be registered with the state.[5]

In several cases, under statutory law forest land is the property of the state or the nation (e.g., India, Indonesia, and Niger). Local residents may not have state-recognized ownership rights to forest land or other forest resources under these systems, but only usufruct rights (i.e., the right to access the collectively owned land and use resources for individual benefit) and, in some cases, management rights. In practice, as the cases from Indonesia and Niger illustrate, there may be space for negotiation between communities and the state to establish rights claims and make them more secure (Bachir et al. 2005; Galudra 2005; Santosa et al. 2005). Alternatively, as described in the case from India’s Orissa state, an “assumed” or *de facto* commons develops in which communities use and manage lands as com-

[5] For more information on the Indigenous Peoples Rights Act and its implementation, see www.pafid.org, www.tebtebba.org and www.ncip.gov.ph.

mons so long as government agencies remain inactive in the management of areas under state tenure (Singh 2002). In some of these cases, the state may create forms of rights for local communities through pieces of legislation, although these stop short of providing a legal framework for recognizing resources managed as common property nationwide.

Joint Forest Management in India represents a longer term effort by the Indian government to grant and provide statutory backing for local forest users. Under these programs, local committees are registered as trusts and thus become officially recognized bodies. This is intended, at least in principle, to benefit forest resource users by allowing them to receive support services from the government and participate in benefit-sharing. However, communities' enthusiasm for joint projects with government is often colored by a general distrust of forest departments (see also Chapter 8). In the case from Saigata village, even though the state forest department had instructed all divisions to implement joint forest management, it took 4 years of negotiation between the forest users' group and the forest department before communities succeeded in registering their committees. In some cases, state authorities may also act to the benefit of local actors by placing constraints on customary social inequities. In this case, it was not until the state intervened that women were provided an opportunity to participate in Joint Forest Management council meetings (Ghate 2005).

State action of a different kind played a key role in recognizing collective rights in Guatemala, where in 1984 the government established agrarian communities as a counter-insurgency move. In this case, farmers' cooperative associations (*Empresas Campesinas Asociativas,* or ECAs) were created by government. Initially, the government sought to control ECA leadership and disassociate them from communities, leading to corruption within the associations. Five years later, in 1989 – a time of political change in the country – a new ECA was formed by local farmers in the Santo Domingo municipality. A more genuinely community-based (i.e., bottom-up) approach has helped address farmers' land access problems, including use of common-pool forest areas that were managed as part of the communal tenure system, and also has supported collective sales and actions to improve farmers' market strength (Vay Ganon 2005).

State actions are also contributing to some of the pressures on common property regimes. Policies around natural resource tenure have not been exempt from the global trend to promote economic liberalization, creating pressure for the privatization of land and other natural resources. In Botswana, national agricultural and rural policies since the 1970s have resulted in the privatization of tribal communal lands and concentration of pastoral resources in the hands of the wealthiest cattle owners. While cattle herders lost access to common pasture lands through these processes, there is no evidence that rangeland management has improved following privatization policies. Environmental pressure on pasture resources has continued to rise as privatization reduces the land area available for common grazing (Taylor 2005). This results in a net decrease in environmental sustainability as a whole, with the privatized commons not yielding any net gains, and the remaining "common" commons facing greater environmental stress. Thus, while the resulting degradation of communal pastures may be taken as evidence that privatization is necessary, these environmental outcomes are actually rooted in the initial privatization of the commons. In addition to undermining environmental sustainability, this action resulted in larger areas of grazing land concentrated in the hands of fewer users.

In several case studies, ambiguity in national laws and policies was identified as a pressure on common property regimes, in the sense that it creates room for competing claims to resources, and the involvement of (and competition between) multiple state institutions in recognizing these claims or in directly managing resources. In four case studies, state-led conservation efforts have increased conflicts over natural resources and undermined existing systems to manage resources as common property, such as through the creation of national parks and forest reserves which have removed large tracts of common areas from prior users and vested control and ownership in state agencies.

Devolution and Decentralization

Beyond recognizing local use and creating minimal usufruct rights, the case studies indicate that the devolution of state functions to lower administrative units and, in certain cases, to communities is impacting common property regimes. Some cases illustrate how this form of state action, often in collaboration with local users, can serve to strengthen the rights of local communities and the basis for their organizing to manage the commons, including enhancing their accountability to different groups of resource users. Other cases identify aspects of decentralization that may weaken common property regimes, particularly when the commons are managed under customary law and decentralization occurs via state action without adequate involvement of customary institutions.

Under state-sponsored devolution and decentralization programs, such as those in Burkina Faso, Ethiopia, Mali, Niger, and Uganda, specific legislation recognizes local management groups, committees, or councils and accords them rights to use and manage the resource base (Bachir et al. 2005; Hamadoun 2005; Obaikol et al. 2005; Unruh 2005).[6] Under its Ethnic Federalism policy, the Ethiopian government allows local customary authorities to assume a stronger role in managing conflicts over common lands (Unruh 2005).[7] Afari leaders are able to draw on the support of

[6] In this chapter, decentralization refers to the delegation of state powers, such as the authority to establish laws or generate public revenue, to local government. Devolution refers to the transfer of rights and responsibilities from central government to community-based institutions, such as resource user associations (see Ribot 2002).

[7] "With the change in government in Ethiopia in 1991, the country has pursued an 'ethnic federalism' approach to governance whereby administrative boundaries (Regions) were redrawn along broad ethnic lines … While the current Ethiopian constitution indicates that all land belongs to the state, much power has been given over to these ethnic regions to govern their own affairs … The constitution also gives the regions the power to recognize customary dispute resolution mechanisms" (Unruh 2005, p. 3).

the national government for this effort, which has included the establishment of special committees to mediate land disputes.

Decentralization may weaken commons management by establishing a parallel local administrative structure whose authority undermines customary institutions. In Zimbabwe, the 1998 Rural District Councils Act confers natural resource management powers to rural councils – functions formerly carried out by local chiefs. This has contributed to the decline of customary institutions for managing the commons, leaving chiefs no legal power to create and enforce rules on natural resource management in communal lands. These powers now rest with the Rural District Councils, who can make decisions without consulting the chiefs. In Muzarabani, even low-level leaders from the Village Development Councils or councilors can challenge a chief's authority. Nonetheless, people have continued to apply customary regulations, although in a very limited way (Chidhakwa 2005).

By contrast, decentralization in Thailand has empowered local government authorities but without reducing the authority of existing village institutions to manage community resources (Kijtewachakul 2005). The Sub-district Administrative Organizations have the ability to tax land where *sor-por-kor* (a form of state-recognized land certificate) exists and to manage a budget for forest conservation activities. Sub-district Administrative Organizations also allocate individually managed cropland. Village committees retain the authority to mediate and negotiate land access among villagers, particularly lands that are used for shifting cultivation.

Access Through Projects

In at least three cases, state-sanctioned wildlife or conservation projects in national parks or forest reserves provide opportunities for communities to negotiate agreements with their governments to improve tenure security. One common element of these cases was the involvement of international organizations in the funding and/or implementation of these initiatives.

In Thailand, the implementation of the Upper Nan Watershed Management Project (a collaborative initiative between the Danish and Thai governments that began in 1997) has created a channel through which forest resource users can negotiate some recognition of their access and use rights (Kijtewachakul 2005). Through this project, villagers were able to lobby for the zoning of forests to accommodate conservation and utilization areas, thus securing access and use rights to valuable timber and nontimber forest products. The project was able to facilitate this outcome largely by enhancing the bargaining power of communities with the state and by providing the space and opportunity for users to interact with state officials.

Similarly the Takiéta Joint Forest Management Project in Niger (Box 9.1) was initiated by SOS Sahel in 1995, with the aim of promoting processes that would lead to decentralized (devolved) and sustainable management of the Takiéta Forest Reserve, taking into account the needs of different user groups. By the end of the project, the Forest Service signed an agreement recognizing and supporting participatory management of the forest by adjacent communities:

In the Takiéta case from Niger, the forest user *Association Kou Tayani*, working with facilitators of the Takiéta Joint Forest Management Project, outlined a process to identify resources, exchange information with other user groups, convene multi-stakeholder forums to determine common concerns and approaches, and to elect representatives from among different users to serve on a commons management group. Over a five-year period, these processes – which were made possible in the first place through the state's agreement to devolve natural resource management – helped to bring about changes in social relations and improve the ability of user groups to manage and resolve conflicts over the commons (Bachir et al. 2005).

Box 9.1 Developing an autonomous common property regime in Takiéta Forest Reserve, Niger (Bachir et al. 2005)

Takiéta Forest Reserve was created in the 1950s and was theoretically owned, managed, and protected by the government of Niger. Over time, the reserve was subject to uncontrolled exploitation by local people and outsiders, with unchecked and rapidly expanding agricultural clearance taking place at the boundaries of the forest and in the forest itself. In addition, pressure on the rapidly dwindling and degraded pastoral resources within the reserve was increasing as sedentary populations diversified into livestock production (bringing them into increased competition with transhumant pastoral groups). This *de facto* open access property regime (through state ownership yet absence of management and exclusion) was also threatened by an influential local "dereservation lobby" aiming to privatize the land for individual profit.

The Takiéta Joint Forest Management Project (TJFMP) was set up in 1995 at the request of the Government of Niger. Its mandate was to promote a process leading to local sustainable decentralized management of the Takiéta Forest Reserve, taking into account all the different user groups and drawing lessons from the experience. Since Takiéta forest had officially been set aside by law as a reserve, the starting point for management was one where only usufruct rights were officially accorded to local people. However, with the project, a *carte blanche* had been given by the government to come up with new forms of management to be decided by all the various actors. The process followed at Takiéta evolved as a series of steps that took place between 1997 and 2000, the outcomes of each step defining the next step to be taken. These included:

- Clear identification of the resources concerned and all direct and indirect stakeholders.
- Analysis by different stakeholder groups of the natural resources and the role that they play in their system of production (actual, historical), and assessment of current forest management challenges and their causes. These views were shared among all groups to build a common information base.

(continued)

Box 9.1 (continued)

- Multistakeholder workshops brought together around 200 of these groups' representatives to debate options and identify governing principles of shared resource management, including a process for organizing a management body, the Local Management Structure (LMS).
- Election of delegates to the LMS, which was carried out internally within each stakeholder group according to criteria agreed upon in the stakeholder workshops.
- Preliminary gatherings of LMS delegates to enable them to get to know each other, share information and plan.
- Information regarding the natural resources and their use potential was collected using local inventory methods and base maps, analyzed and shared. An exhaustive list of forest users and uses was produced. Options for improving the resource were identified and a management plan drafted.
- Formal and informal links were established and reinforced by the LMS, through a series of visits to local authorities, government services, and other partners, including pastoral associations.
- Presentation of the proposed management document to all stakeholders for review and amendment.
- Formal recognition of the LMS by the state as the *Association Kou Tayani*, with a mandate to manage the Forest Reserve.
- The management document was presented to the regional authorities to request legal recognition to execute their management plan; by the time the project came to a close, 6 months of autonomous management had taken place.

LMS members have subsequently continued to hold regular meetings, make decisions, plan, budget, and carry out numerous activities (such as local seedling production and planting, pasture improvement, soil and water conservation) in the area in collaboration with the local population, which regularly mobilizes itself behind the association on a voluntary basis. Development of the resource in terms of honey production, fishing, and the creation of rural fuelwood lots has also taken place.

Projects have played a similar role in Nepal, where the state claims ownership rights to forest areas. Through a partnership with the International Fund for Agricultural Development (IFAD), the Nepali government now leases forest lands to community groups, targeting the poor, women, and the disadvantaged. In this case, with the support of an international development project, the state has recreated group rights in areas where common forest lands previously existed and are still recognized by local residents (Shrestha 2005; see also Chapter 8).

As will be discussed below, state-driven conservation may also be an obstacle to strengthening common property regimes, particularly where there are no channels for communities to participate in projects and for local tenure systems to be recognized and incorporated. While the positive examples were few, they nonetheless illustrate how state action and projects may, with appropriate design, interface to create more secure tenure and access opportunities for local communities to manage resources as common property.

Community Action and Common Property Regimes

Community-based organizing may also be a means to strengthen access to the commons, particularly when commons are under threat. Indeed, community organizing is one of the most common forms of response to pressures and threats to the commons (Box 9.1). Some form of collective action was discussed in nearly half of the case studies. Collective action is often driven by a desire to adapt and create more supportive local arrangements, including the renegotiation of power arrangements between communities, the state, and other actors. The link between collective action and community empowerment is seen most clearly in cases where common property users face external competition for resources (as in the cases from Indonesia, Peru, and Scotland) (Galudra 2005; Guzman 2005; Seki 2005). In addition to increasing the leverage and collective strength of communities, collective action may contribute to adaptations and innovative approaches to addressing specific challenges, through socioeconomic innovations, environmental innovations, or – as discussed in the previous section – mechanisms for conflict management.

Systems of common property may emerge through organized action by communities, either for management and regulation of resource use or for defending the resource from unwarranted incursion. In Saigata village, in the interior of India's Maharashtra state, the self-organization of a forest users' association in the 1970s in response to deteriorating forest condition established clearer rights and responsibilities to common forests (Ghate 2005). Active collective management of forest resources has prevented resources from being treated as open access, which was in turn facilitated by strong leadership from within the community:

> In this case the growing denudation of the forest disturbed Mr. Suryabhan Khobragade, a resident of Saigata … He had witnessed the changes in land-use patterns since the days of the '*Malgujar*,' when he was working for him as child labor. Between 1955 and 1975, the forest around Saigata had changed from thick canopy forest to degraded land. Yet, he was also aware of the fact that it would be difficult to dissuade fellow villagers from giving up their income generating pursuits without offering them an alternative. After many discussions with like-minded people in the village, it became clear that asking fellow villagers straightforwardly to stop anti-forest activities would not yield the required response. Instead, something positive needed to be done circuitously, to bring the community together … Community action first began by setting up a '*krishak charcha mandal*' (farmers' discussion group), where a majority of the farmers shared his concern about the deteriorating condition of the forest as it had resulted in a scarcity of fuel wood and fodder. After many rounds of discussions, it was thought that a plan was needed to start the process to rejuvenate the forest. Mr. Khobragade initiated an effort to first identify the dependence of each household on forests (Ghate 2005: pp. 3–4).

This process led to the establishment of a local forest protection committee, which is now elected by the forest users' association. The committee has taken steps to make common property rights more secure through more sustainable use of the forest. It established, for example, different forest zones and regulations such that harvesting could take place in one zone, but not in all zones simultaneously. Uses were also restricted: in one zone, fresh wood cutting was prohibited, while another was set aside for cutting grass to use as fodder (Ghate 2005).

In Laid village in Scotland and among *campesino* (smallholder) communities in Peru, proposals for mining exploration on customary lands led to self-organized community mobilization (Seki 2005; Burneo 2005). In the case from Peru, poverty rates are higher where mining takes place: 50% and 77% higher in the two regions of the country where gold production is highest. According to the law, *campesino* communities are not able to oppose concessions but they may receive compensation if they are unable to work on their lands during the exploitation of mineral resources. In recent years, this situation has pushed communities to organize themselves in defense of collective rights in the face of threats and conflicts posed by mineral exploration, through demonstrations and confrontations with mining enterprises, in an effort to push these companies to take more seriously the concerns of local residents (Burneo 2005). In this sense, the existing tenure institutions provide a vehicle for collective organizing by land users, through which they may reassert and, potentially, redefine their rights *vis-à-vis* those claimed by other potential users.

Collective action is also taking place in Indonesia with communities reclaiming common lands that lie within national park space, often working together with nongovernmental organizations (Galudra 2005). In West Kalimantan, Indonesia, the NGO-facilitated Community Forestry Strengthening Program (*Program Pemberdayaan Sistem Hutan Kemasyarakatan* – PPSHK) has complemented local collective action, such as community mapping, with an advocacy campaign in the provincial capital. In the absence of a statutory framework that recognizes indigenous rights to land and territory, this combination has provided some improvement in tenure security for commons' users via informal agreements between communities, their NGO partners, and provincial officials. These examples demonstrate how collective action by communities, including that undertaken in alliance with supportive outside organizations, can contribute to expanded or more secure access to resources – or to compensation when resource rights are lost.[8]

Discussion

The examples presented in the case studies reinforce the existing literature that identifies access to resources via common property as a means of sustaining and even enhancing rural livelihoods and, under the right set of conditions, enabling

[8] For more information on PPSHK's activities in West Kalimantan, see www.jeef.or.jp/EAST_ASIA/indonesia/PPSHK.html, www.landcoalition.org/partners/ppppshk.htm.

sustainable management of natural resources. Many rural men and women rely on diverse products from the commons for subsistence, including during lean times. The cases which focus on land access by pastoralist communities suggest that access to the commons is particularly crucial for pastoralists, for whom food security is primarily, if not wholly, dependent on access to seasonal pastures and water sources spread over large areas (Unruh 2005; Aredo 2005a; Aredo 2005b). Privatization of rangelands, such as through establishing individual leaseholds or ownership, has been shown to decrease pastoralists' mobility and ability to negotiate access to neighbors' pastures and water sources – something which is crucial to livelihood security and sustainability in areas of low and unpredictable rainfall (Ngaido and McCarthy 2005). In addition to threatening pastoralists' livelihoods in the short run, over the long term this trend toward individualization of grazing lands is also weakening the customary institutions that govern common pool rangelands. This can further accelerate their transformation from commons into private tenure, with disputes over land access often emerging in the process (Ngaido 2005).

The incentives of governments with regard to securing common property rights, as described in many of the cases, are mixed. Most governments have a strong incentive to generate revenues through commercial-scale extractive industries or nonconsumptive use such as conservation and tourism, rather than devolved resource management. Loss of the commons may be a by-product of government efforts to harness revenue from natural resources, which often include efforts to install a system of property rights (usually private, individual) suited to investors. In several cases, however, community organizing has successfully thwarted top-down, external appropriation of the commons.

Customary systems remain an important authority backing and enforcing access to the commons. There are fewer instances where state legislation is the main source of legitimacy for common property rights, in part because numerous countries still lack legal frameworks to recognize common property regimes. Customary systems for governing common property can remain vulnerable when they are not recognized by the state, particularly when governments take actions or establish policies that undermine the authority of customary institutions.

While customary systems are often inclusive of groups and individuals that are not necessarily "members" as long as non-members willingly abide by locally established rules of access, they may also fall short of being representative of the interests of all relevant community members. These are key issues to consider when evaluating options to improve tenure security within common property regimes, particularly the security of access rights for vulnerable groups and poor households. Capacity-building activities with resource user groups, such as those described in the cases from Takiéta Forest in Niger or Saigata in India, can help to address this issue (Bachir et al. 2005; Ghate 2005).

Meanwhile, the state can create, encourage, or sustain community rights and access to resources in various ways. National legislation to recognize common property rights is one means, but not the only state action being observed. Through a process of decentralizing authority and rights to resource users, states may provide a basis for creating and strengthening common property regimes. By mandating joint management, the state also legitimizes local use. However, access created through state programs can also pose challenges. While having the potential to strengthen common property regimes and secure the rights of women and the poor, there is the risk that decision-making and benefit flows may be captured by more influential groups.

The literature on decentralized natural resource management has illustrated how governance reforms may create opportunities for elite interests (government or private) to assert control over natural resources or resource rents (Bigombé Logo 2003; Colfer and Capistrano 2005). Resulting ambiguities in cross-sectoral legislation, and in the roles and responsibilities of local and customary authorities, has also resulted in further insecurity for the commons. These contradictions have in some cases created tension between local bodies and the state, despite state recognition of local rights. Depending on the role played by the state, the government can in some cases create opportunities that would otherwise not exist for the poor and marginalized to access natural resources.

In some cases, projects involving community associations, NGOs, and/or international organizations are also acting as the basis for common property regimes, with tacit or explicit backing from the state. Partnerships with non-governmental organizations, development project facilitators, and the state can all provide important support to local institutions regulating access to the commons, and facilitate adaptation to pressures and threats facing the commons. When other mechanisms fail to protect local interests, spontaneous collective action can be an effective approach to defend customary rights to the commons. Still, new legislation and policy reforms are needed, in order to support these systems.

While such legal pluralism – i.e., the coexistence of different sets of rules and institutions from which rights and obligations are derived – provides options for expanding access and securing rights to resources, the simultaneous occurrence of multiple layers of authority can also be the source of uncertainty, confusion and even conflict, weakening existing rights and undermining weaker authority systems. This reinforces the importance of carefully evaluating what tenure systems exist, their sources of legitimacy, their content, and how they function to allocate resource rights, in order to identify opportunities for building synergies across these multiple sources of authority to strengthen common property regimes. The challenge of developing and implementing laws and policies that support common property reflects, at least in part, the need to increase the visibility and voice of rural people who depend on the commons for their livelihoods. Increasing not just participation in, but also leverage over, the processes and institutions that determine land tenure and natural resource management policies should be an important element of efforts to strengthen common property regimes.

This summary of research findings on common property regimes points to several recommendations for policy and practice:

1. While more and more countries are developing laws and policies that recognize common property regimes, other sector-specific legislation or policies, or institutional reforms such as decentralization, are often at odds with these normative frameworks. There is a need to identify overlaps and conflicts among laws and policies, in order to minimize conflicts on the ground among different resource users and to ensure that common property systems are not undermined.
2. There should be greater involvement of rural people who depend on the commons in the development of laws and policies related to resource tenure and access, and in the aforementioned efforts to manage potential intersectoral conflicts. Capacity-building of common property users or user associations on organizing and advocacy may be needed, so that resource users are prepared to participate in relevant policy forums from positions of strength and in a well-informed manner.
3. When rules related to resource access and use must be renegotiated for reasons internal or external to the concerned communities, care must be taken to avoid elite capture given the power imbalances that characterize different resource users both within and between groups. Caution must be used when facilitating decision-making, to ensure that all relevant interests are captured and equitably brought into the decision process.

Conclusion

This chapter has aimed to identify trends from a diverse set of case studies regarding access and rights to natural resources through common property regimes. The case studies indicated a number of ways through which access to the commons is mediated, including group membership, through the state, through organized community action, or with the support of natural resource management projects. Customary law and practice continues to be the most common source of legitimacy for the tenure regimes discussed in the cases. In some cases, state laws and policies run counter to customary tenure systems, undermining their authority and weakening their ability to manage and secure continued access the commons. In other cases, state legal frameworks recognize collective resource rights, or other forms of state action explicitly or tacitly legitimize common property systems. This may open new doors to reforms that can close the gaps between statutory and customary law in ways that ensure rural livelihoods and environmental sustainability are not undermined.

The seemingly uphill challenge of developing and implementing laws and policies that support common property reflects, at least in part, the need to increase the visibility and voice of rural peoples who depend on the commons for their livelihoods. As long as communities that manage resources as common property are left out of decision-making, their rights to these resources will be at risk, and the tenure systems through which they manage resources will be threatened.

References[9]

AFRA (2005). *Securing tenure at Ekuthuleni. Case Study submitted for the joint study *Rural common property in a perspective of development and modernization.* Pietermaritzburg, South Africa: Association for Rural Advancement (AFRA).

Agrawal, A. (2001). Common property institutions and sustainable governance of resources. *World Development, 29*(10), 1649–1672.

Aredo, D. (2005a). *Fuzzy access rights in pastoral economies: Case studies from Southern Ethiopia. Case study submitted for the joint study *Rural common property in a perspective of development and modernization.* Addis Ababa, Ethiopia: Addis Ababa University.

Aredo, D. (2005b). *Property rights, customary institutions, and conflict: The case of the southern Pastoral areas of Ethiopia. Case Study submitted for the joint study *Rural common property in a perspective of development and modernization.* Addis Ababa, Ethiopia: University of Addis Ababa.

Bachir, A., Vogt, G., & Vogt, K. (2005). *Cooking stones to extract the juice: 5 years of autonomous common property resources management at Takiéta. Case study submitted for the joint study *Rural common property in a perspective of development and modernization.* Niger: CRAC-GRN/SOS-Sahel.

Bigombé Logo, P. (2003). The decentralized forestry taxation system in Cameroon: Local management and state logic. *Environmental Governance in Africa Working Paper* No. 10. Washington, DC: WRI.

Bromley, D. (1991). *Environment and economy: Property rights and public policy*. Cambridge, MA: Basil Blackwell.

Bruce, J. W. (1995). *Legal bases for the management of land-based natural resources as common property*. Rome: FAO, Forests, Trees and People Programme.

Chidhakwa, Z. (2005). *Local management of indigenous fruit trees as common property in North East Zimbabwe. Case study submitted for the joint study *Rural common property in a perspective of development and modernization.* Zimbabwe: Southern Alliance for Indigenous Resources (SAFIRE).

Colfer, C. J. P., & Capistrano, D. (2005). *The politics of decentralization: Forests, power and people*. London: Earthscan.

Dangbégnon, C. (2005). *Land tenure systems and pastoral resources management in Chabe community, Benin. Case study submitted for the joint study *Rural common property in a perspective of development and modernization.*

Burneo de la Rocha, Z. (2005). *La Propiedad Colectiva de la Tierra: Las Comunidades Campesinas del Peru. Case study submitted for the joint study *Rural common property in a perspective of development and modernization.* Lima, Peru: Centro Peruano de Estudios Sociales (CEPES).

Di Gregorio, M., Hagedorn, K., Kirk, M., Korf, B., McCarthy, N., Meinzen-Dick, R., & Swallow, B.M. (2008). *Property rights, collective action and poverty: The role of institutions for poverty reduction*. CGIAR System-wide Program on Collective Action and Property Rights (CAPRi). Washington, DC: IFPRI (Series: CAPRi Working Paper, no. 81).

Dietz, T., Dolsak, N., Ostrom, E., & Stern, P. C. (2002). Introduction: The drama of the commons. In E. Ostrom, T. Dietz, N. Dolsak, P. C. Stern, S. Stonich, & E. U. Webers (Eds.), *The drama of the commons*. Washington, DC: National Academy Press.

Food and Agricultural Organization (FAO) of the United Nations. (2002). *Land tenure and rural development*. Rome, Italy: FAO.

[9] A "*" before title indicates that the paper was one of the 41 case studies contributed to this initiative and cited in: Fuys A., Mwangi, E., & Dohrn, S. (2008) *Securing Common Property Regimes in a Globalizing World: Synthesis of 41 Case Studies on Common Property Regimes from Asia, Africa, Europe and Latin America*. Knowledge for Change series, #3. Rome, Italy: International Land Coalition (ILC). Available at: http://www.landcoalition.org/wp-content/uploads/ilc_securing_common_property_regimes_e.pdf (Last accessed Feb. 28, 2010).

Fuys A., Mwangi, E., & Dohrn, S., (2008). *Securing Common Property Regimes in a Globalizing World: Synthesis of 41 Case Studies on Common Property Regimes from Asia, Africa, Europe and Latin America*. Knowledge for Change series, #3. Rome, Italy: International Land Coalition (ILC). Available at: http://www.landcoalition.org/wp-content/uploads/ilc_securing_common_property_regimes_e.pdf (Last accessed Feb. 28, 2010).

Galudra, G. (2005). *Land tenure conflicts in Halimun area: What are the alternative resolutions for land tenure conflicts? Case study submitted for the joint study *Rural common property in a perspective of development and modernization.* Bogor, Indonesia: World Agroforestry Centre.

Ghate, R. (2005). *A community case study: Self-initiated forest management in Saigata. Case study submitted for the joint study *Rural common property in a perspective of development and modernization.* Nagpur, India: The Institute for Research and Development (SHODH).

Guzman, W. (2005). *Propiedad colectiva, Zonificación y Ordenamiento Territorial: Estudio de caso en Bosques Inundables de Aguaje (Mauritia flexuosa) en la Comunidad Nativa de Parinari, Loreto, Perú. Case study submitted for the joint study *Rural common property in a perspective of development and modernization.* Peru: Instituto de Investigaciones de la Amazonia Peruana (IIAP).

Hamadoun, M. (2005) *La propriété rurale commune dans la Zone Nord du Mali (Région de GAO). Case Study submitted for the joint study *Rural common property in a perspective of development and modernization.* Mali: Université Mandé Bukari.

Hardin, G. (1968). The tragedy of the commons. *Science, 162*, 1243–1248.

Hess, C. (2006). Definitions. Digital library of the commons. http://dlc.dlib.indiana.edu/cprdef

Hess, C., & Ostrom, E. (2003). Ideas, artifacts and facilities: Information as a common pool resource. *Duke Law Journal*, Vol. 66, pp. 111-145. Durham, NC: Duke University.

International Land Coalition (2008). *Report on IASC 2008: Connecting local experience of global challenges.* Rome: ILC. http://www.landcoalition.org/pdf/08_NCP_08_07_reflections%20on%20IASCP_MT.pdf (Last accessed Feb. 28, 2010).

Karangathi, J. (2005). *A case study on common property tenure system (Kenya). Case study submitted for the joint study *Rural common property in a perspective of development and modernization.* Molo, Kenya: Mau Community Forest Association (MACOFA).

Kijtewachakul, N. (2005). *Common property and complexity of local rights system in Sopsai watershed, Nan Province, Northern Thailand. Case study submitted for the joint study *Rural common property in a perspective of development and modernization.*

Kumar, C., & Nongkynrih, K. (2005). *Customary tenurial forest practices and the poor in Khasi – Jaintia Society of Meghalaya. Case study submitted for the joint study *Rural common property in a perspective of development and modernization.* Delhi, India: Center for International Forestry Research (CIFOR) and North Eastern Hill University.

Mbog, S. (2005). *Reflexion sur la propriété Rurale Commune dans une Perspective de Développement et de Modernisation: le cas du Cameroun. Cameroon: Organisme de Développement, d'Etude, de Formation et de Conseils (ODECO).

Meinzen-Dick, R., & Di Gregorio, M. (2004). Collective action for property rights and sustainable development: Overview. *Collective action for property rights and sustainable development.* Washington, DC: International Food Policy Research Institute (IFPRI).

Meinzen-Dick, R., Mwangi, E., & Dohrn, S. (2006). Securing the commons. *CAPRi policy brief 4*. Washington, DC: International Food Policy Research Institute (IFPRI). http://www.capri.cgiar.org/pdf/polbrief_04.pdf.

Meinzen-Dick R., Pradhan, R., & Di Gregorio, M. (2005). Understanding property rights. In E. Mwangi (Ed.), *Collective action for property rights and sustainable rangeland management* (pp. 3–4). Washington, DC: International Food Policy Research Institute (IFPRI).

Mgugu, A. T. (2005). *Rural common property in a perspective of development and modernisation: Case from Zimbabwe. Case study submitted for the joint study *Rural common property in a perspective of development and modernization.* Zimbabwe: The Platform on Women's Land and Water Rights in Southern Africa (WLWRSA).

Mwebaza, R. (2000). *Land rights of the Karamajong pastoral minority in Uganda. Case study submitted for the joint study *Rural common property in a perspective of development and modernization.* Kampala, Uganda: Uganda Land Alliance.

Ngaido, T. (2005). Can pastoralist institutions perform without access options? In: E. Mwangi (Ed.), *Collective action for property rights and sustainable rangeland management* (pp. 9–10). Washington, DC: International Food Policy Research Institute (IFPRI).

Ngaido, T, & McCarthy, N. (2005). Institutional options for managing rangelands. In E. Mwangi (Ed.), *Collective action for property rights and sustainable rangeland management* (pp. 13–14). Washington, DC: International Food Policy Research Institute (IFPRI).

Obaikol, E. (2005). *Common property resource management in Uganda: The Legal and institutional framework. Case study submitted for the joint study *Rural common property in a perspective of development and modernization.* Kampala, Uganda: Associates for Development.

Obaikol, E., Kamusiime, H., & Rugadya, M. (2005). *Rural common property resources management in Uganda: A case study of community Forest Management in Budongo – Masindi District. Case study submitted for the joint study *Rural common property in a perspective of development and modernization.* Kampala, Uganda: Associates for Development.

Ostrom, E. (1990). *Governing the commons: The evolution of institutions for collective action*. Cambridge: Cambridge University Press.

Ostrom, E., Gardner, R., & Walker, J. (1994). *Rules, games and common pool resources*. Ann Arbor, MI: The University of Michigan Press.

Otsuka, K., & Place, F. (2001). Issues and theoretical framework. In K. Otsuka & F. Place (Eds.), *Land tenure and natural resource management: A comparative study of agrarian communities in Asia and Africa*. Baltimore, MD and London: The Johns Hopkins University Press.

Ribot, J. (2002). *Democratic decentralization of natural resources: Institutionalizing popular participation*. Washington, DC: World Resources Institute. Technology Adaptation in Smallholder Agriculture: A Review of Issues and Empirical Methods. Washington, DC: IFPRI.

Santosa, A., Ramdhaniaty, L. N., & Nurhawan, R. (2005). *Community, halimun area and common property. Case study submitted for the joint study *Rural common property in a perspective of development and modernization.* Bogor, Indonesia: Indonesian Institute for Forest and Environment (RMI).

Sarker, A. (2005). *Land improvement districts as irrigation common-pool resources in Japan. Case study submitted for the joint study *Rural common property in a perspective of development and modernization.* Brisbane, Australia: University of Queensland.

Schlager, E., & Ostrom, E. (1992). Property rights regimes and natural resources: A conceptual analysis. *Land Economics, 68*, 249–262.

Seki, E. (2005). *Community action toward buyout of land in Scotland. Case study submitted for the joint study *Rural common property in a perspective of development and modernization.* Aberdeen, Scotland: University of Aberdeen.

Shrestha, B. (2005). *Rural common property under leasehold forestry in Nepal. Case study submitted for the joint study *Rural common property in a perspective of development and modernization.* Kathmandu, Nepal: Mobilization and Development (MODE).

Singh, S. (2002). *Conflicts and disturbance – A reason to change: lessons from community based natural resource management institutions in Orissa, India. Case study submitted for the joint study *Rural common property in a perspective of development and modernization.* Orissa, India: Foundation for Ecological Security (FES).

Taylor, M. (2005). *Review of shifts in tenure systems over Botswana's common rangelands, and the policies that have encouraged these shifts. Case study submitted for the joint study *Rural common property in a perspective of development and modernization.* Gaborone, Botswana: Indigenous Vegetation Project, United Nations Development Program (UNDP).

Unruh, J. (2005). *Common property and conflict in Ethiopia: The case of the Afar, Somali, and Karamojong cluster pastoralists. Case study submitted for the joint study *Rural common property in a perspective of development and modernization.* Montreal, Canada: McGill University.

Vay Ganon, M. (2005). *Formas de Tenencia Colectiva de la Tierra en Guatemala. Case study submitted for the joint study *Rural common property in a perspective of development and modernization.* Mazatenango, Guatemala: Asociación Comité de Desarrollo Campesino (CODECA).

Wily, L. A. (2006). *Land rights reform and governance in Africa: How to make it work in the 21st century?* UNDP Discussion Paper (March 2006). New York, NY: UNDP.

Part III
Institutional Disjunctures and Innovations

Chapter 10
Innovative Farmers, Non-adapting Institutions: A Case Study of the Organization of Agroforestry Research in Malawi

Judith J. de Wolf

Abstract Farmer experimentation with technologies, diverting from the official recommendations, highlights a common theme in the academic literature on agricultural research and development. Local knowledge and farmer- or demand-driven research have become watchwords of international development efforts, yet remarkably little farmer experimentation has made it into the sphere of formal agricultural research. Farmer practices, interests and experimentation are not systematically analysed, nor is there any serious testing of the effectiveness of farmers' experiments and adaptations of technologies. International institutes for agricultural research – such as the members of the Consultative Group on International Agricultural Research (CGIAR) – have adopted a changed discourse on farmers' knowledge, yet their research practice appears surprisingly persistent and little influenced by farmers' agendas.

Drawing on fieldwork and studies on the adoption of agroforestry technologies in Malawi and building upon social science research into the institutional embedding of development discourses, this chapter analyses this incongruence between research discourse (farmer-oriented), and the institutional framework which continues to be geared towards the international research community. Building on the recognition that the institutional set-up and environment of agricultural research produces particular policies, discourses and outcomes, it is shown that, despite a changed discourse on research, change in organizations and research practices has been limited – with changes rarely going beyond rhetoric. Despite new development priorities, research institutes largely still speak to scientific audiences rather than with farmers. It is argued that for agricultural research institutions to adapt to the changing discourse on agricultural research, these institutions themselves need to change organizationally. The chapter critically discusses some recent organizational adaptations in agricultural research, and suggests further modifications so as to make international agricultural research more able to adapt to farmers' practices and agendas.

J.J. de Wolf (✉)
TSBF-CIAT Harare, P.O. Box MP 228, Mount Pleasant, Harare, Zimbabwe
e-mail: judith.dewolf@hetnet.nl

L. German et al. (eds.), *Beyond the Biophysical: Knowledge, Culture, and Power in Agriculture and Natural Resource Management*,
DOI 10.1007/978-90-481-8826-0_10, © Springer Science+Business Media B.V. 2010

Keywords Agroforestry • Local knowledge • Institutional culture • Innovation • World Agroforestry Centre

Introduction

Some 20 years ago, the publication of *Farmer First: Farmer Innovation and Agricultural Research* (Chambers et al. 1989) marked a paradigm shift in thinking about agricultural research. Although conventional Transfer of Technology (ToT) approaches – underpinning industrial agriculture and the standardized green revolution packages – had been criticized since the 1970s for introducing technologies that did not fit the circumstances of resource-poor farmers in developing economies, the Farmer First approach signaled a more radical shift. Moving beyond early Farming Systems Research that sought to tailor international agricultural research to the needs of small-scale farmers through a multi-disciplinary approach (Rhoades et al. 1987), the *Farmer First* paradigm stressed the importance of local knowledge and the capacity of resource-poor farmers to innovate. The book and numerous subsequent publications made the case for agricultural research to link to farmers' agendas and knowledge (de Boef et al. 1993; Scoones and Thompson 1994). Such insights have since been commonly accepted, while the initial, rather populist *Farmer First* perspective has received considerable criticism. First, by largely ignoring power dynamics – both within rural communities and between poor farmers and outside agents – *Farmer First* methodologies have often been naively optimistic regarding the possibilities of collaboration among and between farmers and researchers. Second, the *Farmer First* paradigm suffered from a simplistic and celebratory notion of local knowledge as an environmentally well-adapted single, cohesive stock "out there", waiting to be tapped. Such a notion does not correspond with the complex and rapidly changing socioeconomic and agro-ecological environments in which resource-poor farmers in the global South find themselves.

Numerous critiques and farmer participatory approaches, addressing these power/knowledge shortcomings, have since been developed (Drinkwater 1994; Long and Villareal 1994, Chapter 13), yet the challenges of farmers accessing agricultural research institutions and influencing their research agendas persist. This chapter does not focus on farmers' knowledge, its soundness or (wider) applicability, or smallholder farmers' encounters with researchers and the problems of communication that come with it. Although these are important problems which are not easily overcome, this chapter seeks to understand the problem of linking international agricultural research – as embodied by the Consultative Group on International Agricultural Research (CGIAR) – to farmers' practice from an organizational perspective. It looks at the ways in which agricultural research institutions operate. Hence, the focus is on the organization and culture of research in which both social scientists and biophysical researchers operate.

The problem addressed here is not a question of researchers' unwillingness to collaborate with farmers or their misunderstanding of farmers – although there is certainly need for improvement in this field. Rather, the chapter problematizes the current institutional environment in which agricultural researchers operate. Since institutions for agricultural research are increasingly funded by donors that set development targets, research may seem to have become more farmer-oriented. But has it? And can social scientists within international agricultural research make a difference after the adoption of the *Farmer First* paradigm? Hence, the question is: have changes in the organization of agricultural research made it more responsive to farmers' needs?

Building upon field research, literature reviews, and experiences as a social scientist working within an international research institution in the field of agroforestry,[1] the analysis presented here looks at the institutional environment – comprising both organizational and cultural aspects – in which agricultural researchers work. It shows how the organization and culture of research in one such institute – the World Agroforestry Centre (ICRAF) – has shaped the particular form farmer-oriented research in the early 2000s has taken, being focused on technology development and directed at counting technology adoption, and identifying variables influencing adoption. In so doing, this chapter seeks to elaborate why it is unlikely that agricultural researchers in international institutes – be they biophysical or social scientists – will link up with farmers and their priorities. The chapter is organized in two parts. The first part briefly describes soil fertility enhancing agroforestry technologies and the different ways which smallholder farmers in southern Malawi have adapted these technologies to fit their farming practices. It raises the question that is then addressed in the second part of this chapter, which is why such farmer adaptations (or experimentation) are not picked up by agroforestry research. The second part analyses the institutional environment and culture of research in ICRAF and how, despite changes in this environment, research has not become more farmer-oriented.

Farmers' Practices and Agroforestry Researchers: Some Examples

In the continuing debate on the problems of engaging farmers in agricultural research, it seems almost forgotten that agricultural research has contributed tremendously to agricultural practice and performance, both in industrial and in

[1] The World Agroforestry Centre (ICRAF until 2002) is the world's leading research institute for agroforestry research and development. Established in the 1970s, it joined the Consultative Group on International Agricultural Research (CGIAR) in 1991 (www.worldagroforestrycentre.com). The author worked as an associated social scientist for the centre, and was based at Makoka and Chitedze research stations in Malawi from 2003 to 2006. The author wishes to thank the anonymous reviewers of this chapter for valuable comments.

developing countries. Very successful, high yielding ("Green Revolution") maize varieties, fertilizer recommendations, pesticides, and herbicides have been developed without much consultation of the end-users of such technologies.[2] This chapter, which takes the example of soil-fertility improving agroforestry technologies,[3] also deals with researcher-developed technologies that have proved to be working – from a biophysical point of view. These technologies appear to be particularly well suited for resource-poor farmers, as they hold the promise of reduced dependence on agricultural input markets (for fertilizers) or the need for cattle manure to sustain yields on permanently cropped lands.

Agroforestry technologies aimed at improving soil fertility make use of the ability of certain trees to assimilate and fix atmospheric nitrogen with the aid of bacteria living in its root nodules (for a detailed description, see Giller 2001). Thus fixed nitrogen is released into the soil, where it becomes available for other crops. Hence, nitrogen-fixing trees have an additional value for soil fertility improvement, on top of the "green manure" that trees normally provide as they shed their leaves (Giller 2001; Makumba 2003; Chilimba et al. 2004).

A number of these nitrogen-fixing agroforestry technologies are particularly well-suited to situations of high population pressure on land and extreme poverty, such as those prevailing in southern Malawi. Here, population densities are among the highest in Africa – as high as 379 persons per square kilometer in some districts[4] – and leaving smallholder-farming families with an average of 0.5 ha of cultivated land by the late 1980s (NSO 2008). In the absence of substantial numbers of livestock, and with limited sources of income that can be used to purchase chemical fertilizer, soil fertility replenishment is a major problem in this region. Farmers' small plots produce hardly enough maize – the main staple food – to feed the household. And as the land needs to be cropped continuously with this relatively nitrogen-demanding crop, soils are rapidly exhausted. Consequently, agricultural productivity is very low.[5] In such circumstances, agroforestry technologies aimed at

[2] Since the 1980s, the "Green Revolution" has been critiqued, as its impact has been very uneven, and the technologies often failing to reach the poor. Additional problems include reduced and polluted groundwater supplies, agro-chemical induced health problems, reduction of bio-diversity and food quality, and increased dependency of smallholder farmers on markets (Hazell and Ramasamy 1991; Lipton and Longhurst 1989).

[3] There are a number of other agroforestry technologies, ranging from fodder banks to feed livestock, rotational woodlots, to the improvement of indigenous fruit trees (domestication, processing, marketing). Although a similar argument may be developed for these technologies, these technologies will not be discussed here.

[4] The three highest-ranking rural districts are Chiradzulu, Thyolo, and Mulanje, with population densities of 379, 343, and 256 persons per sq. km, respectively. On average, Malawi's Southern Region had some 185 persons per sq. km in 2008 (NSO 2008).

[5] For the main staple crop, maize, yields ranged between 1 and 1.2 t/ha in the early 2000s (Benson et al. 2002). To be sure, the main drivers of agricultural productivity in Africa are soil fertility *and* climate. Although rainfall can be erratic, southern Malawi can be considered suitable for crop cultivation, with average rainfall ranging from 1,000 to 1,200 mm per annum (Kanyama-Phiri et al. 2000).

Table 10.1 Soil fertility improving agroforestry technologies and their benefits (Matakala 2004)

Agroforestry technology	Trees used	Benefits under farmer conditions
Biomass transfer	*Tephrosia vogelii* *Sesbania sesban*	N_2: dependent on # seasons grown Wood harvests
Improved fallows	*Tephrosia vogelii* *Tephrosia candida* *Sesbania sesban*	Maize yields: 2.0–3.5 t/ha N_2: 70–100 kg/ha Wood harvests of up to 10 t/ha
Mixing crops with coppiced trees	*Gliricidia sepium*	Maize yields: 1.8–3.0 t/ha N_2: 60–210 kg/ha
Annual relay cropping of trees	*Sesbania sesban*[a] *Sesbania macrantha*[a] *Tephrosia vogelii*[b] *Crotolaria spp.*[b] *Cajanus cajan*[b]	Maize yields: 1.2–2.3 t/ha N_2: 50–70 kg/ha Wood harvests of up to 5 t/ha

[a] Raised in nurseries, bare-rooted seedlings are transplanted.
[b] Sown directly under a canopy of established crops.

improving soil fertility seem to be the perfect – biophysical – solution to smallholders' productivity, as they reduce the need for external inputs (manure, fertilizer).

Of the most common soil fertility improving agroforestry technologies that are briefly elaborated below, the last two are generally regarded as suitable for southern Malawi or similar situations (Table 10.1 provides an overview of these technologies and the tree species used):

1. *Biomass transfer.* This cut-and-carry system requires separate areas where nitrogen-fixing shrubs and trees are planted. Usually vegetable gardens near streams and rivers are fertilized with the biomass of these nitrogen-fixing trees that grow elsewhere. The technology is only suitable for situations in which not all land is needed for the cultivation of crops or grazing of livestock (Ajayi et al. 2008).
2. *Sequential fallow rotation or improved fallow.* In this system, nitrogen-fixing trees are planted together with maize. The maize is harvested and the (slower growing) trees remain for (usually) two agricultural seasons in which no maize is grown. In preparation for the third season, the trees are cut and the leaves and litter (biomass) incorporated into the soil. The biomass thus produced can contain to 70–100 kg/ha of nitrogen, and with the leaf biomass incorporated into the soil, maize yields of 3–5 t/ha have been reported on farmers' fields. "However, such yields depend heavily on good rainfall, the use of improved maize varieties that respond well to N fertilizer, and good management" (Akinnifesi et al. 2005, p. 2). In addition to the improvement in soil fertility, farming households also benefit from the wood harvested after the fallow that can amount to 10 t/ha (to be sold, used for fuel, or roofing beams). In southern Malawi, improved fallow is

problematic as smallholder farmers cannot afford to leave the little cropland they have fallow for some years.[6]

3. *Simultaneous intercropping.* Also known as coppiced fallows, here tree seedlings are planted in between the maize ridges. Once the trees are properly established, the trees are cut back three times per year (Makumba et al. 2005). The biomass from these cuttings is then incorporated into the soil, in the ridges where maize is grown. This technology is considered to be extremely suitable for the Southern Region of Malawi, where land shortages are acute and labour is thought to be relatively abundant or cheap. Since the trees are coppiced, they do not interfere with the maize crop. The cut biomass can be used as green manure over many years. Although the commonly used *Gliricidia sepium* trees take some time to establish before they produce biomass, the nitrogen quantities generated typically range between 60 and 210 kg/ha. Depending on rainfall and soil type, maize yields under farmer conditions are said to range between 1.8 and 3.0 t/ha. Depending on the used spacing for maize, intercropping with trees may reduce the number of planting stations for maize, thus reducing maize yields per hectare (Ajayi et al. 2008).
4. *Annual relay (fallow) cropping.* Fast-growing trees or shrubs are (trans)-planted in the field after the maize crop is established. The shrubs remain in the field after the harvest of the maize crop and continue to grow. Their full canopy will only develop after the crop is harvested. When the land is prepared for the next season, the shrubs are cut and the biomass is incorporated into the soil. This technology has the advantage of no fallow periods, nor do farmers have to wait for the trees to get established (as with simultaneous intercropping). Furthermore, the results can already be seen after 1 year. However, the trees have to be replanted every year and the potential increase in yield is not as significant as in case of the other three systems as the amount of tree biomass produced in a year is smaller. Maize yields under farmer conditions typically range between 1.2 and 2.3 t/ha. Like simultaneous intercropping, this system is considered to be most suitable for Malawi's Southern Region. Although pigeon pea (*Cajanus cajan*) is one of the recommended species for this technology, the contribution of this crop to soil fertility has proved to be very limited (Chirwa et al. 2003), its impact depending on what farmers do with the crop residue after harvesting the peas. Yet farmers in southern Malawi seem to prefer the combination of maize and pigeon peas, albeit not for its effects on the soil; it gives them additional food.

From the above descriptions of the major soil fertility improving agroforestry technologies it becomes clear that these technologies not only have a number of "in-built" assumptions or blind spots regarding smallholder farming (such as cheap or abundant labour, gender neutrality, land availability), but also that "management"

[6] Biomass transfer and improved fallows are promoted in Zambia and the Central Region of Malawi, where in many areas land is relatively abundant as compared to southern Malawi.

by farmers is a crucial factor in the effectiveness of the technology. Let us therefore consider some observations from southern Malawi on farmers' management and adaptation of these technologies.[7]

Observation (1): From Mixed Cropping to Ground Leaves

Mr. Sitolo is a resource-poor farmer living not far from the main road from Zomba to Lilongwe. One day we visited his small farm in Ntubwi EPA, Machinga district in Malawi's Southern Region, an area where agroforestry has been promoted in the past. We were looking for a farm for an interested American researcher to visit. We thought of Mr. Sitolo as he was known to be an active member of the "agroforestry farmers club" right from the beginning when the technologies were introduced in this area. When we met him at his homestead, it appeared however, that Mr. Sitolo was no longer practicing the mixed intercropping with maize and *Gliricidia sepium* as "recommended". Instead, he was experimenting with applying the Gliricidia biomass to his cotton crop. And as he showed us around, he took us into one of his small houses on his homestead, where he kept his dried Gliricidia leaves. He explained that he harvested the leaves, dried them under shade to maintain the green leaf color, and then ground the leaves into a powder, which he then applied to his maize crop as if it were chemical fertilizer. He claimed that last season, his maize crop did very well after applying the Gliricidia powder in his maize field twice.

Observation (2): Different Trees in One Field, Rotating Maize and Tobacco

Although he had been practicing agroforestry since a long time, James Chikoko in Kutambala had agroforestry trees in only one of his three fields. In this field he cultivated maize and tobacco in rotation. Along the ridges he had *Gliricidia sepium* trees. "Jerejere" (*Sesbania sesban*) and "ombwe" (*Tephrosia vogelii*) had been planted together in the same field – although the "jerejere" had dried up "(that is what happens when it matures," according to Mr. Chikoko). He continued to explain that he cut the "ombwe" down when he grew tobacco in the field. The tobacco did

[7] To be sure, the case examples are not representative of all southern Malawi's farming population. However, the aim of presenting these "apt illustrations" is not to present representative cases, but to illuminate wider social patterns and processes through the study of the particular. It is our understanding of the social processes as identified in the particular situation that allow us to understand similar (or contrasting) situations (see van Donge 2006).

well with only the Gliricidia. Mr. Chikoko also applied a little fertilizer when he cultivated maize in the field with the agroforestry trees.[8] He knew it was not taught to him like that, but he decided on the fertilizer nevertheless. “The trees are only effective after two years”, he explained, and when the field changed for the better, he reduced the amount of fertilizer. He did not want to try to cultivate his agroforestry field without any chemical fertilizer, because he feared he would not yield enough to feed his family. Therefore he did not want to try it without fertilizer, despite having observed others cultivating fields with agroforestry trees without any extra fertilizer. “Their harvests are not as good as his”, claimed Mr. Chikoko.

Observation (3): Not Following the Agroforestry with Hybrid Maize Recommendation

There are sound agronomic reasons to recommend soil fertility improving agroforestry technologies in combination with hybrid maize; it is more responsive to more mineralized nitrogen in the soil than local maize varieties, and perhaps many other crops. Nevertheless, in southern Malawi, resource-poor farmers are not often seen growing hybrid maize in their agroforestry fields. Local maize varieties are much more common, and very often one also observes cassava or other food crops being grown in combination with nitrogen-fixing trees. An impact assessment study of soil fertility enhancing agroforestry technologies conducted in southern Africa in 2004, also found that in southern Malawi farmers plant a variety of other crops in the agroforestry fields (Table 10.2), with positive reports:

> All the crops, when grown in agroforestry fields, they do well. All are healthy.
>
> – Mrs. Florence Kazembe, Namadidi village (2004)

> Beans, *nandolo*, soya, pumpkin, groundnuts, cucumbers, *nsama* (bambara nuts), and cassava benefit from agroforestry. Especially beans, such as *nsama*, groundnuts, pigeon peas do well.
>
> – Mrs. Loney Sinja, Namadidi village (2004)

The impact assessment study by the World Agroforestry Centre concluded, “… it appears that any crop suitable to the existing ecological conditions in the respective sites, will do well under agroforestry” (Schüller et al. 2005, p. 7). Yet, whether these alternative uses of agroforestry technologies are indeed effective and efficient is largely unknown. Study designs on the impact of nitrogen-fixing agroforestry technologies continue to consider only the effects on hybrid maize yields.

The above observations on farmer management of agroforestry technologies show the innovativeness of smallholder farmers and their capacity to adapt intro-

[8] Mr. Chikoko is not the only one. Many Malawian farmers add fertilizer to their agroforestry field if they have the means to do so. They often do not believe nitrogen-fixing agroforestry technologies can actually work on their own.

Table 10.2 Crops cultivated with soil fertility enhancing agroforestry (AF) technologies (Schüller et al. 2005)

(N = 51)	Per cent of farmers growing crop with AF (%)	Crop reacts favorably to AF (farmers' view) (%)
Maize	100	81
Bambara nuts	6	3
Beans	84	32
Cassava	74	26
Groundnuts	68	6
(Indigenous) vegetables	90	12
Millet	6	
Pigeon peas	90	29
Pumpkin	35	13
Sorghum	13	
Soy beans	16	6
Sweet potatoes	16	

duced technology packages to suit their own needs. To be sure, not all such adaptations constitute effective or efficient resource use. Yet, observations like these do provide important entry points for understanding agricultural practices and different farmers' agendas that are relevant for agroforestry research. For instance, they point to a potential inconsistency in the thinking about and evaluation of nitrogen-fixing agroforestry technologies. On the one hand they are promoted as an external input reducing – and thus, pro-poor – technology (i.e. no need to buy fertilizers), while on the other hand, agroforestry research is based on the assumption that farmers are capable and willing to purchase hybrid maize seeds. However, as observation #3 shows, for resource-poor farmers in southern Malawi, buying hybrid maize seeds each year is beyond their reach. Rather than hybrid maize, they prefer local maize varieties – an agronomically sub-optimal option – that can be kept and used the next year. It saves them not only the cost of seed, but also the cost of chemicals used to preserve the harvest, since local flint varieties[9] can be stored much longer than hybrid maize.[10] It is a moot point whether these technologies still make sense from an economic point of view when only local maize is grown.

The observations from southern Malawi further reveal how smallholder farmers who recurrently face food shortages are not merely interested in the workings of agroforestry technologies with maize, their main food crop. Cash needs and the extreme shortage of land in southern Malawi make farmers net consumers of food, affecting their decision to not simply concentrate all their agricultural efforts on (hybrid) maize production. Farmers interviewed during the impact assessment

[9] Flint varieties have kernels with a hard outer layer enclosing the soft endosperm.

[10] Furthermore, the taste of local maize is also said to be better and it is claimed there is more starch ("starch kwambiri") in local maize. Therefore, farmers claim, local maize fetches a higher prize when sold locally.

study suggest that nitrogen-fixing trees may work well with a number of crops, yet little is known scientifically about such alternative uses since researchers have not followed them up. Nor is Mr. Chikoko's practice of rotating tobacco and maize in combination with nitrogen-fixing trees taken up by researchers. Equally, smallholder farmers' use of nitrogen-fixing trees in combination with cassava signifies a need for a reliable source of food in situations of erratic rainfall and/or limited labour availability. This latter constraint runs counter to a common assumption underpinning the promotion of nitrogen-fixing agroforestry technologies: that in highly populated and impoverished areas such as southern Malawi, agricultural labour is abundant or available at very low cost.

Lastly, the observations on Mr. Chikoko and Mr. Sitolo's unusual experiments and adaptations of the agroforestry technologies are not easily captured by the quantitative surveys that are commonly used to evaluate technology adoption. Yet, they do point to the need for agroforestry researchers to consider alternative uses of technologies (in combination with other crops and other agroforestry technologies, etc.), their effectiveness and the rationale behind their emergence. Despite maize being the staple food crop in many parts of Africa, for resource-poor farmers facing recurrent food shortages it is clearly not the only crop – let alone the hybrid variety – they may want to grow in combination with nitrogen-fixing trees. So, why do these observations on smallholders' farming practices relating to agroforestry not seem to inform research on agroforestry?[11]

A Resilient Research Institution in a Changing Environment

> … farmers themselves are innovators in their use of agricultural technology and (…) their innovativeness is conditioned by their social-cultural and economic circumstances as well as their physical environment (…) Therefore, technology development should begin and end with the farmer.
>
> – Rhoades and Booth 1982, cited in Prain et al. 2006, p. 166

To understand why the above acknowledgement (which later featured so prominently in the *Farmer First* paradigm) did not result in agroforestry researchers incorporating farmers' experiences and agendas into their (participatory) research,

[11]There is an exception. One farmers' adaptation of agroforestry technology has been widely accepted by scientists: the reduction in the number of prunings of *Gliricidia sepium* in simultaneous intercropping. Initially, it was recommended that well-established *Gliricidia* trees be pruned five times a year. However, farmers appeared to be pruning only three times. Subsequent on-station trials revealed this practice to be just as effective, thus making it the official recommendation (Makumba et al. 2005). However, the most likely cause of this farmer adaptation – limited labour availability – was not taken up in further agroforestry research (see, for example, Makumba 2003).

we need to better understand the institutional environment in which agroforestry research by ICRAF in Africa takes place. But before exploring this environment, and particularly, how it changed since the early 1990s, it is useful to briefly outline the initial attempts to make agroforestry research more farmer-oriented in the mid-1990s. As before, the focus is again on soil fertility enhancing agroforestry technologies in Malawi.[12]

In Malawi, ICRAF's research on soil fertility enhancing agroforestry technologies started with on-station trials in the early 1990s. After a couple of years of exclusively on-station research, some of the trials were taken on-farm, that is, to farmers' fields (Phiri and Akinnifesi 2000; Nyirenda et al. 2001; Akinnifesi et al. forthcoming). Thus, researchers hoped to get better insight into the performance of different technologies under farmers' conditions. Four different types of on-farm experimentation were distinguished (Franzel et al. 2001; Thangata and Alavalapati 2003):

Type I: Researcher designed, researcher managed
Type II: Researcher designed, farmer managed
Type III: Farmer designed, farmer managed
Extension farmers: Spontaneously adopting farmers

By the mid-2000s most of these on-farm experiments had ceased. Only the "extension farmers" have remained, often fused with type III farmers. They continue to practice agroforestry in their fields, but devoid of scientific support. Rather than reflecting a farmer-first paradigm, the "extension farmers" position appears strikingly similar to that of "innovators" and "early adopters" in the conventional Transfer-of-Technology (ToT) model (see Rogers 1983; Leeuwis and van den Ban 2004). Typically, such farmers are also the local elites, but disconnected from agroforestry research – often under the assumption that farmers are mentored and monitored by NGOs, government extension officers, and/or Community Based Organisations (CBOs).

One important reason underpinning the demise of on-farm experimentation pertains to the organization of agricultural research. On-farm agricultural research proved to be highly labour intensive for the biophysical researchers. Researchers would have to spend much more time in the field (e.g. solving practical issues), rather than analysing and publishing the findings of experiments, their main task and performance evaluation criterion.

A second factor was the prevailing scientific culture among agroforestry researchers. Trained in predominantly biophysical scientific disciplines, and working in an international research institute geared towards the understanding of agro-ecological processes relating to nitrogen-fixation, researchers of the early 1990s were generally ill-prepared for dealing directly with farmers, let alone farmer-led experimentation. Although the participating farmers in the type II and

[12]This is not to say that soil fertility was the only problem in Malawian smallholder agriculture. Market failure is often identified as a major constraint to rural development (Dorward and Kydd 2004; van Donge 2002, 2007).

III experiments tended to be initially enthusiastic – not least because it involved receiving inputs, a harvest and compensation in case of crop failure (Akinnifesi et al. 2009) – distrust between farmers and researchers gradually developed.[13] Farmers felt their opinion did not matter (interviews by the author in Thondwe EPA), while researchers suspected farmers of tampering with the study design and the instructions (personal communication with ICRAF staff, Makoka). Not surprisingly, type II and III experiments were often considered "less scientific" by the biophysical researchers, caused by the lack of control over the research design, researchers' perceptions of farmers, and the required large investments in time (c.f. Franzel 1997).

The failure of on-farm experimentation in Malawi in the 1990s – a first attempt to re-orient agroforestry research towards farmers' circumstances and needs – may not be surprising. *Farmer First*-inspired research was highly innovative at the time, and the culture and organization of agricultural research may not yet have been ready to adapt to this new paradigm and its far-reaching consequences. Yet the institutional environment of agroforestry research, and international agricultural research at large, underwent major changes in the 1990s and early 2000s. First, the investors in agroforestry research changed the rules of the game: research became increasingly project-based and investors increasingly demanded tangible development outcomes. Second, the acknowledgement that more farmer-oriented research was needed, resulted in the hiring of more social science trained staff who could complement the biophysical oriented researchers, and provide insights to steer agroforestry research. Below, several aspects of these wider developments are discussed, showing how they interacted with each other, as well as the existing institutional environment of agroforestry research. Ironically, the analysis suggests that the changing institutional environment of agroforestry research has had little impact on the organizational culture of the World Agroforestry Centre, and is also unlikely to result in a closer collaboration between researchers and farmers.

Shift in Funding, New Goals, and a "Culture of Accountancy"

Established in 1978 to promote agroforestry research in developing countries, ICRAF joined the CGIAR in 1991. Thus ICRAF's work became linked to the goals of the CGIAR: reducing poverty, increasing food security, and improving the environment. Investors in its research, which until then had been largely focused on

[13] Besides distrust between researchers and farmers, both adopters and agroforestry technologies sometimes became the victim of distrust and jealously in the communities where on-farm trails were conducted. As participating farmers reaped benefits that others did not get, intra-community relations sometimes became strained. In a number of villages in southern Malawi where I did research in 2004, people still recounted such experiences. They saw them as a cause of non-adoption of agroforestry technologies by those who had not participated in the on-farm trials.

Africa, were thus largely national governments with an international development agenda, and development-oriented international organizations and foundations such as the EU, World Bank, and Ford Foundation.[14]

As Bellon et al. observed for CIMMYT, the "sources and nature of (CGIAR) funding have changed significantly" over the past two decades … "Core unrestricted funding has declined, leaving management increasingly dependent on special project funding to implement the research agenda" (2006, p. 134). Agroforestry research by ICRAF was no exception, although core funding declined only in relative terms (Table 10.3). The shift in funding had two important consequences. First, the increased significance of restricted funding implied greater control of investors over the channeling of funds to particular activities, and thus greater control by these investors.[15] The research agendas of CGIAR institutes thus became more donor-driven.

Second, the shift in funding instigated an institutional reorientation. From a strict focus on research, development-oriented goals became additional objectives for CGIAR institutes. For instance, ICRAF re-organized institutionally, integrating its research and development tasks (ICRAF 2003). In order to reach the newly set development targets, more emphasis had to be placed upon research *and* extension. Strategies to get the technologies to the farmers needed to be developed. Scaling-up and scaling-out became the watchwords of this newly assumed role (Böhringer 2001). But as expertise in the field of extension within the centre was limited, the strategies developed initially had to build on the often understaffed and underfinanced

Table 10.3 Summarized overview of unrestricted and restricted funding to ICRAF 1995–2007 (Annual reports: ICRAF 1996, 2001; World Agroforestry Centre 2006, 2008)

Year	1995	2000	2005	2007
Unrestricted core funding (US $000)	8,147	7,854	9,540	9,454
Restricted funding (project funding)	8,475	14,508	21,014	22,092
Total	16,622	22,362	30,554	31,546
Unrestricted funding as percentage of total (%)	49%	35%	31%	30%

[14] See: "More than 30 years of agroforestry research and development" at: www.worldagroforestrycentre.com (Accessed 20 Feb 2009).

[15] Chambers notes that, in principle, core funding allows for greater flexibility to respond to "changing realities, perceptions and opportunities" (2006, pp. 364). He continues that "it is a sad paradox that precisely when CGIAR's mandate and context demand greater adaptability and opportunism, CGIAR's core funding should be shrinking." Barrett (2008) also argues for increased core funding to cover social science staff.

Table 10.4 Dissemination and development staff as percentage of total ICRAF-Southern Africa (Annual reports: World Agroforestry Centre 2002, 2004a, b, 2006, 2007, 2008)

Year	2001–2002	2003	2004	2005	2006	2007–2008
Researchers						
Biophysical sciences	24	24	24	14	14	10
Social scientists (incl. economists)	1	3	4	3	1	1
Research assistants and research officers	5	1	1	2	1	2
Dissemination and development facilitators (training officers)	3	7	8	6	4	3
Administrative staff	1	3	4	3	4	5
Total	34	38	37	28	24	21
Dissemination staff as percentage of total staff (%)	9%	18%	22%	21%	17%	14%

These staff numbers exclude local, non-academic staff. The 2007–2008 figures include two consultants.

national agricultural extension services in developing countries, as well as NGOs active in the field of agricultural development. Extension officers of such organizations became the recipients of training, in order for them to train farmers in agroforestry. And although the staff component dedicated to the increasingly important developmental task within the organization did increase for some years, extension did not become an important task within ICRAF. Numbers of dissemination and development officers have declined since 2004 (Table 10.4). With counter-pressure from the CGIAR, ICRAF remained a predominantly research-oriented institute, despite the important shift in its financial resources.[16]

An additional consequence of the shift towards more development-oriented project funding was the need to develop developmental impact criteria for agroforestry research and extension efforts. Development-oriented donors pressed for stricter development planning, including logical frameworks, "milestones" to be achieved, and clearly defined targets. In general these development targets got quantitatively defined. Subsequently, numbers of farmers having adopted agroforestry technologies, the number of seedlings handed-out, the amount of seed distributed to farmers, etc. became important variables in ICRAF reports and publications. Adoption figures in particular have been discovered as a powerful communication tool vis-à-vis investors in agroforestry research. For instance, in an annual report of ICRAF Southern

[16]In ICRAF Southern Africa, the indirect extension approach through training of trainers also suffered from the lack of follow-up. This was the result of limited resources available for extension as well as the persistent emphasis on research within the organization, as is evidenced by the prominence of scientific publication output in the organization's performance evaluation system.

Africa to one of its project funders, it was estimated that 55,000 farmers in the southern African region had adopted an agroforestry technology of some sort in 2001 (ICRAF 2001). By 2008, presenting adoption figures had apparently become so firmly institutionalized that researchers could now present highly precise cumulative figures: 417,503 farmers in the southern African region were reported to have adopted agroforestry technologies (e.g. Akinnifesi et al. 2008).

The development agenda of ICRAF's main investors thus gave rise to a "culture of accounting". To be sure, this is not to blame donors for the emergent preoccupation with numbers of agroforestry adopters. If donors had not pressed research institutes to become more oriented towards technology adoption, efforts to reach farmers may have been much more limited. The fact that agroforestry technology adoption has become synonymous with "counting adopters" – hence, a numerical issue – is a reflection of the specific organizational set-up of ICRAF, rather than the intrinsic merit of this approach (compare with Finnemore 1997). It is a result of the specific interpretation of donor's demands for accountability by ICRAF's predominantly biophysically, and generally quantitatively, oriented researchers.

Biophysical, Economic, and Social Scientists in Agroforestry Research: On Cultures of Research

The rise of the *Farmer First* thinking and increased (donor) stress on impact constituted important shifts in the international discourse on development. International institutes for agricultural research, faced with a shift towards restricted project funding, recognized the need to adapt organizationally and strategically (CGIAR 2000). The CGIAR institutes recognized the need for more social science researchers as well as extension-oriented staff, to take on tasks such as understanding farming practices, technology adoption, facilitating communication between researchers and farmers, assisting in effective on-farm research, etc. In other words, there was a strong push towards institutionalizing social sciences in international agricultural research (Cernea 2006). Adopting a development agenda in the late 1990s, ICRAF also sought to integrate its research and development agendas, and re-articulated its work into themes (ICRAF 2003). Yet, social science research capacity within the CGIAR decreased in the late 1990s and early 2000s, with non-economist social science researchers declining by some 24% (Kassam 2003; Cernea 2006; Chapter 12).[17] A survey (N = 356) conducted within the CGIAR in 2002 recorded a mere 11% socio-cultural scientists and 17% economists. Socio-cultural scientists were also found to be on shorter contracts than economists (Rathgeber 2006), suggesting that the latter's work is more firmly institutionalized in the CGIAR.

[17]ICRAF Southern Africa experienced a short-lived increase in the number of social scientists from 2003 to 2005 (see Table 10.4).

To understand why economists' research better fits the organizational competencies and culture of research of biophysical research dominated institutes such as the CGIAR, it may help to look at two congruities between agronomic and economic research: complementarity and similarity of approach.[18] Economists' research within ICRAF, for example, has focused on identifying key socio-economic variables affecting the so-called "potential for adoption" of agroforestry technologies, looking at the feasibility, profitability, and acceptability of different agroforestry technologies (Franzel 1999; Franzel et al. 2001). Thus, economists' research complements biophysical research within the agricultural research organization, rather than co-developing technologies on the basis of understandings of farmers' practices. The assessment of "adoption potential" has become a key element of the participatory, farmer-centered model of research and development within ICRAF (Franzel 1999; Franzel et al. 2001; Franzel et al. 2004). In addition, the research approach of economists within ICRAF is similar to that of biophysical scientists. Both are characterized by a focus on the technology, which is then "tested" under different circumstances, such as different tenure regimes, population densities, household characteristics, and policy contexts (e.g. Place and deWees 1999; Franzel 1999). Alternatively, situations of successful technology adoption are analysed, singling-out the variables that contributed to success, which are then translated into generalized conditions or "essential elements for scaling up agroforestry innovations" (Cooper and Denning 2000; Denning 2001). In analogy with biophysical research aiming to understand the essential factors affecting plant growth or nitrogen-fixation, the economists' research into technology adoption thus builds on an essentially mechanistic understanding of the technology adoption process (see also Rogers 1983; Leeuwis and van den Ban 2004). Although other social science approaches may have yielded equally valuable insights into technology adoption, it is not surprising that, within agricultural research institutions such as ICRAF, the organizational workings and prevailing "culture of research" gave rise to this particular form of technology adoption studies, and that it was primarily economists who designed such studies.

A brief look at attempts to identify household and farm characteristics that influence agroforestry technology adoption yields confusing results. For example, Mkandawire found that "a person who derives most of his income from farming has a higher willingness to invest in the technologies than a person whose main source of income is non-farm" (2001, p. 13). She therefore concludes that Malawian farmers with off-farm sources of income will be less willing to adopt agroforestry technologies. Rapando – also writing on Malawian smallholders – arrives at a similar conclusion, arguing that "the incomes received from these (off-farm) activities may be used to purchase food and/or fertilizer" (2001, p. 37). However, Böhringer et al. found that

[18]Other social science methods, such as the qualitative methods deployed by anthropologists and sociologists, are less suited to the organizational requirements and cultures of research of the CGIAR. As Bellon et al. (2006) argue, biophysical scientists tend to be very skeptical about the manner in which social scientists acquire their data as well as the validity of data resulting from their qualitative methodologies.

– contrary to the commonly held assumption that agroforestry is a pro-poor technology – wealthier Malawian farmers are more likely to adopt than are resource poor farmers, possibly because “they are better able to cope with risk being introduced by testing of new technologies and innovations” (2000, p. 68). Writing about Zambia, Phiri et al. (2004) also found wealthier farmers to be more likely to adopt agroforestry technologies (improved fallows in this case) than the poorer farmers, even though poor farmers did appreciate the benefits of the technology (see also Swinkels et al. 1997; Thangata and Alavalapati 2003). These findings suggest that agroforestry adoption is not easily captured in terms of key socio-economic variables determining adoption or non-adoption. As agroforestry researchers also seem to acknowledge, such studies have often “mainly emphasized biophysical and economic analysis, and not farmer assessment” (Akinnifesi et al. 2004, p. 5).

Technology adoption is, as already suggested above, a complicated *social* process, which is not easily captured in quantitative terms. Just how problematic categorizing farmers into adopter/non-adopter classes can be became clear when I conducted a study into the process of adoption of soil fertility-enhancing agroforestry technologies in southern Malawi.[19] Focusing on areas where ICRAF or its extension partners had been working for a number of years, I often encountered farmers who had planted agroforestry trees, but were unaware of what to do with them. Although my observations were localized and not intended as a representative sample, they challenged the classification of farmers as “adopters” as had been done previously. Assessing impact becomes even more difficult when one takes into account the effects of the nitrogen-fixing agroforestry technologies on crop farming. After all, it is not merely the presence of nitrogen-fixing trees which is important; it is their use. This became most apparent when I conducted interviews in an area not far from the Makoka agricultural research station in southern Malawi. Considered as an area with high adoption rates, there were indeed numerous farmers who had substantial numbers of agroforestry trees in and around their fields. The trees were not used for soil fertility improvement, but grown for their seeds, which the farmers sold to ICRAF. This again raises the question of whether these farmers should be considered adopters of the technology.[20]

---

[19]Some 70 interviews with ICRAF staff, extension officers and (predominantly) farmers currently and previously practicing agroforestry were done between March and July 2004. One of the areas covered villages in Thondwe Extension Planning Area (EPA). Here, major interventions had taken place such as Type II trials, intensive village workshops, training-of-trainers, and more, yet the fieldwork revealed very low rates of adoption. Interviews in villages (randomly sampled from lists of nurseries established) in the Chiradzulu district, where different partner organisations had been active in promoting agroforestry, revealed equally disappointing adoption rates. Finally, in Chiosya and Ntubwi, two so-called Pilot Scaling-Up Areas, there was no evidence that – besides very recently established ones – “agroforestry clubs” as mentioned in project documentation, were still active.

[20]A similar phenomenon has been described by Kiptot et al. (2007), who labelled farmers adopting agroforestry technologies for other reasons than improved farm productivity as “pseudo-adopters”.

Table 10.5 Definition for "use" and two levels of "adoption" of different agroforestry technologies, defined for the implementation of the Zambezi Basin Agroforestry Project, March 2004 (Schüller 2004)

Technology	Definition of use	Definition of adoption
Improved fallows	Planted for the first time at the farm	- Medium adoption: Replanted improved fallows on less than a fifth of the farm for a consecutive second time - Full adoption: Replanted improved fallows on more than a fifth of the farm for a consecutive second time
Intercropping	Practiced intercropping for the first time on at least a fifth of the farm	- Medium adoption: Continue to use intercropping for at least 3 years - Full adoption: Continue to use intercropping for at least 3 years and expanded area under intercropping at least once
Relay cropping	Practiced intercropping for the first time at the farm	- Medium adoption: Continue to use intercropping on less than a fifth of the farm for a consecutive second time - Full adoption: Continue to use intercropping on more than a fifth of the farm for a consecutive second time

However difficult it may be, agroforestry researchers felt compelled to develop criteria to assess agroforestry technology adoption. In 2004, ICRAF Southern Africa agreed upon definitions of technology "use" and "adoption" (Schüller 2004) to be used in counting households "reached" by soil fertility enhancing agroforestry technologies (Table 10.5). The establishment of these definitions of agroforestry adoption neither resulted from, nor did they lead to, a better understanding of farmers' practices and the processes of adoption. They also did not meaningfully reorient research towards a better understanding of such practices and processes. Like the extension of agroforestry technologies, the counting of "adopters" had largely become a task of ICRAF's partners – national extension agencies and NGOs working with farmers.

Concluding Remarks: Farmer-First and the Resilient Organization

In 2006, Cernea and Kassam published a collection of studies taking stock of social science research within the CGIAR, describing it as "an uphill battle". The studies revealed that, whereas the strategic re-orientation of the CGIAR in the early 2000s implied a much greater role for social science research within the institutes, social science research capacity tended to decline rather than to increase (see also Chapter 12).

Thus, the book argued: "Within CGIAR's total program, intensified social research on farmers' needs and their capacities to use and manage natural resources in a sustainable manner must be placed in its mainstream" (Cernea 2006, p. 26).

This chapter, which focused on this changing research agenda in one CGIAR institute, addressed how this mainstreaming of social science research has taken shape within ICRAF Southern Africa. It has shown how changing funding gave rise to a "culture of accountancy" and, as agricultural research remained technology-defined and scientific publication oriented, resulted in farmer-oriented research being defined as studies into technology adoption. In such studies, technology adoption is not analysed as a *social* process that must be understood from a farmer's position and perspective, but as a mechanistic process comprising of general variables such as tenure, gender, wealth, etc. that are understood as determinants of technology adoption. "Farmers' needs and capacities to use and manage natural resources", have largely disappeared from view (cf. Cernea 2006, p. 26).

The strategic reorientation of the CGIAR and ICRAF's policies of the early 2000s, intended to steer agricultural research towards farmers' needs, thus seems to have stumbled on the institutes' own resilient organizations and culture of research. This resilience in agricultural research institutes' functioning, combined with changes in funding, has resulted in a development discourse in which "technology adoption rates" and "scaling-out/up of technologies" take centre stage. Ironically, in practice this has meant not a bridging of the gap between researchers' and farmers' agendas as envisaged in the *Farmer-First* paradigm, but a widening of that gap. With social science in agricultural research institutes like ICRAF being technology-defined, the early twenty-first century has witnessed an increased disconnect between research and farmer practice (see Fig. 10.1).

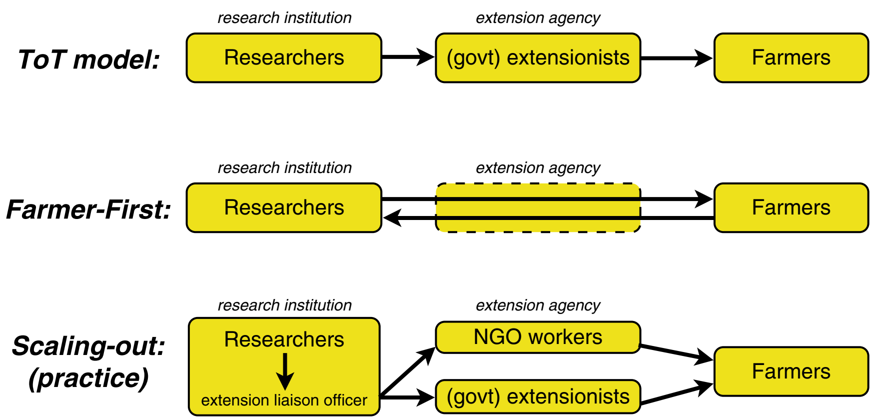

Fig. 10.1 In the conventional Transfer-of-Technology (ToT) model, arrows represent a unidirectional flow of communication and new technologies (see Leeuwis and van den Ban 2004). Central to the Farmer First model is a direct link between research and farmer agendas (see Chambers et al. 1989). "Scaling-out" has increased the number of agencies and the organizational complexity of extension, and enlarged the distance between research and farmers' practice.

While agroforestry researchers need to consider alternative uses of technologies, their effectiveness and the rationale behind their emergence, to connect or re-connect agricultural research to farmers' needs and capacities by recommending new farmer-oriented research methodologies is in part missing the point. Simply appointing (a few) more social scientists within agricultural research institutes is a recommendation that is, on its own, not likely to change the culture of research. In order to alter agricultural research practices, a more fundamental change in the organizations and culture of research within these institutes is required. Such change may be brought about by reorientations from within these institutions; yet, as this chapter has revealed, the international discourse on development and the demands of funding agencies are more likely to be critical in shaping the future of both agricultural research institutes and their research practices. Donors and research managers must proactively explore how to foster institutional cultures in research that place farmers' needs and rationales more squarely in the forefront.

References

Ajayi, O. C., Akinnifesi, F. K., Mullila-Mitti, J., de Wolf, J. J., Matakala, P. W., & Kwesiga, F. R. (2008). Adoption, economics and impact of agroforestry technologies in southern Africa. In D. R. Batish, R. K. Kohli, S. Jose, & H. P. Singh (Eds.), *Ecological basis of agroforestry* (pp. 343–360). Boca Raton, FL: Taylor and Francis/CRC Press.

Akinnifesi, F. K., Chirwa, P., Ajayi, O. C., Gudeta, S., Matakala, P., Kwesiga, F. R. (2008). Contributions of agroforestry research and development to livelihoods of smallholder farmers in Southern Africa, Part I – Taking stock of the adaptation, adoption and impact of fertilizer tree options. *Agricultural Journal, 3*, 58–75.

Akinnifesi, F., de Wolf, J., & Matakala, P. (2005). *On-farm assessment of agroforestry technologies for soil fertility replenishment in Malawi*. Chitedze, Malawi: World Agroforestry Centre (ICRAF).

Akinnifesi, F. K., Franzel, S., Phiri, R., Kwesiga, F. R., Zuze, P., Mhango, J., Ajayi, O., Makumba, W., & Aggumya, A. (2004). Assessment of agroforestry adoption and field management modifications by farmers in Southern Malawi. *ICRAF Southern Africa Regional Programme Working Paper Series* No. 2003-1. Nairobi, Kenya: ICRAF.

Akinnifesi, F. K., Sileshi, G., Franzel, S., Ajayi, O.C., Harawa, R., Makumba, W., Chakeredza, S., Mngomba, S., de Wolf, J. J., & Chianu, J. N. (2009). On-Farm assessment of legume fallows and other soil fertility management options used by smallholder farmers in southern Malawi. Agricultural Journal *4*(6), 260–271.

Barrett, C. B. (2008). *A normative framework for social science activities in the CGIAR*. Rome: CGIAR Science Council. Available at: http://www.sciencecouncil.cgiar.org/fileadmin/user_upload/sciencecouncil/Monitoring_and_Evaluation/Normative_Framework_October_27_2008_final.pdf. Accessed 15 May 2009.

Bellon, M. R., Morris, M., Ekboir, J., Meng, E., de Groote, H., & Saín, G. (2006). Humanizing technology development in the green revolution's home. In M. M. Cernea & A. H. Kassam (Eds.), *Researching the culture in agri-culture: Social research for international development* (pp. 124–139). Wallington, UK: CABI.

Benson, T., Kaphuka, J., Kanyanda, S., & Chinula, R. (2002). *Malawi: An atlas of social statistics*. Zomba/Washington, DC: National Statistical Office (NSO), International Food Policy Research Institute (IFPRI).

Böhringer, A. (2001). Facilitating the wider use of agroforestry for development in southern Africa. *Development in Practice, 11*(4), 434–448.

Böhringer, A., Chilanga, T., Chirwa, P. W., Makumba, W., Mhango, J., Moyo, N., et al. (2000). *Achievements in agroforestry research and development in Malawi in 1999*. Zomba: International Centre for Research in Agroforestry (SADC-ICRAF Agroforestry Project).

Cernea, M. M. (2006). Rites of entrance and rights of citizenship: The uphill battle for social research in CGIAR. In M. M. Cernea & A. H. Kassam (Eds.), *Researching the culture in agri-culture: Social research for international development* (pp. 3–31). Wallington, UK: CABI.

CGIAR. (2000). *A food secure world for all: Towards a new vision and strategy for the CGIAR*. Rome: FAO.

Chambers, R. (2006). Social research and researcher in CGIAR: An underused potential. In M. M. Cernea & A. H. Kassam (Eds.), *Researching the culture in agri-culture: Social research for international development* (pp. 361–372). Wallington, UK: CABI.

Chambers, R., Pacey, A., & Thrupp, L. A. (Eds.). (1989). *Farmer first: Farmer innovation and agricultural research*. London: Intermediate Technology Publications.

Chilimba, A. D. C., Phombeya, H. S. K., Saka, A. R., & Kabambe, V. H. (2004). Promising agroforestry technologies for small-scale farmers in Malawi. In M. R. Rao & F. R. Kwesiga (Eds.), *Proceedings of the regional agroforestry conference on agroforestry impacts on livelihoods in Southern Africa: Putting research into practice* (pp. 125–130). Nairobi: World Agroforestry Centre (ICRAF).

Chirwa, P. W., Black, C. R., Ong, C. K., & Maghembe, J. A. (2003). Tree and crop productivity in gliricidia/maize/pigeonpea cropping systems in southern Malawi. *Agroforestry Systems, 59*, 265–277.

Cooper, P. J. M., & Denning, G. L. (2000). *Scaling up the impact of agroforestry research* (p. 43). Nairobi: ICRAF.

de Boef, W. K., Amanor, K. W., & Bebbington, A. (1993). *Cultivating knowledge: Genetic diversity, farmer experimentation and crop research*. London: Intermediate Technology Publications.

Denning, G. L. (2001). Realizing the potential of agroforestry: Integrating research and development to achieve greater impact. *Development in Practice, 11*(4), 407–416.

Dorward, A., & Kydd, J. (2004). The Malawi 2002 food crisis: The rural development challenge. *Journal of Modern African Studies, 42*(3), 343–361.

Drinkwater, M. (1994). Knowledge, consciousness and prejudice: Adaptive agricultural research in Zambia. In I. Scoones & J. Thompson (Eds.), *Beyond farmer first: Rural people's knowledge, agricultural research and extension practice* (pp. 32–41). London: Intermediate Technology Publications and International Institute for Environment and Development.

Finnemore, M. (1997). Redefining development at the World Bank. In F. Cooper & R. Packard (Eds.), *International development and the social sciences: Essays on the history and politics of knowledge* (pp. 203–227). Berkeley, CA: University of California Press.

Franzel, S. (1997). *Types of on-farm trials*. Nairobi: Presentation notes for the workshop on participatory agroforestry research, ICRAF.

Franzel, S. (1999). Socioeconomic factors affecting the adoption potential of improved tree fallows in Africa. *Agroforestry Systems, 47*, 305–321.

Franzel, S., Coe, R., Cooper, P., Place, F., & Scherr, S. J. (2001). Assessing the adoption potential of agroforestry practices in sub-Saharan Africa. *Agricultural Systems, 69*, 37–62.

Franzel, S., Denning, G. L., Lillesø, J. P. B., & Mercado, A. R. (2004). Scaling up the impact of agroforestry: Lessons from three sites in Africa and Asia. *Agroforestry Systems, 61*, 329–344.

Giller, K. E. (2001). *Nitrogen fixation in tropical cropping systems*. Wallingford, UK: CABI.

Hazell, P. B. R., & Ramasamy, C. (1991). *The Green Revolution reconsidered: The impact of high-yielding rice varieties in South India*. Baltimore, MA: John Hopkins.

ICRAF (1996). Annual Report 1995. Nairobi: International Centre for Research in Agroforestry.

ICRAF (2001). Annual Report 2000. Nairobi: International Centre for Research in Agroforestry.

ICRAF (2001). Annual Progress Report. Agroforestry for sustainable rural development in the Zambezi river basin, Southern Africa Region, Report No. 01/01: Jan 2000–Mar 2001. Harare: SADC-ICRAF Southern Africa Regional Agroforestry Programme.

ICRAF (2003). Semi-Annual Progress Report. Agroforestry for sustainable rural development in the Zambezi river basin, Southern Africa Region, Report No. 02/01: April–Sept 2002. Harare: SADC-ICRAF Southern Africa Regional Agroforestry Programme.

Kanyama-Phiri, G., Snapp, S., Kamanga, B., & Wellard, K. (2000). Towards integrated soil fertility management in Malawi: incorporating participatory approaches in agricultural research. *Managing Africa's Soils* No.11. Edinburgh: IIED-Drylands Programme.

Kassam, A. (2003) An overview of social science research in the Consultative Group on International Agricultural Research. *International Social Science Journal* 55(177): 441–462

Kiptot, E., Hebinck, P., Franzel, S., & Richards, P. (2007). Adopters, testers or pseudo adopters? Dynamics of the use of improved tree fallows by farmers in western Kenya. *Agricultural Systems, 94*, 509–519.

Leeuwis, C. (with contributions from A.W. van den Ban) (2004). *Communication for rural innovation: Rethinking agricultural extension*. Ox/Ede: Blackwell Science and Technical Centre for Agricultural and Rural Cooperation.

Lipton, M., & Longhurst, R. (1989). *New seeds and poor people*. London: Unwin Hyman.

Long, N., & Villareal, M. (1994). The interweaving of knowledge and power in development interfaces. In I. Scoones & J. Thompson (Eds.), *Beyond farmer first: Rural people's knowledge, agricultural research and extension practice* (pp. 41–52). London: Intermediate Technology Publications and International Institute for Environment and Development.

Makumba, W. I. (2003). *Nitrogen use efficiency and carbon sequestration in legume tree-based agroforestry systems. A case study in Malawi*. Wageningen: Department of Soil Quality, Wageningen University and Research Center.

Makumba, W., Jansen, B., Oenema, O., & Akinnifesi, F. K. (2005). Influence of time of application on the performance of Gliricidia pruning's as a source of N for maize. *Experiential Agriculture, 42*, 1–13.

Matakala, P. W. (2004). *Feasibility study on integrating agroforestry into the agriculture and livestock husbandry systems in the communities of Cubo, Chivovo, and Mbindhzo in Massingir district* (p. 33). Maputo: World Agroforestry Centre.

Mkandawire, E. (2001). Evaluation of agroforestry technologies in Zomba district. M.A. Thesis, Department of Economics, Chancellor College, University of Malawi.

NSO. (2008). *2008 population and housing census: Preliminary report*. Zomba: National Statistical Office.

Nyirenda, M., Kanyama-Phiri, G., Böhringer, A., & Haule, C. (2001). Assessment of the economic performance of improved fallow agroforestry technology for smallholder maize production in central Malawi. Paper presented at the *5th International Conference of the African Crop Science Society.* Lagos, Nigeria, 21–26 Oct 2001.

Phiri, R., & Akinnifesi, F. (2000). Farmers' perception of two agroforestry species and their contribution to soil fertility replenishment in Malawi. Paper presented at the *Annual Agricultural Scientific Conference.* Lilongwe: Malawi Institute of Management (MIM), 6–10 Nov 2000.

Phiri, D., Franzel, S., Mafongoya, P., Jere, I., Katanga, R., & Phiri, S. (2004). Who is using the new technology? The association of wealth status and gender with the planting of improved tree fallows in eastern Zambia. *Agroforestry Systems, 79*, 131–144.

Place, F., & DeWees, P. (1999). Policies and incentives for the adoption of improved fallows. *Agroforestry Systems, 47*, 323–343.

Prain, G., Thiele, G., Ortiz, O., & Campilan, D. (2006). Rootcrops in agricultural societies: What social research has revealed. In M. M. Cernea & A. H. Kassam (Eds.), *Researching the culture in agri-culture: Social research for international development* (pp. 166–193). Wallington, UK: CABI.

Rapando, D. B. (2001). Influence of technology characteristics and socio-economic factors on adoption of agroforestry technologies in Southern Malawi. M.A. Thesis, Department of Economics, Chancellor College, University of Malawi and University of Nairobi.

Rathgeber, E. (2006). Who are the social researchers in the CGIAR system? In M. M. Cernea & A. H. Kassam (Eds.), *Researching the culture in agri-culture: Social research for international development* (pp. 51–77). Wallington, UK: CABI.

Rhoades, R. E., Horton, D. H., & Booth, R. H. (1987). Anthropologist, biological scientist and economist: The three musketeers or three stooges of farming systems research? In J. R. Jones & B. J. Wallace (Eds.), *Social science and farming systems research: Methodological perspectives on agricultural development* (pp. 21–42). London: Westview Press.

Rogers, E. M. (1983). *Diffusion of innovations*. New York: Free Press.

Schüller, M. (2004). Approved definitions of use and adoption, as of May 2004. Approved by the Regional Planning Meeting in Maputo, May 2004.

Schüller, M., de Wolf, J. J., & Matakala, P. (2005). *Changing Lives and Landscapes: Beyond the Figures.* Results of an Impact Assessment of Agroforestry Technologies in the ICRAF Zambezi Basin Agroforestry Project. Harare: World Agroforestry Centre (ICRAF).

Scoones, I., & Thompson, J. (Eds.). (1994). *Beyond farmer first: Rural people's knowledge, agricultural research and extension practice*. London: Intermediate Technology Publications and International Institute for Environment and Development.

Swinkels, R. A., Franzel, S., Shepherd, K. D., Ohlsson, E., & Ndufa, J. K. (1997). The economics of short rotation improved fallows: Evidence from areas of high population density in Western Kenya. *Agricultural Systems, 55*(1), 99–121.

Thangata, P. H., & Alavalapati, J. R. R. (2003). Agroforestry adoption in southern Malawi: The case of mixed intercropping of *Gliricidia sepium* and maize. *Agricultural Systems, 78*(1), 57–71.

van Donge, J. K. (2002). Disordering the market: The liberalisation of burley tobacco in Malawi in the 1990s. *Journal of Southern African Studies, 28*(1), 89–115.

van Donge, J. K. (2006). Ethnography and participant observation. In V. Desai & R. B. Potter (Eds.), *Doing development research* (pp. 180–188). London: Sage.

van Donge, J. K. (2007). Maize and entrepreneurship in rural Malawi. Paper presented at the *European Conference on African Studies (ECAS)*. Leiden, The Netherlands, 11–14 July 2007.

World Agroforestry Centre. (2002). *Transforming lives and landscapes: Annual report 2001–2002*. Nairobi: World Agroforestry Centre (ICRAF).

World Agroforestry Centre. (2004a). *Restoring hope, restoring the Environment: Annual report 2004*. Nairobi: World Agroforestry Centre (ICRAF).

World Agroforestry Centre. (2004b). *Working trees for working people: Annual report 2003*. Nairobi: World Agroforestry Centre (ICRAF).

World Agroforestry Centre. (2006). *Agroforestry science to support the millennium development goals: World agroforestry centre annual report 2005*. Nairobi: World Agroforestry Centre (ICRAF).

World Agroforestry Centre. (2007). *Annual report for 2006: Tackling global challenges through agroforestry*. Nairobi: World Agroforestry Centre (ICRAF).

World Agroforestry Centre. (2008). *Annual report 2007–2008: Agroforestry for food security and healthy ecosystems*. Nairobi: World Agroforestry Centre (ICRAF).

Chapter 11
Framing Participation in Agricultural and Natural Resource Management Research

Barun Gurung

Abstract All research practice draws on particular world views that are held and taken for granted by members of the research community. Researchers learn to perceive and order their research activities without reflecting on the special features of their particular world views. As a result, they construct and legitimate particular sets of beliefs about the ability of their particular research agendas to shape the ways in which social and technological phenomena are articulated and hence addressed. This chapter demonstrates how such world views are embedded in research practice as systems of classification that order and interpret incoming and outgoing information in ways that are very similar to human cultural practice. In particular, this chapter draws from anthropological concepts that describe similar processes used by social groups to produce and reproduce particular identities through processes that include and exclude other groups. Hence, it is argued that research practice needs to be more cognizant of the implicit assumptions that underlie it, because the outcomes are in no small measure predetermined by them.

Keywords Agricultural research, practice of • Frame analysis • Participatory research • Technologically-oriented research • World views

Introduction

Agricultural research practice is comprised of both technologically-oriented research and social science research. Both of these communities of research practice coexist in a relationship in which "the other" is characterized by oppositional categories that stem from the particular world views each group holds. For instance,

---

B. Gurung (✉)
Women Organizing for Change in Agriculture and NRM (WOCAN)
13403 Norden Drive, Silver Spring, MD 20906, USA
e-mail: gurungbarun@yahoo.com

L. German et al. (eds.), *Beyond the Biophysical: Knowledge, Culture, and Power in Agriculture and Natural Resource Management*,
DOI 10.1007/978-90-481-8826-0_11,

the following comments by a reviewer for a scientific journal (referred to here as "JXB") on why a paper on participatory research should not be accepted for publication reveals a bias that underlies technologically-oriented research practice:

> The manuscript by [XXX] et al. presents to a large extent an *anti-science view*. The perspective of the manuscript is to push a *sociological/political agenda* that is attractive to funding entities. Basically, the proposed approach to developing plant drought tolerance says that scientific knowledge is not needed to select improved cultivars and we simply let farmers make some casual observations on plant appearance. The farmers will be happy in the short run based on a season or two of selection, but ultimately there is no perspective on what, if anything, is being accomplished and if the plant selections will be serviceable in different seasons. While farmer feedback on new genotypes is useful, the idea of having farmers making scientific decisions seems bogus to me. The participatory concept has been pushed for a number of years now, but I still don't see that it has a place in a science-based journal. I am especially reluctant to make a place in a journal such as [JXB], which is focused on studying and utilizing information on basic plant mechanisms to improve plant performance. Without consideration in regards to the agenda of the conference, I would reject this manuscript. (emphasis added)

The reviewer has clearly not taken on board the progress made in fields like participatory varietal selection and participatory plant breeding, both of which combine the science of the researcher in (pre)selecting plants having appropriate traits for the farming system concerned with the farmers' intimate knowledge of what they want from a variety beyond simple yield maximization. Equally, this reviewer has not considered the rejection by farmers of many "improved" varieties developed by scientific breeders, especially in heterogeneous and low-productivity environments.

A similar logic manifests itself in the "popular" language of participatory practice (e.g. Chambers 1995 [2000]), which seeks to move research from "*things to people*" (e.g. from characteristics of varieties to preferences of farmers), from "*blueprint to process*" (e.g. from "We generate varieties to maximize yield in a specific environment" to involving, working with, and getting to know the people who will use the products of research), from "*supply-driven to demand-driven*" (e.g. from "Here are the technologies we've produced" to "What would you like?").

Both world views invoke distinction and comparison, or a logic that pits the other as "*bad*" and oneself as "*good*". The "technologically-oriented" bias of "scientific" research casts participatory research as driven by a "sociological agenda," and by extension, renders it "non-scientific[1]." On the other hand, the participatory approach, with its underlying claim of being focused on people, renders the technological agenda as "anti-people."

---

[1]A host of valid critiques have been leveraged on participatory research and other populist approaches. Some of the criticisms have included the tendency to equate Participatory Rapid Appraisal (a set of tools) with participatory research (a philosophical approach and methodological orientation to research), the tendency to apply a set of participatory techniques without adjusting patterns of perception and behavior, or the tendency to use "participation" as a form of political control – overshadowing questions of legitimacy, justice, power and the politics of gender and difference (Cooke and Kothari 2001; Kapoor 2002; Williams 2004). The view of the author is that while these critiques are often valid, it is not due to the inherent limitations of participatory research *per se* – but rather to how it has been practiced and by whom (e.g. those lacking a firm grounding in the underlying principles and theory), the result being its mis-application and the dilution of its intended effects.

This chapter utilizes frame analysis, a theoretical framework that explains how preconceptions influence the way individuals interpret and assess a given situation or issue, to take a critical look at research practice. In doing so, the chapter questions the basic assumption that research is an objective process, and puts forth the argument that embedded preconceptions of researchers and research systems powerfully (pre)determine the process and outcomes of research. The chapter puts forth an additional argument, that in order for agricultural research to effectively address poverty alleviation, it must critically examine the preconceptions that define the research process, and the subsequent understanding of poverty and strategies employed for it alleviation. The aim of this chapter is less to prescribe alternative formulations for agricultural research practice than to emphasize the need to critically examine underlying assumptions in any research process, and how these assumptions affect the subsequent outcomes of research and development (R&D). This is particularly critical for a research and development system like agriculture whose primary purpose is the redress of poverty.

Theoretical Framework

Frame Analysis

Frame Analysis is a useful tool for understanding how the world views of R&D actors are shaped, and in the process become an unquestioned part of who these actors are. It is based on the concept of frames, which finds its theoretical roots in cognitive and linguistic anthropology (e.g. Bateson 1972 [1954]; Hymes 1974; Frake 1964, 1977). As a concept, frames are interpretive frameworks used by actors to make sense of their world. Such "sense making" occurs through a combination of cultural memory, language, and a process of interpreting the actions and words of others through existing systems of meaning. For example, plant breeding as a research process is much like a cultural system, in that there are certain research protocols that are followed at each stage of the research cycle. The protocols are basically sets of rules and norms that function as guides for the researcher to adhere to. But in an important way, they also function as a frame of reference, through which incoming information (data) is interpreted, and outgoing information (what is disseminated) is legitimated. In this sense, research protocols act as frames.

Frames as interpretive frameworks determine people's behavior in several ways (e.g. Mooney 2003):

- Firstly, since they are deeply embedded in people's views and attitudes, they are evoked through language and inference.
- Secondly, new information is configured to conform to this dominant frame, and as a result, if "facts" do not conform to it, the new information is usually abandoned.

- Thirdly, attitude change cannot happen simply by new information, but rather requires changes in the dominant frame itself.
- Fourth, a frame can be changed over time.

"Selfing" and "Othering": The Politics of Identity

Within the overall concept of frames, this chapter draws on the additional concept of identity formation, which is useful in providing more detailed analysis of the processes that underlie the embedded world views of actors in a given social context. Identity formation is about processes of inclusion and exclusion, or what is commonly referred to in anthropology as "*selfing*" and "*othering*" (see for example, Baumann and Gingrich 2006 [2004]). Identity, in other words, is formed largely through a social process of including (or *selfing*) all that fits into the existing dominant frame defining oneself, while excluding (or *othering*) all other categories that do not readily fit the frame.

Viewed in terms of the two dominant communities of practice in agricultural research (the social and biophysical sciences), this chapter will attempt to demonstrate how the respective world views are constructed and reproduced through social classificatory processes that are similar to identity formation. In particular, the chapter will present two specific classificatory schemes that to varying degrees underlie both technologically-oriented research and participatory research practices. The two types of classification systems are: the logic of *segmentation* and the logic of *binary opposition.*[2]

The Logic of Segmentation: Silencing Alternative Articulations of Research Practice

This section will introduce the logic of *segmentation*, which is a type of classification that resides in people's minds to differentiate themselves from others, implicit to which is a hierarchy that places the insider at the apex and outsiders at the bottom. For the purpose of this analysis, segmentation, viewed within the system of agricultural research practice, places plant breeding at the apex, followed by a second level comprised of technologically-oriented disciplines such as agronomy, soils, pathology, horticulture, and postharvest production. Social science is relegated to the bottom level, in a category usually referred to as "socio-economics" (Fig. 11.1).

[2]The classificatory schemes have been adapted from the works of Edward Said (1978), E.E. Evans-Pritchard (1940), and Louis Dumont (1980) as cited in Baumann and Gingrich (2006 [2004]).

Level 1: Breeding

Λ

Level 2: Agronomy – soils – pathology – horticulture – post-harvest production

Λ

Level 3: Socio-economics

Fig. 11.1 Structure of the segmented hierarchy shaping disciplinary perceptions in agricultural research

There are a number of ways in which this segmented hierarchy keeps participatory research from making a meaningful contribution to the agricultural research agenda. First, the historical context in which the segmented hierarchy established itself sets a powerful norm that dictates and defines what constitutes "appropriate" research practice. Second, the asymmetry of the disciplinary hierarchy is continuously reproduced through language, or the particular ways that participation is characterized (and hence practiced) by technologically-oriented researchers.

The persistence of this segmented hierarchy in people's minds has two important implications for agricultural research. First, it privileges a narrow, technological definition of poverty and its redress – what I call the "scientification of poverty"– due to the implications that research is required for people to "develop." Secondly, by relegating participatory research to a supportive function, it effectively "silences" alternative formulations of poverty and its redress. Each of these consequences obscures alternative views of poverty, for example those viewing its causes as institutional in nature (e.g. insufficient cooperation due to a break-down in governance or the ineffectiveness of public institutions), political (e.g. failure to equitably share decision making authority or public resources), or even cultural (e.g. people having perceptions of well-being that go far beyond income levels or material needs). It also restricts the realm of "acceptable" participation to problems that are technological in nature – thus restricting the voice of local people in articulating other, more constraining factors (see also Chapters 2 and 13).

The Hierarchy in Its Historical Context

This hierarchy is rooted in the institutional history of international agricultural research, where the technology-first paradigm, actively promoted by the Rockefeller Foundation in the 1940s, was applied in the Mexican Agricultural Project (Anderson et al. 1991, cited in Reece 1998). One important element of this paradigm was the hierarchy of disciplines that resulted in response to problem definition: in Mexico, the problem was identified as the unwillingness of farmers to invest in soil improvement measures unless stem rust could be controlled. Since plant breeding and genetics were seen as the means to overcome stem rust, this decision elevated these disciplines to the apex of the pyramid (ibid).

This hierarchy was carried over, first into the International Rice Research Institute (IRRI) and then into other international agricultural research centers. Anderson et al. (1991, cited in Reece 1998) note that that "the classic cluster of agricultural sciences found at research stations in the US was transferred to IRRI … scientists in the classic cluster of disciplines had their own hierarchy, which placed breeding and genetic manipulation on top." Hence, the structure implied here was widely replicated throughout the Consultative Group on International Agricultural Research (CGIAR).

Language and Practice

The technological paradigm is continuously reproduced and maintained through the particular language and the ways in which it characterizes the participatory *other*. Participatory practice is talked about and cast in terms that are narrowly instrumental[3] – as demonstrated in the comments of CGIAR scientists captured in Box 11.1.

Box 11.1 Impression of biophysical researchers on the value of participatory research (PR) (Gurung and Menter 2004)

- … your product is only a tool, and it is a tool which is used by the final clients (farmers) to get the feelings back to the technologists … it is then used by the technologists to get the information that is required … which means you (PR people) have two clients … and you have been paying too much attention to one end of the clients (farmers) and not enough to the other end of the clients (technologists).
- … PR was set up as an end in itself but now people are asking where is the impact. So there is a slow swing away from it being an end in itself … to PR being just a tool. But what concerns me is when the PR methodology becomes more than a tool and an end in itself. All research dealing with agriculture is participatory by its very nature. PR is being presented with an image that it is only done with small farmers (with drawings on the ground conducted by illiterate farmers) and this has led to a division causing PR all sorts of problems. No organization, if it is authentic, will not be doing PR although it may not be calling it that. One must avoid the "messianic" mode … since it becomes offensive to many people. The idea that PR is new is problematic for many people. PR in (this organization) has become almost a dogma associated with one person. So if you want to talk about organizational change to integrate PR, one must be careful not to sell it as dogma but rather to talk about improving its efficiency …

(continued)

[3]Instrumental in the sense of being employed to achieve narrow functional ends. The 'instrumental' role of participatory research refers to it being co-opted by a technological research agenda, where participatory methods and approaches are utilized in isolation from their theoretical origins.

Box 11.1 (continued)

- … The problem of PR approaches is that the farmers' response is very context specific and as such, is prone to miss the bigger context. The technologist can provide more options. PR goes too much in the farmer direction.
- … There is also the feeling that too much money is being put in (by donors) to the "religious" aspect of PR when in fact it is just a tool and as such, it is bordering on a threat (to technologists). In budget crises (and in the fragmented environment) this is more so. In the present (institutional) structure, everybody sees everybody as a threat (competition is promoted).
- … In the course of the last several years (13 years) I have seen many things that are essentially tools that have become ends in themselves.

Though sampled from a small body of biophysical scientists, the views do in a fundamental way represent the larger body of scientific practice. For instance, as noted by Okali et al. (1994), one of the major aims of participatory practice began with the idea of operating at the interface between knowledge systems of scientific and local communities. Hence, by definition, they note, it is a people-centered process of "purposeful and creative interplay between local individuals and communities on the one hand, and outsiders with formal agricultural and research knowledge on the other." However, they cite several authors who note that formal research systems have little faith in the knowledge, experience, and capabilities of their "partners" at the interface. They point out that the problems associated with the interface are based on the view that formal research characterizes local knowledge as nonsystematic, unorganized, and not lending itself to standardization, and the view that farmer research cannot be improved because pragmatism and flexibility do not lend themselves to systematization (Gubbels 1988; Lightfoot 1987; van der Ploeg 1989; Stolzenbach 1992, cf. Okali et al. 1994).

The majority of biophysical scientists and projects that claim to be involved in participatory practice are in fact using those tools instrumentally to achieve goals that are defined in technological terms – rather than as a means to identify and redress social, political, or even economic constraints to development. Results of a survey conducted by the CGIAR Systemwide Program on Participatory Research and Gender Analysis show that most projects that claim to be using such approaches do not evolve beyond a researcher-led type of participation. One result of such a trend is that marginal end-users, such as women and the poor, tend to be consulted at a late stage in the evaluation of technologies that have already been developed and are ready for dissemination. Hence, the likelihood of these technologies matching their priorities is small (Johnson et al. 2000).

Finally, as Okali et al. note, in the overall, global context, "most programmes are largely concerned with evaluating, adapting, and extending technologies in the formal research system. … With respect to more client control of the testing process, … we must conclude that there is no clear, broad trend in this direction" (1994, p. 118).

The "Scientification" of Poverty

The hierarchy that is embedded in agricultural research systems leads to the "scientification of poverty," which is the belief that scientific expertise is a fundamental prerequisite to alleviating poverty. Demonstrations of this belief are evident, for instance, in the mission statement of the CGIAR, a global consortium of research centers structured around biophysical components (e.g. forests, water, livestock) or commodities (e.g. potato, wheat, rice). Its stated mission is to "achieve food security and reduce food poverty in developing countries through scientific research and research-related activities in the fields of agriculture, forestry, fisheries, policy, and environment". It goes on to list its "outstanding achievements" primarily in terms of technologies produced and disseminated over the course of its existence (e.g. see www.cgiar.org).

Implicit in the "scientification of poverty" world view resides a concept of poverty that is derived largely from a notion of material deprivation. Rooted in principles of classical economics, the narrow definition of poverty is further propagated through a system of measurement that measures changes in poverty status in relation to the inability of incomes to meet basic nutritional need. This approach is called the "poverty line" approach. It uses the calculation of daily calories for the average individual, multiplied by the number of persons in an average household, in order to estimate the sum needed to meet daily household nutritional needs. The poverty line approach separates households that earn less than this amount from those earning at least this amount. Data on household income that is collected routinely through household expenditure has become the agreed standard for measuring the incidence of poverty in individual countries as well as at the international level (Kabeer 2003).

Other approaches, such as the "capabilities approach" or "participatory poverty appraisal"[4], which provide a broader metric for viewing and measuring poverty, are silenced largely due to the persistent adoption of the poverty line approach, particularly in agricultural research and development. A major rationale for this is the belief that the introduction of other, multiple dimensions of poverty could seriously complicate its measurement (Malik 1998). To summarize, the technological orientation

[4]These alternative views of poverty encompass the idea of income and consumption as important only to the extent that they contribute to enhancing the capabilities of people to achieve the lives they want. Capabilities through participation include meeting basic needs such as nourishment and health, as well as more complex social ones such as enhanced community status and self respect.

privileged by the logic of segmentation effectively silences alternative formulations of development and legitimates the persistent definition of poverty in narrow, technological terms.

The Binary Logic of Distinction and Comparison: A Language of Exclusion

This section will introduce a system of binary logic, which in its simplest form is a framework that uses oppositions and exploits them to maximum contrast. It will be argued that participatory rural appraisal (PRA), which is generally viewed synonymously with participatory practice in agricultural research[5], employs a form of binary logic to make itself distinct from the dominant (development) discourse. This has led to the development of typologies of participation and the belief that different results can be achieved depending on the particular level of participation being employed in a research and development process. It is argued that such dichotomies only strengthen the perceived and real "instrumental" character of participatory research because of the focus on a set of tools rather than a reengagement with the theoretical and ideological underpinnings of earlier participatory approaches, for which the emphasis had been on empowerment and "conscientization".

Participatory Rural Appraisal (PRA)

The development of PRA is largely related to the critique of development practice (e.g. Chambers 1983). With its focus clearly on practical issues rather than theory (e.g., the theory of empowerment), PRA draws its conceptual underpinnings from a series of binary contrasts it makes with the dominant, linear approach to development (Table 11.1) (Chambers 1995 [2000]).

One significant outcome emerging from the binary classificatory scheme underpinning PRA has been the dichotomy between so-called "functional" and "empowering" approaches to participation, a tension that has been widely acknowledged in the literature (e.g. Cooke and Kothari 2001; Rahnema 1992). "Functional" participation refers to a process whereby the research and development process is largely guided by actors who are external to the process. Decision-making and agenda-setting are outside the control of the so-called end-users or farmers. On the other hand, "empowering" research and development refers to a transformative agenda, wherein

[5]A distinction is made between participatory rural appraisal (PRA), which in addition to emphasizing a set of tools (as mentioned above), strives for speed and focuses on practical issues rather than being theory driven, and participatory research (PR), which focuses on fostering an awareness among farmers or the poor themselves of the reasons for their economic, social, and political status (see Wright and Nelson 1995).

Table 11.1 The binary opposition of "participatory" and "conventional" research approaches (adapted from Chambers 1995 [2000])

Parameter	Participatory research (e.g. PRA)		Conventional research
Mode	Process	>	Blueprint
Keyword	Participation	>	Planning
Goals	Evolving	>	Preset
Decision-making	Systems	>	Centralized
Analytical assumptions	Systems	>	Reductionist
Methods/rules	Systems	>	Standardized
Technology	Varied basket	>	Fixed package
Interactions	Enabling	>	Controlling
Client viewed as	Actors/partners	>	Beneficiaries
Force flow	Demand driven	>	Supply driven
Output	Diverse capabilities	>	Uniform infrastructure
Planning and action	Bottom-up	>	Top-down

end-users (farmers) participate in the process that changes meanings, power relations, or social organization (c.f. Goodwin 1998).

More elaborate and detailed typologies have emerged from this basic dichotomy. Based loosely on four types of participation – contractual, consultative, collaborative, and collegial – Biggs and Farrington (1991) illustrate the various types of engagement between researcher and farmer that are made possible with participatory practice. Another, more elaborate typology outlines different types of participation in terms of who makes decisions and how (Fig. 11.2).

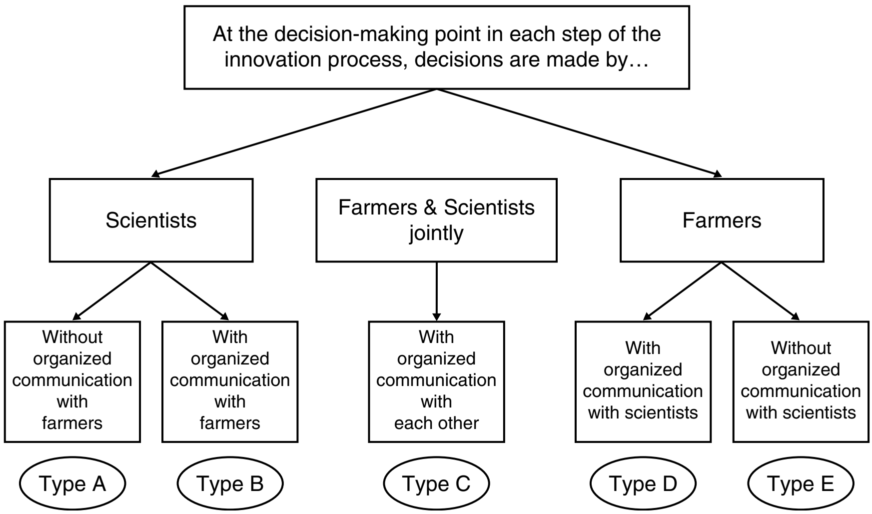

Fig. 11.2 Types of participatory research based on locus of decision-making (derived from Lilja and Ashby 1999)

While serving as a general framework for participatory practice, such typologies are meant to serve two basic functions: guide research and development implementation, and serve as a tool for assessing the impact of different types of participatory practice. However, they often do little to enable more empowering research practices. Moreover, a central weakness of such typologies is the limited theoretical content related to processes of domination and change, and their inability to sufficiently problematize the role of the researcher. Often, this role is viewed as that of a neutral facilitator in the process of change and distribution of power (e.g. Wright and Nelson 1995. Yet most social scientists now agree that no facilitator is neutral and disciplinary specialists – when acting as facilitators – often bias the process and outcomes toward their own agendas.

In sum, while the PRA-centered approach may generate considerable local knowledge for local use, it makes little use of theoretical and comparative information to develop an understanding of how local livelihoods and production practices are shaped by the wider (political, economic) systems in which they are embedded. The scope of questions generally explored through PRA (largely diagnostic, technical, and apolitical) also limits its potential in elucidating a wider host of (potentially determining) constraints. While there is no denying that a PRA-centered approach does emphasize a need for change in behavior and attitudes of individual experts (e.g. researchers, development agents), it says little about trying to understand how the silence and invisibility of the poor is maintained by the workings of the broader economic and political systems in which they are embedded. Projects also tend to apply a full suite of PRA tools without a clear understanding of how they fit into broader project or community objectives – and much of the information remains unused. Finally, there is little insight from such participatory projects that contributes to the body of theoretical knowledge on which future strategies can draw (Wright and Nelson 1995).

Reframing Participation for Transformation

The outcomes of the existing social realities of both the technological and participatory paradigms in agricultural research have tremendous implications for the way poverty is conceptualized and addressed. An inclusive process in agricultural research requires a reformulation of participatory practice. Such a reformulation would necessarily begin with deemphasizing the predominant focus on the "speedy" and "practical" dimensions of PRA, and revisiting the theoretical and ideological underpinnings of early participatory practice.

Review of the historical development of participatory research, both as a concept and as practice, is an important first step in understanding how the various strands emerged and how PRA is situated within this overall context. PRA is a relatively new development in the overall historical context of participatory research and is usually associated with Robert Chambers (1983). Earlier approaches to participatory research are closely tied to developments in action research in the field of anthropology. The 1930s' experimental project "An Anthropology of Ourselves" is generally considered the forerunner to participatory research because unlike conventional research, this experimental approach trained and employed "mass observers" to systematically observe and engage with the wider public. While some criticism emerged to this approach, principally based on its lack of "scientific" and "theoretical" rigour (e.g. Firth 1939; Marshall 1937), it nevertheless was groundbreaking because the "mass observers" who collected information from others also used themselves as subjects of study – representing a significant break from the concept of the neutral observer.

A second strand in the development of participatory research is associated with the radical approaches to development in the 1960s and 1970s (Fals Borda 1988; Freire 1972). Commonly referred to as "participatory research and development" (PR&D), this approach opposed development that promoted oppressed people's participation in unaltered systems that maintained dependency and domination. In this context, Paulo's Freire's concept of "conscientization" and critical methods in adult education had a significant influence on participatory approaches. The theoretical contributions of this approach are the multiple roles of the researcher (such as facilitation, conflict management, and coactor in knowledge production); and the learning partnership between researcher and participant in which both have knowledge to contribute. Both critically reflect and analyze, leading to personal transformation and enhanced awareness of the reasons behind one's political and economic marginalization ("conscientization") (Maguire 1987).

The historical context of action research and emancipating ideology provides important cornerstones for reframing participatory research in agricultural research and development systems. Drawing from these earlier approaches, a reframed participatory approach needs to consider how to increase the participants' understanding of their situations (e.g. what keeps them from achieving their aspirations) and their ability to use this information, in conjunction with local knowledge of the viability of different political strategies, to generate change for themselves. It also needs to aim at finding ways for such processes to contribute to the production of knowledge that is useful for enabling local development priorities to be realized, and generated through effective engagement between researcher(s) and subject(s). Finally, such a reformulation of participatory practice needs to become institutionalized in the structure and culture of agricultural research organizations – most notably through a loosening of the reins of participation to enable participants to prioritize actions that fall outside of (but may be complementary to) the technological or biophysical realm.

Conclusion and Recommendations

The chapter began by questioning the basic assumption that research is an objective process and put forth the argument that embedded world views implicit to all research practice powerfully (pre)determine the process and outcome of research. The chapter went on to outline two types of classification schemes that inform the world view of the two communities of research practice in agriculture. The first, segmentation, described the process by which technologically-oriented research maintains the hierarchy of disciplines that prioritizes a technology focus, and marginalizes other formulations of research practice. As a result, poverty and its redress are defined in purely technological terms. The second, the binary logic of distinction and comparison, describes a process in which PRA assumes distinction, as legitimate social science, through comparison with and thus exclusion from the dominant technological paradigm. However, the PRA world view, driven by a narrow focus on practicality and speed, lacks the theoretical and ideological underpinnings of true participatory research. The chapter argues for a reformulation of participatory practice that is situated in more conventional theoretical and ideological underpinnings of social science practice.

Finally, in arguing for a more relevant research and development process, one that seeks to redress poverty and become more demand driven, the agricultural research and development system needs to reformulate participatory research practice. It must move away from its current PRA orientation to one that is rooted in and reflects the theoretical and ideological underpinnings of participatory research in empowerment and emancipation. This would require the following:

1. Increased training of researchers in methods such as "training for transformation," to heighten their awareness of and sensitivity to what constitutes effective facilitation and management of participatory research processes.
2. Development of new configurations of knowledge and skills, such as through the formation of interdisciplinary teams with equal status, and maximum field-based collaboration and information sharing, among diverse disciplines. This must be based on the belief that the research systems' capacity to innovate depends upon its ability to respond to problems by assembling relevant people, by building transdisciplinary teams, and by reconfiguring them into new teams as the critical research questions – in large part defined by the beneficiaries themselves – evolve. The notion of "team" is based on much more than a group coming together; it must be grounded in how its members interact and are managed so as to make their interaction meaningful (as viewed by the intended beneficiaries).
3. The institutionalization of learning and change mechanisms within research and development organizations themselves. This can be enabled through in-house reflections on the effectiveness of different institutional innovations (e.g. in team constitution and management, or in methodologies) and through frequent consultation of the intended beneficiaries – men *and* women, "progressive" *and* difficult-to-reach farmers – as to the usefulness of agricultural research and development. It can also be advanced by building systems of "downward accountability" that are specifically reflected in the individual terms of reference of researchers and in their performance appraisals. Finally, organizational policies and procedures that enable the participation of local communities in agenda-setting for research and development are essential.

References

Bateson, G. (1972 [1954]). *Steps to an ecology of mind*. New York, NY: Ballentine.

Baumann, G., & Gingrich, A. (Eds.). (2006 [2004]). *Grammars of identity/alterity: A structural approach*. New York, NY: Berghahn Books.

Biggs, S. D., & Farrington, J. (1991). *Agricultural research and the rural poor: A review of social science analysis* (p. 139). Ottawa: International Development Research Center (IDRC).

Chambers, R. (1983). *Rural development: Putting the last first*. London: Longman.

Chambers, R. (1995 [2000]). Paradigm shifts and the practice of participatory research and development. In N. Nelson & S. Wright (Eds.), *Power and participatory development: Theory and practice* (pp. 30–42). London: Intermediate Technology Publications.

Cooke, B., & Kothari, U. (2001). *Participation: The new tyranny?* New York, NY: Zed Books.

Fals Borda, O. (1988). *Knowledge and people's power*. New Delhi: Indian Social Institute.

Firth, R. (1939). An anthropologist's view of mass-observation. *Sociological Review, 31*, 166–193.

Frake, C. O. (1964). How to ask for a drink in Subanum. Part 2: The Ethnography of Communication. *American Anthropologist, 66*(6), 127–132.

Frake, C. O. (1977). Plying frames can be dangerous. *Quarterly Newsletter of the Institute for Comparative Human Development, 1*(3), 1–7.

Freire, P. (1972). *The pedagogy of the oppressed*. Harmondsworth: Penguin.

Goodwin, P. (1998). 'Hired hands' or 'local voice?' Understandings and experience of local participation in conservation. *Transactions of the Institute of Geographers, 23*, 481–491.

Gubbels, P. A. (1988). Peasant farmer agricultural self-promotion: The World Neighbors Experience in West Africa. *ILEIA, Newsletter, 4*(3), 11–14.

Gurung, B., & Menter, H. (2004). Mainstreaming gender-sensitive participatory approaches: The CIAT case study. In D. Pachico (Ed.), *Scaling up and out: Achieving widespread impact through agricultural research*. Cali, Colombia: Centro Internacional de Agricultura Tropical (CIAT).

Hymes, D. (1974). Social anthropology, sociolinguistics, and the ethnography of speaking. In D. Hymes (Ed.), *Foundations in sociolinguistics: An ethnographic approach* (pp. 83–112). Philadelphia: University of Pennsylvania Press.

Johnson, N., Lilja, N., & Ashby, J. (2000). Characterizing and measuring the effects of incorporating stakeholder participation in natural resource management research: Analysis of research benefits and costs in three case studies. *Working Document* No. 17. Cali, Colombia: Participatory Research and Gender Analysis Program, Centro International de Agricultura Tropical (CIAT).

Kabeer, N. (2003). *Gender mainstreaming in poverty eradication and the millennium development goals*. Canada: Commonwealth Secretariat.

Kapoor, I. (2002). The devil's in the theory: A critical assessment of Robert Chambers' work on participatory development. *Third World Quarterly, 23*(1), 101–117.

Lightfoot, C. (1987). Indigenous research and on-farm trials. Paper presented at workshop on *Farmers and Agricultural Research: Complementary Methods.* Institute of Development Studies, University of Sussex, Brighton, UK, 27–31 July 2006.

Lilja, N., & Ashby, J. A. (1999). Types of participatory research based on locus of decision making. *PRGA Working Document* No. 6. Cali, Colombia: Participatory Research and Gender Analysis, Centro International Agricultura Tropical (CIAT).

Maguire, P. (1987). *Doing participatory research: A feminist approach*. Amherst, MA: Center for International Education.

Malik, S. J. (1998). *Rural Poverty and Land Degradation: A Reality Check for the CGIAR* (p. 43). Consultative Group on International Agricultural Research (CGIAR), Technical Advisory Committee, TAC Secretariat. Rome: Food and Agriculture Organization of the United Nations.

Marshall, T.H. (1937). Is Mass-Observation moonshine? *The Highway, December*, 48–50.

Mooney, C. (2003). Breaking the frame. *The American Prospect, 14*, 4 March.
Okali, C., Sumberg, J., & Farrington, J. (1994). *Farmer participatory research: Rhetoric and reality*. London: Intermediate Technology Publications.
Rahnema, M. (1992). Participation. In W. Sachs (Ed.), *The development dictionary: A guide to knowledge as power* (pp. 116–131). London: Zed Books.
Reece, J. D. (1998). *Agricultural research practice for environmental management and poverty reduction: The case of CIAT* (p. 256). Ph.D. Thesis, University of East Anglia, Norwich.
Stolzenbach, A. (1992). Farmers experimentation: What are we talking about? *ILEIA Newsletter, 9*(1), 28–29.
van der Ploeg, J. D. (1989). Knowledge systems, metaphors and interface: The case of potatoes in the Peruvian highlands. In N. Long (Ed.), *Encounters at the interface: A perspective on social discontinuities in rural development, Wageningen Studies in Sociology, 27* (pp. 165–182). Wageningen: Agricultural University.
Williams, G. (2004). Evaluating participatory development: tyranny, power and (re)politicization. *Third World Quarterly, 25*(3), 557–578.
Wright, S., & Nelson, N. (1995). Participatory research and participation observation: Two incompatible approaches. In N. Nelson & S. Wright (Eds.), *Power and participatory development: Theory and practice* (pp. 43–59). London: Intermediate Technology Publications.

Chapter 12
Anthro-Apology? Negotiating Space for Interdisciplinary Collaboration and In-Depth Anthropology in the CGIAR*

Ritu Verma, Diane Russell#, and Laura German

Abstract Equitable interdisciplinary teamwork is easier said than done. For, it is not simply a matter of adding a "pinch" of social science into a larger interdisciplinary team, and stirring. Putting interdisciplinarity into action requires a more distilled and nuanced approach involving negotiation, bargaining and, sometimes, contestation and resistance between and among different domains of disciplinary actors, knowledge, meanings and understanding. The overarching goal for anthropologists and socio-cultural scientists is to integrate theories, methodologies, and practices of the study of culture, politics, and social relations into agricultural and natural resource management research, as well as to integrate themselves into larger interdisciplinary teams on an equal footing. As McDonald argues in his call for a discussion on keeping the culture in agriculture, "by putting culture squarely at the center of any analysis of agriculture, we seek to "put people first" by exploring the complex ways that people conceptualize, give meaning to, and organize around agriculture"

---

*This paper is a revised and expanded version of a paper initially presented at the American Anthropological Association annual conference in Washington D.C. in 2005, entitled "Anthro-Apology?: Negotiating Space for Interdisciplinary Collaboration and Rigorous Anthropology in the CGIAR" by the same authors.

#The author's (Diane Russell) contributions to this chapter do not represent official opinions or positions of either USAID or the Government of the United States of America.

R. Verma (✉)
Out-of-the-Box Research and Action,
and
Department of Anthropology, School of Global Studies, University of Sussex,
Arts CC128, Falmer, Brighton, BN1 9SJ, England
e-mail: rvermapuri@gmail.com

D. Russell
US Agency for International Development 1300 Pennsylvania Ave NW, Washington DC 20538;
e-mail: diandeva@gmail.com, dirussell@usaid.gov

L. German
Center for International Forestry Research (CIFOR), Box 0113 BOCBD,
Bogor 16000, Indonesia
e-mail: l.german@cgiar.org

L. German et al. (eds.), *Beyond the Biophysical: Knowledge, Culture, and Power in Agriculture and Natural Resource Management*,
DOI 10.1007/978-90-481-8826-0_12,

(McDonald 2005, p. 71). However, putting culture into the analysis of agriculture in research systems long dominated by biophysical scientists and approaches, such as within research centers of the Consultative Group for International Agricultural Research (CGIAR), is challenging. This chapter describes the various dilemmas, challenges, and opportunities encountered by sociocultural scientists in interdisciplinary projects within the CGIAR. It argues that to more effectively address the needs and realities of vulnerable women and men at the grassroots, agricultural research systems must take more steps to fully integrate social, cultural, and political lines of inquiry into their core mandates.

Keywords Agricultural research • Anthropology • CGIAR • Interdisciplinarity • Sociocultural science • Development • Anthropology of Science

Introduction

> Social research is an indispensable part of the mandate and broad research program of all centers in the CGIAR system. Yet it is a research domain that still today has to keep fighting hard for asserting itself against institutional barriers, scholarly biases from other researchers or some centers' managers, and virtually constant underfunding.
>
> – Cernea (2005, pp. 73)

The CGIAR (or "CG" for short) is a system of 15 international organizations working on poverty alleviation through agricultural research-for-development, where a very small number of anthropologists and sociocultural scientists[1] collaborate with thousands of scientists from the biophysical and economic domains to carry out research, innovate, and provide solutions toward poverty reduction and achieving food security. These scientists include the authors of this chapter, all of whom worked for the CGIAR when the idea for this paper was first conceived, and one of whom continues to work there. The chapter begins by briefly describing the role of anthropology and other sociocultural sciences in the CG as they struggle to integrate cultural, social, and political–economic approaches into predominantly technically and economically-oriented "solutions" to address persistent issues of economic poverty and the struggles of local women and men to sustainably manage natural resources in countries in the South. The second part deconstructs and critically describes the challenges faced by these scientists in the CG. The third section takes a more "constructive" look at some of the processes of negotiation, bargaining, and innovations that take place in interdisciplinary teams in the CG. The chapter concludes by arguing that while the status of social science has improved since the CGIAR was first established, the CG can take greater constructive steps to include social, cultural, and political lines of inquiry into its "core" research dominated by the biophysical sciences.

[1] Prominent sociocultural disciplines include anthropology, sociology, and political science.

A Brief History of Discourses, Contestations, and Negotiations by Sociocultural Scientists for Legitimatization Within the CGIAR

The lingering legacy of the Green Revolution that brought agricultural science into prominence in the 1970s and 1980s continues to shape agricultural scientists' attitudes toward problems and solutions to development. Despite the challenges encountered and lessons learnt from failed attempts for a Green Revolution in Africa (Holt-Gimenez et al. 2006), recent initiatives such as AGRA (the Alliance for a Green Revolution in Africa) are once again focusing on a second attempt at an African green revolution. Little attention is given to the context-specific factors that led to "successes" of the Green Revolution in Asia, and the reasons for failures in attempting a Green Revolution in Africa the first time around. History is therefore suspended and the stage is set up once again for repeating past mistakes, with even less integration and support for the sociocultural sciences than before.

What is also different this time around is the role of the biotechnology revolution in agriculture which promotes genetically engineered crops – a role that the CG has also taken on in its research priorities (Cleveland 2006; CGIAR Science Council 2005). Cleveland argues that although "the same assumptions dominate the biotechnology revolution as dominated the Green Revolution, … unlike the Green Revolution, the biotechnology revolution is controlled by the private sector, and thus the CGIAR is forced to collaborate with biotechnology corporations if it wants to pursue this strategy" (Cleveland 2006, p. 6); one that is significantly driven by fertilizer and seed companies.

It is interesting to note that while the CG's current priorities feature biotechnology, increasing commercialization, and market orientation, there is very little mention of sociocultural research or participatory approaches within dominant discourses. The assumption is that improved technology is the main driver of innovation and poverty reduction in the agricultural sector. Yet it is clear that enabling conditions such as market access, gender equity, access to services and resources, and secure property rights are fundamental to improved performance – and social scientists play a key role in understanding these dimensions. With this context as a point of departure, our interest is to shed some historical background on the CG and the role of social sciences within it. It is therefore useful to briefly review attempts at integrating, stock-taking, and reflecting critically on the status and role of social sciences over the years.

The CG was established in 1971 with the aim of crop improvement. It played a significant role in some of the successes (and perhaps failures) of the Green Revolution and continues to play an influential role in agricultural research and development in the South (Cleveland 2006, p. 4). The CG began its history with the inclusion of the social sciences at the very "bottom" in a context very much dominated by biophysical scientists (Cernea 2005, p. 74; see also Chapter 11). The social sciences were also introduced with a narrow conceptualization of their role as an "auxiliary" function to the leading biophysical sciences, rather than an independent domain of disciplines in their own right (ibid., p. 81). Although the pioneering social scientists faced many struggles, obstacles, and a continually marginalized status, they also made some interesting contributions to their respective disciplines and to the CGIAR as a whole. For instance, these include influencing the incorporation of innovations in participatory tools and approaches (e.g., Landcare, African Highlands Initiative), design and popularization of the farmer field school approach, and improving women's access to agricultural extension (e.g., Janice Jiggins, Louise Fresco). Other innovations focused on the use of action research to improve conventional research and development practice. One body of work, for example, enabled farmers to move from awareness and concern (yet inaction) about natural resource degradation to behavioral changes through governance innovations (German et al. in press; Mazengia 2006).

As we elaborate later in this chapter, from 1974 to the mid-1990s, the Rockefeller Foundation also played a critical role in boosting the influx of and attempts at integrating anthropologists and sociologists in the CGIAR through a program of postdoctoral fellowships. While the CG benefitted greatly and the program produced scholars and researchers who would go on to be leaders in their fields, it did not manage to successfully elevate the status or integrate sociocultural science into the central mandate and practices of the CG. More than a decade after the "Rocky Doc" program came to a close, Cernea notes, "not only has each year's 'infusion' of young social researchers been closed down, but a gradual process of shrinking resources for this research area has also set in. The trend is even more visible in the first years of the current decade" (2005, p. 78), and remains unabated.

Cernea argues that although things have changed since the early days of the CG, which were marked by narrow definitions of the rationale and role for the social sciences, the basic assumption that social scientists and anthropologists play an auxiliary function has not been dislodged (ibid., p. 81). Indeed, in many centers, the role of anthropologists is regarded as "service providers" to biophysical scientists. For instance, one of the authors of this chapter experienced heated debates with a team of biophysical scientists, who insisted that her role was a "supportive" one to their "core" biophysical mandate – namely, to assist them in enhancing adoption rates for their technologies by rural farmers. While the recognition of social sciences has come a long way in the CG, anthropology and other sociocultural sciences are particularly marginalized relative to economics, and lack resources, support, and institutionalization as disciplinary domains in their own right. Hence, "the need for independent social research on those major topics that are par excellence social, behavioral, cultural" is not adequately recognized (ibid., p. 81). As a consequence, inadequate attention, discursive space, and research prioritization is given to context-specific cultural, political, and social realities or to inequitable power relations and marginalities. This is cause for alarm to anthropologists, the CGIAR as a whole, and its supporters.

As recently as 2000, the CGIAR's strategy called for an increased role for social science research within CG Centres (McDonald 2005; Cernea 2005; CGIAR Science Council 2000). It stipulated:

> There are important developments in sociology, anthropology, social geography, and economics relevant to the future strategy and research priorities of the CGIAR … Behavioural and socio-cultural variables of resource management are no less important for resource sustainability than physical parameters. These variables require in-depth exploration through the use of social research methods (CGIAR Science Council 2000).

While such discourses promote the public face of the CG and are commendable, the everyday practices and realities are often quite different. While the discourse in 2000 emphasized an intensified role of social science research, "the path to such laudatory goals cuts against disturbing trends within the CGIAR, which has experienced staff depletion and deep cuts in its support for and integration of the social sciences in its myriad research facilities and products" (McDonald 2005, p. 71).

> Cernea similarly reflects, "within the vast total research portfolio of the CGIAR, the size of social research is unexpectedly small and underfinanced. This is paradoxical, because the strategic relevance of social research to the CGIAR's overall research for food security and poverty reduction is necessarily high. Such inverse proportionality is therefore abnormal. As with any inside abnormality, the effects are dysfunctional to the system's operations and performance" (ibid., p. 73).

Statistics compiled by the Gender and Diversity Program (G&D) of the CGIAR in their 2008 systemwide human resource survey indicate that the number of staff in the natural sciences is three to four times greater than that of the social sciences (G&D 2008). We also find that the spread is even greater for the core scientific functions, with social scientists filling only 17% of the principal scientist positions in 2008 (as compared to 78% for natural scientists) and only 19–20% of the senior scientist and scientist positions. These numbers must be nuanced by the fact that the number of sociocultural scientists in the CG declined from 163 in 1995 to 126 in 2002 (Cernea 2005; CIAT 2002), a trend which continued in a number of centers where the authors have worked in the recent past. If data were available to disaggregate economists from sociocultural scientists,[2] the figures would perhaps be even more extreme for most of the CG centers. In 2002, only 21% of all social scientists were found to be from anthropology, sociology, and "related fields" (political science, policy, communications, and extension education) (CIAT 2002).

While the small numbers of social scientists in the CGIAR are struggling to do justice to the social scientific mandate, they do this with very few resources, in isolation from one another, often on the defensive, and with weak links to leading centers of social scientific thought and practice. Some of the questions that arise from this problematic situation are: Why does the CG not back up and believe in their own statements and discourses (Cleveland 2006, p. 4)? What do most CG scientists and policy makers think should be the role of anthropology and sociocultural research in the CG (ibid.)? In order to answer the last question, it is first important to ask what definitions of "development," "sustainable agriculture", and "natural resource management" are being used, as this in turn defines the roles of farmers, biophysical scientists, economists, and sociocultural scientists (ibid.). What must be investigated are the various assumptions and meanings that differently trained and positioned scientists bring to different definitions and concepts, and how this might explain the diminished role and marginalized space of sociocultural science in the CG. In order to do so, it is useful to critically reflect on the assumptions underlying the CG's establishment.

---

[2] The 2008 G&D survey did not disaggregate between economists and sociocultural scientists.

The initial conceptualization of the CGIAR was based on a model rooted in the Green Revolution which aimed to transform agriculture through the spread of new technology such as improved crops, chemical fertilizers, etc. This is a priority that the CG supported significantly in the first attempt and continues to support in the second attempt at a Green Revolution in Africa. Many critics have called into question the purported "gains" of the Green Revolution, demonstrating that these were uneven, with many small-scale farmers not benefitting directly and some becoming more marginalized than before (Cleveland 2006; Holt-Gimenez et al. 2006; Shiva 2000). For instance, in Asia the Green Revolution led to a much less secure seed supply as multinational corporations sought to gain ownership rights to plant germplasm (Shiva 2000). It also exacerbated the social disparities in places such as Bangladesh due in part to increased landlessness – which in turn stemmed from farmers' inability to pay debts acquired to purchase inputs when harvests failed because of environmental uncertainty (Bodley 1994). Cleveland (2006) argues that in contexts such as Mexico the focus was on large-scale farmers in more optimal growing environments over small-scale farmers in marginal areas. Although the hope was that small-scale farming would simply disappear, small-scale farmers not only persisted but also resisted Green Revolution discourses and interventions. The inherent assumption, Cleveland argues, is that people will move away from farming as a way of life; and if the end goal is to eliminate this as a form of livelihood, then understanding local farmers is not necessary, and therefore social science is not required "except in formal statements to appease popular and donor sentiment" (ibid., p. 5). Other assumptions made by biophysical scientists and economists are that farmers make economic decisions considered rational by the logic of formal economics, and all it takes is "for scientists to get the biology right and the economists to get the prices right" (ibid., p. 5). However, this perspective suspends social, cultural, and political realities from the analysis. Nevertheless, the persistence of economic poverty and decline in people's ability to sustain their environments and natural resources in the South has also led to rethinking of the very assumptions on which agricultural research is premised, including the critical need for research on social, cultural, and political realities – not just "technical" and economic ones.

Anthropologists, social scientists, and their supporters within and outside the CGIAR are aware of the pressing issues faced in trying to integrate social, cultural, and political issues into broader research agendas in the CG, as well as the reconciliation of different meanings and assumptions. As recently as 2002, an international conference on social research in the CGIAR was held in Cali, Colombia in which participants from 13 of the CGIAR's 15 centers and from outside academic and research organizations met to discuss issues of staffing, status, and difficulties in implementing social scientific research. This chapter discusses many of the issues raised at the conference, such as declining numbers of social scientists, gaps between political–economic trends and grassroots realities, and the relegation of the social sciences to an auxiliary role (Cernea 2005).

In 2005, the CGIAR's new strategy moved further away from identifying social science as a priority and subject of study in its own right, and adopted a sectoral approach focusing primarily on biophysical aspects of agriculture such as biodiversity, genetic improvements, high level commodities and products, water/land/forests, and institutional innovations. Of the five system priorities, only one has a primary emphasis on social science,[3] namely, "improving policies and facilitating institutional innovation to support sustainable reduction of poverty and hunger" (CGIAR Science Council 2005, p. 51). Yet a closer look at subpriorities highlights a continued bias toward technology ("science and technology policies and institutions") and markets. Of the one subpriority (out of 20) with a clear sociocultural emphasis – "rural institutions and their governance" – the general goal is to, "enhance the role that rural organizations and innovative institutional partnerships play in *maximizing impact from agricultural research* and in *creating marketing platforms* for smallholder producers" (emphasis added). In short, social science has no role outside of supporting technology adoption and market integration. Perhaps the subpriority with the greatest scope for more in-depth sociocultural inquiry is, "improving research and development options to reduce rural poverty and vulnerability," because of its more open-ended emphasis on risk, potential for exploring factors constraining rural livelihoods, and approaches to rural development. In identifying the "mobilization of new sciences", the strategy indicates that there will be strategic shifts in scientific expertise, "some in different directions", including "new social science capacities (or linkages) in poverty analysis, and market analysis and global trade" (CGIAR Science Council 2005, p. 61). The Science Council is conspicuously unclear and silent on the role and marginalization of the sociocultural sciences in the system.

The Council's statement on the role of gender analysis is also problematic. Gender issues and analysis are not integrated throughout the document to the extent they should be, and "merit" only one short paragraph in a document totaling more than 70 pages:

> It is intended that in the translation of strategic priorities into projects and programs, regional (biophysical and social) factors will be taken into account. In particular, the gendered nature of agricultural production will influence research in areas with large numbers of women farmers (e.g. SSA) and approaches to defining pro-poor traits for improvement, market chain research, biodiversity conservation, and opportunities for land tenure, amongst others (CGIAR Science Council 2005, p. 63).

Gender issues, it seems, were an afterthought, as in many "add-women-and-stir" approaches characterized by the outdated 1970s Women in Development (WID) approach[4] that assumed that issues of women's equality and economic poverty could simply be addressed by adding women into gender-blind models of development. In such an approach, women's role in agriculture and the management of natural resources is limited to acknowledging "areas with large numbers of women," but with no conceptualization and analysis of the critical role that agricultural practices, the commoditization of agriculture, access to natural resources, and gender and

[3] Unless one is interested in studying critically the anthropology of science or the impacts of technology, in which case all the priorities might be a good subject for reflexive and critical research.

[4] For an overview of WID and more recent approaches to the integration of gender into development, see Rathgeber (1990) and Parpart and Marchand (1995).

power relations play for women worldwide. While other institutions of research have moved toward embracing a more nuanced and sophisticated study of gender issues, the CGIAR is sadly lagging behind in this critical area, where women are not only a majority of agriculturalists in Sub-Saharan Africa and other parts of the "developing" world, but are also often the most vulnerable and marginal sectors of society.

The continued weakness in recognizing the social sciences and its diminishing role in the CG might also be attributed to more recent and broader dynamics. For instance, at the time of writing the 2005–2015 strategy, debates within development at large led to a more intense questioning of the role and predominance of agricultural research (Cleveland 2006, p. 1) and the CGIAR system. As an era of reduced funding to agricultural research and initiatives ensued, the CGIAR struggled to maintain donor support and funding, and not surprisingly, the slope faced by the social sciences was steeper than for other disciplines (ibid.).[5] Given the global food crisis the world faces today, in hindsight, the decline in support and funding to agricultural research appears to have been short-sighted.

Nonetheless, the world now faces very different challenges such as globalization, climate change, HIV/AIDS, and most recently, the global financial and food security crisis, and large scale land grabs in Africa. Funding for agricultural research has been ramped up again and new private philanthropic donors such as the Bill and Melinda Gates Foundation are actively supporting agriculture. It is unfortunate that the CGIAR system has effectively undermined the contributions that could be made by the sociocultural sciences by allowing severe staff depletion (despite warnings raised by numerous scholars, development practitioners and supporters). This marginalization has come at a time when the dynamics, power relations, and transformation in global food production marked by changes in seed production, agricultural production technology, and the commercialization of food and land around the world warrant the inclusion of sociocultural perspectives more than ever before (Stanford 2006, p. 21). In short, the challenges and issues are pressing and the funding resources are more available, but the CGIAR does not have a plan to address the erosion of the sociocultural sciences, nor to critically analyze and address why so many colleagues in this disciplinary domain have opted out of the system in recent times.

"Surviving on the Crumbs at the Margins": Challenges Faced by CG Anthropologists in Interdisciplinary Contexts

Based on the brief history of social sciences in the CG, the question then arises, "who exactly are the social scientists in the CG, what kinds of environment do they work in, and what types of struggles do they engage in?" As mentioned above, in 2002, a survey published by CIAT demonstrated that there were only 126 social

[5]Other institutions that support social sciences, such as universities, were able to better maintain the relevance of the social sciences to their core mandates (Brush 2006, p. 1).

scientists in the CG (CIAT 2002), which represented a decline by almost a quarter from 1995, when there had been 163 (Cernea 2005, p. 35). These social scientists were also unevenly distributed, with some centers having none (i.e. for instance at the time of writing, the World Agroforestry Centre had no full-time anthropologist, sociologist, or political scientist). Economists form the single largest group of social scientists, accounting for 58% of the category "social scientist" (i.e. 73 of 126 social scientists, compared to 53 identified as "non-economists") (CIAT 2002), a subject we return to below. In terms of gender, 36% of all noneconomist social scientists are women (ibid.), which has several implications, as we also elaborate further below. In terms of length of service and position, only 45% of social scientists stay in the CGIAR longer than 5 years, and only 5.7% make it to senior management – with 7.5% making it to middle management (ibid.). Lastly and perhaps most importantly, only 21% of all social scientists are from anthropology, sociology, and "related fields" which include sociocultural disciplines. Their average length of service is 6.5 years.

This sets the quantitative background for our discussion, and perhaps substantiates critiques by scholars such as Box that "social scientists doing social research in the CGIAR are few, far between, and dwindling" (2008, p. 173). Indeed, Cernea notes with concern, "the proportion of social researchers to total research staff has dropped below a reasonable critical mass needed to exercise intellectual institutional influence and effective scholarly interaction. In some centres, the numbers of social specialists may be as low as two, one, or even zero" (2005, p. 78). Similarly, the operations evaluation unit of the World Bank in its independent evaluation of the CGIAR at 31 years, raises concerns of an aggregate loss of social science capacity, noting a 24% loss of noneconomist social scientists since 1995 (World Bank 2004, p. 89). This during a period in which there was a total increase of scientists in the CG of 2.2% (ibid.). Needless to say, without a minimum critical mass of anthropologists and sociocultural scientists, it is difficult for the CGIAR to contribute to cutting-edge social science research, innovation, theoretical debates, or constructive solutions. If we follow Cernea's surmise that the CG is in fact far behind the World Bank in this regard in proportional terms, then the situation is indeed alarming and of grave concern (2005, p. 81). Furthermore, if a critical mass of anthropologists or other sociocultural scientists is not included in policy making in the CG, including serving on the Science Council itself,[6] then not only will the CG's research be weaker for it, but will continue to reinforce power relations that disadvantage sociocultural disciplines and attention to farmers' everyday lived realities. In the end, having fewer colleagues in strategic placements such as management and policy making, coupled with lower retention rates, places sociocultural scientists in a particularly vulnerable and marginalized position.

[6]Current (2009) members of the Science Council include six biophysical scientists and one economist (see www.sciencecouncil.cgiar.org/).

Of the few anthropologists and sociocultural scientists in the CG, what kind of work and research do they do? Rathgeber (2006), in her study of social scientists in the CGIAR, argues that in fact much of what qualifies as "social science" is actually not carried out by trained or professional social scientists, and that 70% of all social researchers in the CG are in fact trained in other disciplines. She also argues that those "with their highest degrees in the social sciences spend the least amount of time on research" (ibid.). As Box reflects, it is startling "that people without formal training in a social science do most of the work in this field," and those who do obtain such training do very little social scientific work (2008, p. 174).

Another issue discussed at the Cali conference in 2002 was a concern about a notable bias toward economic analysis that led to the marginalization of other social science disciplines, and to a disjuncture between "macroeconomic" and micro, household-oriented social research (Cernea 2005; CIAT 2002). This raises several other issues. First, as already discussed, even if a "critical mass" of social scientists does exist in the CGIAR, it is a critical mass of economists, and not necessarily anthropologists or other sociocultural scientists. This bias also means that often what is understood and perceived more widely in the CG as "social research" is in fact economic research. In many agricultural research systems, all social scientific research is lumped into a single category of "socio-economics", which is problematically conflated with anthropological and sociocultural research despite the detailed classification and positioning of various biophysical disciplines in these same institutes and within the system as a whole. Second, the effect of the relegation of sociocultural science to a "service provision" role means that it often finds itself "downstream" of other leading research. Hence, its role is often perceived by biophysical scientists as one of collecting data on the impacts of their technologies (Cernea 2005, p. 83), rather than questioning if the technology is appropriate in the first place, if indigenous technologies already exist in the context where it has been deployed, or if technological aspects are even relevant to the broader development problem at hand. What is sacrificed is the potential for "upstream" research and knowledge generation on the social, cultural, and political dynamics of agriculture, pastoralism, natural resource management, indigenous practices and knowledge (ibid.).

It is important to note that the institutional context of the CG changed in the mid-1990s and increasingly placed importance, and pitted researchers' very survival, on project-based funding. As already mentioned, this occurred at a time when a worldwide decline in public funding for agricultural research and extension was accompanied by an expansion in private-sector financial investment in commercial seed development. What this ultimately meant was a diminishing core of funds available for researchers to cover salaries, operational costs, and research.[7] As competition for resources intensified, the social sciences and scientists lost out.

[7]The survey undertaken by CIAT in 2002 demonstrates that of the category of anthropologists, sociologists, and "related disciplines," 42% were receiving "core" funds, while 34% had special project/competitive and grant funds, 9% had funds from systemwide programs, and 15% were seconded to the CG (CIAT 2002).

As already discussed, many CGIAR centers have experienced over recent years a severe depletion of their sociocultural scientists (Cernea 2005), the erosion of social science agendas from strategic priorities, and the marginalization of anthropologists and other sociocultural sciences more severely than ever before.[8] As a consequence, in an era of "resource mobilization" and "cost recovery", a culture of politeness has also emerged whereby scientists are afraid to debate critically. Research results, whether they succeed in fulfilling their intended goals or not, are turned into "success stories" as a result of donor and institutional exigencies. What this means is that rather than being constructively critical (of one's own work or one another's work) with regard to project failures and recognizing unintended consequences, researchers will often go to great lengths to shed light only on project "successes." Failure to "succeed" is perceived as a potential impediment to having one's contract renewed. This then is the new context of the CG.[9] Recent critical external reviews of social science programs of the CGIAR (e.g., of the Participatory Research and Gender Analysis (PRGA) systemwide program) and of individual centers (e.g., the Centre Commissioned External Review and collapse of CIAT's Rural Innovation Program in 2006), coupled with a severe decline of funding, led to a major decline in the numbers of social scientists by 2007 and 2008. It has therefore become critically important that the CG prioritize anthropology and social sciences within the system, while ensuring the necessary mechanisms are in place to ensure rigorous and relevant research for all disciplines.

However, some things have remained constant. If power relations are at the heart of all interactions within development contexts then as one of our anthropology colleagues reflects, anthropologists are "surviving on the crumbs at the margins of the CG". These power relations color disciplinary dynamics, the resources available, and the discourses that are constructed as central guiding forces for the deployment of development and the practices that support them. What is most interesting is the way social relations between different disciplines reveal a great deal about the practice of science. Even anthropologists with years of research experience are often perceived as "junior" scientists in interdisciplinary teams made up of mostly biophysical scientists who are seen as their "seniors". For instance, in one CG center, sociocultural scientists are often brought on board to "add social science" to proposals and projects, but in ways that relegate them to a service provision role whereby the main agenda, research questions, and budgets are developed and controlled by biophysical scientists. Added to this are uncertain

[8]CIFOR (the Center for International Forestry Research) is perhaps an exception to the overall trend in the CGIAR, with sociocultural scientists currently out-numbering economists, and social scientists (in the aggregate) occupying between 33% and 56% of senior scientist and managerial positions. However, with the exception of postdoctoral fellows, biophysical scientists dominate more junior scientific positions – with sociocultural scientists, economists, and biophysical scientists occupying 14%, 14%, and 72% of these staff positions (respectively).

[9]Perhaps this is a context that is not very different from the new context of academia (as we have observed in the UK and US recently).

career paths, marginalized positions relative to other types of scientists, little scope for advancement to senior or middle management positions, transient lengths of service, and inequitable access to funding and resources. Power relations limit the ability of these individuals to influence the discourses and practices of development in the CG, and therefore it is not surprising that social science and anthropological research has all but disappeared from the CG's latest strategic priorities. Seniority, status, decision making, discourses, and access to resources reflect these relations of power, with only a few exceptions.

But perhaps the real challenge is one of power *and* knowledge: the power to define the problem and the solutions. The issue is not only what qualifies as science, but whose interpretations count, and what are the ideologies that underlie those interpretations. It is a struggle between people trained in different disciplines over meaning, knowledge, resources and, ultimately, power – the power to define what is scientific research for development, and what is not. Within this context, the sciences of the natural (biophysical) world are often considered hard and factual, or the stuff of "real" science. Anthropology and other sociocultural sciences are not taken seriously and are perceived as being "soft". Despite the fact that the authors of this chapter began our careers as engineers or in environmental management, and have thus paid our technical dues, we have faced uphill battles in some CG centers in terms of negotiating space for (or recognition of the value of) rigorous and systematic sociocultural research. For, it seems, we have gone "soft". At best, anthropology is perceived as a "soft" science. At worst, sociocultural science is considered as not being scientific at all. It is often considered as being "quaint", "anecdotal", and orbiting the stratosphere of development practice rather than science. These views are derived from the perception of sociocultural science as not being replicable, scalable, or quantifiable; too specific, theoretical, critical, or time-consuming; and above all, as offering critiques but no practical solutions.

The crux of the problem might be that anthropological research is perhaps too nuanced, too complex, and too critical of the established wisdom and dominant models of development on which the CGIAR itself rests. However, the more complex the solution (integrating ecology, crop diversity, and beyond to integrating issues such as division of labor, access to resources, complex social and cultural realities, and political constraints to development), the harder it is to "technologize" and "depoliticize" the solution. Thus it becomes harder to carry out the controlled experiments with which biophysical scientists from certain disciplines are most comfortable, as it is difficult to hold constant the sociocultural realities that are dynamic and ever-changing, diverse, and complex. Hence, we enter into the realm of diverse and competing ideas of what constitutes knowledge and science. And while a controlled experiment in agriculture can take up to ten years to yield useful data, depending on the species or the problem, proposing anthropological research that stretches beyond a few weeks is greeted with scorn and skepticism. Hence, many in the CG downplay social science as "real" science, or as "too expensive" to merit the investment (relative to its perceived benefits).

Furthermore, the performance of scientists is not disaggregated by disciplinary focus, methodology, and standards, but the same measurements of success are applied to biophysical and social scientists alike. For instance, a key measure of success is research products or deliverables such as improved germplasm (Brush 2006) or the development of a new technology. Publication in scientific journals can also be a somewhat problematic measure of success in the CG because of the time required to carry out research, analyze data, and write well-documented qualitative papers, which tend to be longer for the social sciences than the biophysical sciences (ibid). This together with fundraising is often the key measure of evaluation and success. As one CG anthropologist reflects, “to me, the bigger issue is getting bogged down in management and having to produce publications and bring in money; that the disciplinary requirements of good quality work make it essentially incompatible with the system. As well as the distance from literature issue – most journals they buy into being chosen around the biophysical component of focus of the center”. Hence, anthropologists and sociocultural scientists may be inherently disadvantaged by their orientation toward more intensive, long-term, and context-specific fieldwork that demands greater amounts of time for them to study, analyze, and produce “deliverables”. Within such a context, it is difficult for an anthropologist to do high quality science as defined by our own discipline, and we often do not consider the work we do ourselves within the CG as “real” anthropology or sociocultural science.

Despite some of the contradictions about what constitutes knowledge and “science,” if interdisciplinarity is based on the coexistence of multiple scientific theories and practices, CG scientists believe that such an endeavor is not only possible – but that they are already doing it. In response to this, one of our anthropology colleagues recently commented, “does a fish know it is wet?” The solution to this complex endeavor is perceived as simple and straight-forward: it is just a matter of getting on with it, and doing it – which more often than not means that anthropology and the social sciences continue to play an auxiliary role to the “leading” sciences of the CG, with a core focus on increasing agricultural production and technical fixes. The goals of enhancing equitable access to resources or opportunities, addressing political barriers to meaningful livelihoods, or transforming development to enhance the voice of those most in need (Chapters 6, 11 and 13) are left unaddressed by many CG centers. What this assumption does is suspend relations of power, knowledge, and a series of contradictions that help to sustain the dominance of biophysical fields of scientific enquiry in development. It obscures the fact that the practice of interdisciplinarity in the CG is skewed toward biophysical understandings and practices, and therefore, does not represent equitable practice between different disciplines. World views held by biophysical scientists often make it difficult for them to perceive these inequities or the subjective nature of dominant discourses favoring technical approaches to development, as well as technical solutions. When projects fail, or research does not have the impact that was envisioned – for example, when farmers do not adopt technologies that are developed by scientists – the blame is placed on the farmer, not the science or the technology. Hence, as Latour argues, the prevalent view is that science proceeds either in isolation from “social factors” or, “as is the case with ‘great’ scientists, in spite of them” (Latour and Woolgar 1979, p. 21).

When contextualized within broader neoliberal discourses that privilege technical paradigms of development, it is not surprising that status and seniority is achieved primarily through carrying out "technical" solutions, writing "technical" papers, and gaining funding for "technical" projects. And the more countries or research sites for the deployment of these technical solutions, the better. In a similar vein, McDonald argues:

> To remove the study of human thought and behavior from the study of agriculture quickly reduces agrarian-based problems and challenges to purely technical ones. The Western development model of science- and technology-driven progress characterized by rational, efficient, and competitive forms of production has long revealed its serious flaws. The removal of the study of culture in agriculture takes away an understanding of local values, systems of knowledge, and organizational strategies as people address increasingly complex, global realities (2005, p. 71).

The greatest challenge to anthropologists working with colleagues in interdisciplinary teams is that these types of assumptions are at odds with anthropology's core strength of in-depth fieldwork, which is often cumulative over a long period of time. For instance, as far back as 1994, in relation to the integration of farmer participatory research in the CG, Fujisaka remarks, "a major challenge is making participatory research more 'rigorous' in order to improve the accuracy, precision, and predictive power of results and to thereby strengthen credibility among colleagues and donors" (1994, p. 232). Again, the drive and focus is toward "accuracy", "precision", and "predictability", even though social, cultural, and political dynamics are often unpredictable and dynamic, despite our best attempts at analysis and "prediction". Biophysical science's claim to predict results to a high degree of accuracy again creates an epistemological gap between anthropologists and biophysical scientists. Despite this claim to accuracy, new and emerging fields such as the anthropology of science have also called into question claims about truth and "fact" made by biophysical scientists and others (Chapters 2, 5, 6, and 13). It demonstrates that scientists tend to depoliticize processes and prevailingly make a distinction between what is deemed "social" and "technical" (Latour and Woolgar 1979; Latour 1993). At times, scientists create facts by closing controversies, or by black-boxing uncertainties away from scrutiny, while simultaneously universalizing locally specific knowledge by enlisting and rallying the support of institutionalized knowledge networks and allies, as well as convincing nonscientists of the relevance of their work (Latour 1987; Latour and Woolgar 1979; Keeley and Scoones 1999; Shrum 1988). Latour pries open these black boxes to show that accepted facts were once controversies heatedly debated by scientists themselves (1987). Once closure is achieved, these facts are then considered by scientists as "real", and form the basis for future actions, experimentation, and the construction of new facts (ibid).

Methodological differences also exist whereby biophysical scientists often "suspend" contextual factors such as culture, social relations, and politics, and carry out research and experimentation in laboratory settings or controlled on-farm plots. While some CG scientists attempt to carry out participatory experimentation in collaboration with farmers, such as in the field of participatory plant breeding for instance, this requires critically rethinking and calling into question the assumptions of conventional experimentation (Biggs 1989; Cleveland 2006, p. 5; Chapter 4). Such participatory approaches exist in the CG, but receive less support compared to more current "revolutions" in biotechnology such as genetically engineered crops (Cleveland 2006), and have all but disappeared in the CGIAR Science Council's new strategic priorities (2005).

The question of scope, representation, and scaling out also pose challenges between disciplinary understandings, practices, and meaning. CG scientists are increasingly encouraged to work on regional and global projects. While appropriate for answering some research questions, explanatory power is undermined in the process of decontextualizing local realities. Sometimes as many as a dozen countries make up a single, multimillion dollar project, where decontextualized variables from different sites are plugged into "replicable" models. Anthropologists who insist on carrying out context-specific research in only a couple of sites are seen as being "unpractical" and not having enough impact. The issue goes beyond mere numbers of sites: it is also one of "representation". The question of how many informants are enough to be "factual" is one that arises all too often. Anthropology's focus on life histories, personal narratives and on participant observation is perceived as simply "not enough" and too subjective to be "representative". It is believed that factual representation of reality requires hundreds or thousands of informants; ironically, these numbers are often attained under the most incredibly tight schedules using rapid rural appraisals.

As already discussed, a critical challenge is the assimilation of anthropology and other sociocultural disciplines into a generalized field of "socio-economics", where the unique theoretical and methodological contributions of these disciplines are ignored. Disturbingly, many scientific colleagues in the CG cannot tell anthropologists apart from economists in terms of their unique theoretical grounding and skills. The fact that all scientists are lumped into a generalized category with little differentiation between the more quantitative and the more qualitative disciplines or approaches (and thus marginalizing the latter, due to its greater departure from the norm) is symptomatic of the lack of recognition of the precarious position of anthropologists and other sociocultural scientists. In addition, anthropologists may be more inclined toward interdisciplinarity because they are often trained in several subfields such as the anthropology of development, or environmental anthropology, where they are exposed to different theories and methodologies from social as well as other disciplines. Being the minority, they often learn to speak the language of the "other", using such tools as graphs, power point, bar charts, etc. rather than the stuff of anthropology: ethnography,[10] narratives, oral histories, etc. Citing a common anthropological expression, they have "gone native." This leads to a perplexing question: if biophysical scientists cannot tell the sociocultural scientists from the economists, then how do they actually view the social sciences? What

[10]The detailed study of human societies practiced by immersing oneself in that society for an extended period of time. Ethnography is founded on the concept of "holism," the idea that a system's properties cannot be accurately understood independently of each other.

meaning do they give it? Eyzaguirre suggests the very centrality of culture as part and parcel of agriculture is perhaps the reason it may be so difficult for biophysical scientists and development experts to see it (2006, p. 265). The assumption may be that it is the stuff of everyday life, and therefore not visible, scientific, or analyzable. The core strengths of a whole discipline – which makes its business to study, analyze, and theorize culture, social realities, and power relations – are swept aside in favor of more narrowly defined forms of scientific analysis.

Lastly, although there is a great deal of diversity among social scientists, differentiated by gender, nationality, status ("internationally or nationally recruited"), ethnicity, race, marital status, social scientific discipline (anthropologist, sociologist, political scientist, etc.), and theoretical orientation (postmodern, structuralist, neoliberal, etc.), these are rarely acknowledged. In particular, women anthropologists and social scientists are most often doubly marginalized as social scientists and are disadvantaged in terms of power, decision making, and access to resources. While the CG recognizes that in general women are marginalized, have lower rates of staff retention, and hit an impenetrable "glass ceiling" in the upper echelons of management and power, the situation of women anthropologists and social scientists remains invisible. Reports written by the Gender and Diversity (G&D) Program of the CG disaggregate by generalized, professional categories such as "scientist", administration, technical support, etc. (Jayasinghe and Moore 2003; Rathbeber 2006) rather than disciplinary ones. Hence, there is no baseline or in-house data available regarding the position, retention, and other diversity issues pertaining to anthropologists and sociocultural scientists – nor to the gendered patterns of staff retention for these and other disciplines.

"Uphill Battle" or "Professional Suicide"? Negotiating Spaces and Resisting Dominant Practices

Given these challenges, it is not surprising that sociocultural scientists have little influence in integrating theories and methodologies of their disciplines into the mainstream of development and agriculture. We now turn to the spaces that one group (anthropologists) have in the past and are presently negotiating in the CG. Of particular interest are the bargaining, opportunities, compromises, and the precarious balancing acts anthropologists face in "doing anthropology" as they are academically trained to do – including critical deconstruction of "development" itself – while contributing to constructive and practical solutions.

Before describing these current dynamics, it is useful to briefly describe past anthropological efforts in particular (not just social scientific ones) and how they have shaped the current situation. Anthropologists have been working in the CGIAR for over three decades, many of them supported by the pioneering Rockefeller Foundation Fellowships for Social Science in Agriculture. These fellowships covered many sociocultural and socioeconomic fields. In those early days, many research fellows were carrying out versions of "Farming Systems

Research (FSR)". Researchers such as Bob Rhoades carried out innovative studies of indigenous knowledge and agricultural systems. Although many of the original anthropologists did not last long and were eventually purged out of the CG system, one notable exception is Joachim Voss, who until recently was the Director General of the International Center for Tropical Agriculture (CIAT). Some of the early anthropologists, such as James Fairhead and Eve Crowley, carried out fieldwork for or with the CG and went on to do innovative work as academic and applied anthropologists, respectively. Over the years, these pioneering social scientists among others have made significant in-roads in terms of action-oriented research, partnerships with on-the-ground development actors, and the incorporation of political–economic, political–ecological, market, and ecoregional issues. These perspectives also gave birth to systemwide programs on Gender and Diversity (G&D), Participatory Research and Gender Analysis (PRGA), and Collective Action and Property Rights (CAPRi), with varying degrees of success. Despite these efforts, explicitly anthropological perspectives on agriculture and development have failed to emerge. What have emerged, however, are interdisciplinary perspectives integrating diverse social science disciplines, such as those emanating from CAPRi, hosted by the International Food Policy Research Institute.

The greatest challenge for the CG is making a real difference to vulnerable and disenfranchised women and men farmers. We believe anthropologists can provide important ethnographic insights, methodologies and a rich understanding of sociocultural dynamics, such as the patterns of access and control over critical resources that influence how technologies, policies and innovations are used, adapted, or rejected. Of particular relevance are anthropological studies of the impact of technology, such as the Camaroffs' studies of agrarian change in colonial southern Africa (1991, 1997), Ferguson's work on the unintended effects of development projects (1994), Fairhead and Leach's analysis of multiple understandings of forest history (1996; 1995), Mosse's investigation into the social processes of development that ultimately guide development policies (2005), the work of political ecologists on how projects shape gendered and other patterns of resource access (Rocheleau and Edmunds 1997; Schroeder 1993), and Verma's exploration of the development disconnects generated by differences in social and work relations between development practitioners and rural farmers and their impacts on irrigation and rice cultivation projects in Madagascar (2009). Anthropologists can also carry out ethnographic studies in their own right that shed light on social, cultural, and political–economic relations (which are often inextricably intertwined with agriculture) in a particular rural context. Also important is anthropological analysis and questioning of predominantly scientific assumptions about what qualifies as "truth" and "fact" (Chapter 5) and the way distinctions are constructed between what is considered "social" and "technical" (Chapter 11).

While there is, in the current context, a premium for all that is "technical," other forces create windows of opportunity. Funding from donors has increasingly placed pressure on research organizations to be more holistic. This holistic vision requires the integration of social, economic, and gender issues into development and poverty alleviation. Projects that are predominantly biophysical are criticized for not including social issues. Hence, it has become a matter of survival for biophysical scientists to leverage the input of their social scientific colleagues in order to submit more "holistic" projects to successfully compete in the development market for project funding. However, the complaint from their social scientific colleagues in the CG is that the interest to carry out this "holistic" research is window dressing only. In some centers, once funding is secured, there are few incentives and support for carrying out rigorous social science. For example, scientists are not evaluated in their performance evaluation in terms of integrating participatory approaches, ensuring a people-centered focus in their work or including sociocultural realities. And ethnography is rarely on the radar. When social science is carried out, it is often quantitative, rapid, and watered down. However, there is a ray of hope. Although there is little funding for purely qualitative research, anthropologists are valued for their insights, and in some development organizations, there are those anthropologists who are sympathetic to the cause of ethnography. CG anthropologists are working toward engaging with other like-minded individuals and supporters for change.

As the CG continues to explore means to better support development, ethnographic knowledge is even more critical. Despite substantial investment in Africa based on decades of development expertize, there is a scarcity of innovative, sustainable, and holistic solutions coming out of the CG. We argue that what are needed are innovative solutions with insights from ethnographies and political–economic analyses that explore when and why people invest in their land and natural resources, and when and why they are prevented from doing so (see for example, Carney and Watts 1990; Moore 1993; Mackenzie 1995; Verma 2001). Critical studies are also needed on the political dynamics of development. What is also required is an open discussion and reflexive exploration of the assumptions and goals built into conventional agricultural production-oriented discourses and practices (which are often at odds with anthropological and ethnographic approaches). Cleveland, for instance, argues that "one of the goals of conventional agricultural development is to eliminate the very objects of much of social science research – small-scale, limited resource farmers" (2006, p. 5).

We also believe that it is important to build bridges with biophysical scientists. Although in a foray into the "mainstream" of the CG, a workshop on environmental anthropology organized in 2005 by two of the authors for natural scientists to learn about the discipline was disastrous in terms of participation. Not one biophysical colleague attended the workshop. Yet the following week, almost everyone turned out for a presentation by a visiting researcher on "Why anthropologists can't see the forest from the trees," in which a forester presented a software program that analyzes "indigenous knowledge." Perhaps this failed attempt at bridge-building results from the fact that anthropologists are working within a set of social relations that renders them at the margins and does not take them seriously (and indeed, even mocks them). However, in trying to fit in and build bridges in such a context, anthropologists may be in danger of replicating the discourses of development and positivist science. This may ultimately water down the practice of anthropology, and render ourselves obsolete and at the margins of a discipline that demands theory, ethnography, and critical analysis.

Sociocultural scientists in the CG are caught in a no-go zone. They are too "soft" for their biophysical colleagues, yet too "hard" for academic colleagues from their own disciplines. Anthropologists in the CG have committed the ultimate "crime" in anthropology: they have gone "applied," and have become an enmeshed part of the development machinery. The anthropologist thus finds herself at different cross-currents of power, knowledge, and discipline. In the end, not only do they need to defend themselves to their colleagues in the halls of academia, they also need to defend themselves to their biophysical colleagues down the hall from their office. It is not only a difficult balancing act and an uphill battle that causes some anthropologists to reflect whether they are actually committing professional suicide in the CG, which may account for the low retention rates and lengths of service.

Conclusions: Close, but No "CGIAR"

Without serious attention and critical reflection on the integration of anthropology and sociocultural sciences into the CG and other agricultural research systems, agricultural research[11] will most certainly fail to deliver on its mandate to reduce poverty and improve food security – to the extent that it has the potential to. The Consultative Group for International Agricultural Research, by definition, must carry out research on agriculture – which not only includes biophysical elements and domains of knowledge, but also social, economic, political, and cultural domains as well (not to mention serious consideration for indigenous practices and knowledge, and the participatory integration of local women and men's voices, experiences, and needs). This will not be accomplished by relegating social science and anthropology to "service provision" for the other "leading" biophysical sciences. For doing so means that agricultural research in the CGIAR is unbalanced, carried out on an unequal footing, and with varying degrees of power and access to resources between various disciplines. This is also done at the expense of social scientific and sociocultural research *as strategic research* within an interdisciplinary context, as well as in its own right.

As this chapter has argued, in its current trajectory and implementation of its own priorities and strategies, we would like to say, "close but no CGIAR". In short, there can be no effective "CGIAR" without a serious integration of sociocultural science into the mainstream, including the relevant knowledge, methodologies, and broader philosophical orientations to development. One center has made significant

[11] While the focus of this chapter has been on the CGIAR, it equally pertains to the experiences of socio-cultural scientists in national agricultural research systems – the most creative and talented of whom tend to quickly move to more fertile professional ground given the scientific and political challenges faced. The recommendations herein can therefore be equally relevant to the CGIAR as to other agricultural research systems driven by similar perspectives and challenged by similar constraints.

steps in this direction, even to the point of having biophysical scientists in the minority in a number of high level staff grades. While this was at first questioned by many, it does create a culture of mutual respect and broadens the scope of questions that are asked and (to a large extent) theoretical and methodological traditions that are considered legitimate. Biophysical scientists at one time found themselves on the margins, and still find the scope of "acceptable" research to be inscribed by questions considered by their (social science and, increasingly, biophysical) colleagues to be socially and politically relevant.[12]

Yet this is one exception. The CG as a whole can do much better to embrace its mandate more holistically and with greater attention to indigenous knowledge, the sociocultural and gender realities of the people it is meant to serve and knowledge of the broader political landscape in which development (and the geopolitics of underdevelopment) takes place. It needs skilled sociocultural scientists to fulfill its mandate in a serious way.

In conclusion, we would like to raise some additional points as food for thought. First, just because we are all anthropologists does not mean we are homogenous. We all bring different types of conceptual approaches, and theoretical and ideological baggage to the practice of anthropology within the context of international development. Just the process of writing this chapter between three like-minded anthropologists in the CG (all of whom are women) revealed differences in theoretical training, writing styles, and perceptions. More broadly, the diversity of sociocultural disciplines and social sciences means that the heterogeneity multiplies exponentially. In short, there is great diversity and human subjectivity in the practice of applied sociocultural science. However, in most CG centers and other agricultural research institutions, most of these scientists are isolated – "lone anthropologists" in an ocean of biophysical scientists, and as such, tend to cling to one another in the life boat of anthropology. Some are perceived by their colleagues to have "sold out" to the dominant discourses and positivist perspectives on development, while others feel "lost at sea" without solid ground in sight. Participating in conferences with a wider community of peers, creating disciplinary debates and initiatives, and collaborating with academic colleagues in like-minded disciplines is critical to revitalizing and remembering the rhythms of anthropological and sociocultural life back on dry and solid ground.

[12] One colleague in CIFOR complained that his social science colleagues often view biophysical research to be too "theoretical" (e.g. not of immediate social relevance), and therefore felt constrained in the questions that could be asked. Questions about forest biomass, once largely shunned by his peers, are now *en vogue* as a result of the emerging global interest in climate change mitigation. This experience can be viewed in two ways: as a constructive way in which social scientists have helped enhance the relevance of biophysical research, or as a failure of other disciplines (in this case, social scientists) to acknowledge early on the importance of certain questions from other disciplines. This example provides further evidence for the need for cross-"cultural" dialogue among different disciplines on an equal playing field.

Second, we would like to say that we have attempted to (and continue to attempt to) take constructive (rather than only deconstructive) steps to improve the profile and impact of anthropology within this ocean of biophysical science. When we first wrote this paper for the American Anthropological Association meetings in December 2005 in Washington D.C., we believed what was needed was an explicit CG-wide network of anthropologists and other sociocultural scientists to promote rigorous and in-depth sociocultural science and reduce our isolation from one another. Indeed, we attempted to create exactly this type of network, called "Anthro-No-Apology". However, while it had an enthusiastic beginning, the network failed to take off. In retrospect, this is not because it was not needed or because anthropologists and other socio-cultural scientists were not open to it. Without adequate resource allocation, recognition, legitimatization, institutionalization, and buy-in from all social scientists, and demand for such a network – not just from anthropologists but with genuine buy-in and support from economists, biophysical scientists, senior managers, and donors – such efforts were in vain and against the dominant biophysical grain of the CG.[13] Also, since then, many of the anthropologists involved in the network opted out and left the CG altogether. Such failures are unfortunate, given the diminishing numbers of anthropologists in the CG since Rathgeber's study (2006) and the very difficult balancing acts they have to manage between being anthropologists and applied social scientists. Institutionalized efforts to foster a community of peers in the socio-cultural sciences is urgently needed in the CG.

Third, another constructive strategy that is required after the severe decline and erosion of anthropologists and other sociocultural scientists from the CG in this past decade is to address the resulting depletion not just in policy, strategies, and priorities, but in actual practices. In tandem to this, an up-to-date quantitative survey and stock-taking exercise of the numbers and roles of sociocultural scientists in the CG – a role that perhaps must be taken on board by the Gender and Diversity Program as well as independently carried out – is a key area of concern. As discussed above, the 2008 survey by the Gender and Diversity Program collected data based on a homogenized category of "social scientists", which did not differentiate between economists and sociocultural scientists (G&D 2008). We recommend that future surveys be differentiated by social scientific disciplines and pay greater attention to differences between economists, anthropologists, geographers, and other social scientific disciplines. This must be complemented with a qualitative study and analysis, where key questions might be posed including: why do sociocultural scientists disproportionally drop out? Why are rates of retention low, especially for women? Together, it can be useful in measuring against the baseline work undertaken by the CG in 2002 (CIAT 2002), alert attention to the gravity of the situation, and build a case for restrengthening the role of social sciences in

[13]Indeed, one debate within the network was whether it should remain an exclusive network of anthropologists, or whether it should be open to other disciplines. By ear-marking the network for anthropologists only, it might have missed an important opportunity for promoting interdisciplinary understanding and bridge-building with other sociocultural scientists as well as the wider CG.

meeting the strategic priorities the CG has ambitiously set for itself (c.f. CGIAR Science Council 2005). As already discussed, this is critical during a time when there are fundamental changes in world production regimes and shifts in power and control over food, energy, fiber, land and fodder production systems to the private sector. In light of such critical transformations, future CGIAR strategies and priorities must bolster the institutional and intellectual importance of anthropology and sociocultural science in the CG (Cleveland 2006), to enable these scientists to critically engage intellectually, deconstruct taken-for-granted assumptions, and provide constructive and politically-relevant solutions. Stanford argues that the decline in social science staff is particularly troubling at this juncture in history, and undermines the capacity of marginal and vulnerable small-scale farmers to benefit from these transformations and sustain their livelihoods (2006). Indeed, she challenges us to consider that:

> As the private sector expands its role and influence in plant breeding, patenting of food crops, and international commercialization of food industries, international public institutions need to address the needs and concerns of small farmers and rural peoples. If international public institutions do not face the task of defending Third World small farmers and small-scale food production in the global economy, then who will? It is unfortunate that, at this critical juncture, the CGIAR centers do not recognize their responsibility or their opportunity to squarely address the critical issues that mark this transformation and impact those people for whom the CGIAR programs claim to devote their breeding and technological development programs (2006, p. 21).

It is important that the CG makes linkages between broader political–economic and global changes and how they impact, are transformed, resisted, and given meaning by small-scale farmers. This is critical to understand and analyze from a sociocultural and political–economic perspective in light of new dynamics and significant changes in the power relations that determine world food production and control of resources (Cotula et al. 2008; SEI 2008; Stanford 2006, p. 21).

Fourth, an important constructive strategy already engaged, and one that most probably requires further strengthening, is to bolster and legitimize the work of social scientists in the CG through innovative, supportive, collaborative synergies, and intellectual exchange between and among themselves and those working outside the system on similar issues (McDonald 2005, p. 72; Cernea 2005, p. 84). Another related challenge is to search for engaging ways to work and collaborate with biophysical scientists on an equal footing. For such initiatives to work, CG social scientists must be open, self-reflexive, and be able to critically engage in current debates in a way that perhaps begins by deconstructing their own assumptions and practices, but with the end goal of being constructive and much more capable of withstanding and surviving peer- and externally-commissioned reviews of their own work. The lack of space to critically and vigorously debate among ourselves has undermined our ability to be cutting-edge in the larger field of anthropology and beyond. In order to remain at the cutting edge of intellectual debates and discussions, we must ourselves be able to critically reflect, question, and deconstruct current trends, transformations, and policies that disenfranchise our "end clients," the most vulnerable and marginal farmers and resource users in the South –

as well as our own roles and the roles of agricultural organizations within them. We must, for instance, be able to question underlying assumptions in policy shifts that relegate such things as seeds, germplasm, land, and indeed other natural resources from a public good to private property (Stanford 2006, p. 21) within a context of highly unequal global power relations and access to resources. For such "policy shifts radically affect small farmer access to seeds, the nature of the seed distribution system, issues of control over genetic material, and subsequent farmer rights over food crops" (ibid.). These issues place agricultural research and agricultural research organizations squarely in the political realm, and any public agricultural research center that ignores social, cultural, and political realities (and its own role within them) cannot effectively carry out its mandate for poverty alleviation and food security (ibid.).

Despite such challenges, anthropologists continue to work tirelessly to advance sociocultural disciplinary perspectives which are critical to responding to the needs of economically-poor and vulnerable farmers in countries of the South. We continue to believe that we need to be constructive and not only deconstructive – to build bridges with the academic anthropology community and to engage in discipline-specific research of relevance to rural development, as well as develop initiatives for robust and genuine interdisciplinary dialogue and collaboration. In the end, we hope we can reach a day when we no longer have to apologize for being anthropologists.

Acknowledgements The authors would like to thank Conrad Kottak for providing thoughtful and valuable feedback as a discussant when this material was first presented as a paper in a panel on the role of anthropologists in interdisciplinary projects at the 2005 AAA conference in Washington D.C. Thanks go also to Cynthia Fowler for organizing the panel and inviting us to participate. We would also like to acknowledge the contributions of Vicki Wilde of the G&D Systemwide Program and Lely Taulu of CIFOR for their generous contribution of data on staffing.

References

Biggs, S. (1989). A multiple source of innovation model of agricultural research and technology promotion. *AgREN Network Paper* No. 6. London: ODI.

Bodley, J. H. (1994). *Cultural anthropology: Tribes, states and the global system*. Mountain View, CA: Mayfield.

Box, L. (2008). Book Review of M. M. Cernea & A. H. Kassam, (Eds.), 2006, *Researching the culture in agri-culture: Social research for international development.* Wallingford, UK: CABI. *Development and Change, 29* (1), 173–196.

Brush, S. B. (2006). Cernea comment. Special Section, Peer Commentaries on Michael Cernea's "Studying the culture in agriculture: The uphill battle for social research in CGIAR." *Culture and Agriculture, 28* (1), 1–3.

Camaroff, J., & Camaroff, J. (1991). *Of revolution and revelation, volume 1: The dialectics of modernity in a South African frontier*. Chicago, IL: University of Chicago Press.

Camaroff, J., & Camaroff, J. (1997). *Of revolution and revelation, volume 1: Christianity, colonialism and consciousness in Southern Africa*. Chicago, IL: University of Chicago Press.

Carney, J., & Watts, M. (1990). Manufacturing dissent: Work, gender and the politics of meaning in a peasant society. *Africa, 60*(2), 207–241.

Cernea, M. M. (2005). Studying the culture of agriculture: An uphill battle for social research in the CGIAR. *Culture and Agriculture, 27*(2), 73–87.

CGIAR Science Council. (2000). *A food secure world for all: Towards a new vision and strategy for the CGIAR*. Rome: Science Council Secretariat.

CGIAR Science Council. (2005). *System priorities for CGIAR research 2005–2015*. Rome: Science Council Secretariat.

CIAT (2002). CGIAR social scientists survey. Cali: CIAT. http://webapp.ciat.cgiar.org/src/survey.htm. Accessed 30 April 2009

Cleveland, D. (2006). What kind of social science does the CGIAR, and the world, need? *Culture and Agriculture, 28*(1), 4–9.

Cotula, L., Dyer, N., & Vermeulen, S. (2008). *Fuelling exclusion? The biofuels boom and poor people's access to land*. London: IIED.

Eyzaguirre, P. (2006). Agricultural biodiversity and how human culture is shaping it. In M. M. Cernea & A. H. Kassam (Eds.), *Researching the culture in agri-culture: Social research for international development* (pp. 264–284). Wallingford, UK: CABI.

Fairhead, J., & Leach, M. (1996). *Misreading the African landscape*. Cambridge: Cambridge University Press.

Fairhead, J., & Leach, M. (1995). False forest history, complicit social analysis: Rethinking some western African environmental narratives. *World Development, 23*(6), 1023–1035.

Ferguson, J. (1994). *The anti-politics machine: "Development", depoliticization, and bureaucratic power in Lesotho*. Minneapolis, MN: University of Minnesota Press.

Fujisaka, S. (1994). Will farmer participatory research survive in the international agricultural research centres? In I. Scoones and J. Thompson (Eds.), *Beyond farmer first: rural people's knowledge, agricultural research and extension practice* (pp. 227–235). London: Intermediate Technology Publications.

Gender and Diversity (2008). *Systemwide CGIAR HR survey 2008*. Nairobi: Gender and Diversity Programme of the CGIAR.

German, L., Mazengia, W., Tirwomwe, W., Ayele, S., Tanui, J., Nyangas, S., Begashaw, L., Taye, H., Admassu, Z., Tsegaye, M., Charamila, S., Alinyo, F., Mekonnen, A., Aberra, K., Chemangeni, A., Cheptegei, W., Tolera, T., Jotte, Z., & Bedane, K. (in press). Enabling equitable collective action and policy change for poverty reduction and improved natural resource management in the Eastern African Highlands. In E. Mwangi, H. Markelova, & R. Meinzen-Dick (Eds.), *Collective action and property rights for poverty reduction.* Washington, DC and Baltimore, MD: IFPRI and Johns Hopkins.

Holt-Gimenez, E., Altieri, M. A., & Rosset, P. (2006). Ten reasons why the Rockefeller and Bill and Melinda Gates Foundations' Alliance for a Green Revolution for Africa will not solve the problems of poverty and hunger in Sub-Saharan Africa. *Food First Policy Brief* No. 12. Oakland, CA: Institute for Food and Development Policy.

Jayasinghe, G., & Moore, B. (2003). First the good news … Staffing the CGIAR 2003. *Working Paper* No. 40. Nairobi: CGIAR Gender and Diversity Program.

Keeley, J., & Scoones, I. (1999). Understanding environmental policy processes: A review. *Working Paper* No. 89. Brighton: Institute of Development Studies.

Latour, B. (1987). *Science in action: How to follow scientists and engineers through society*. Milton Keynes: Open University Press.

Latour, B. (1993). *We have never been modern*. Hemel Hempstead: Harvester.

Latour, B., & Woolgar, S. (1979). *Laboratory life: The social construction of scientific facts*. Princeton, NJ: Princeton University Press.

Mackenzie, F. (1995). "A farm is like a child who cannot be left unguarded": Gender, land and labour in Central Province, Kenya. *IDS Bulletin, 26*(1), 17–23.

Mazengia, W. (2006). Enhancing improved seed dissemination through local bylaws in Gununo watershed, Southern Ethiopia. Paper presented at the Africa-Wide Workshop on Bylaws. Nairobi, 27–29 Nov.

McDonald, J. H. (2005). Keeping culture in agriculture: A call for discussion. *Culture and Agriculture*, *27*(2), 71–72.

Moore, D. (1993). Contesting terrain in Zimbabwe's eastern highlands: Political ecology, ethnography and peasant resource struggles. *Economic Geography, 69*, 380–401.

Mosse, D. (2005). *Cultivating development: An ethnography of aid policy and practice*. London and Ann Arbor, MI: Pluto Press.

Parpart, J. L., & Marchand, M. H. (1995). Exploding the canon: An introduction/conclusion. In M. H. Marchand & J. L. Parpart (Eds.), *Feminism/postmodernism/development* (pp. 1–22). London: Routledge.

Rathbeber, E. (2006). Who are the social researchers of the CGIAR system? In M. M. Cernea & A. H. Kassam (Eds.), *Researching the culture in agri-culture: Social research for international development* (pp. 51–80). Wallingford, UK: CABI.

Rathgeber, E. (1990). WID, WAD, GAD: Trends in research and practice. *Journal of Developing Areas, 24*(4), 489–502.

Rocheleau, D., & Edmunds, D. (1997). Women, men and trees: Gender, power and property in forest and agrarian landscapes. *World Development, 25*(8), 1351–1371.

Schroeder, R. A. (1993). Shady practice: Gender and the political ecology of resource stabilization in Gambian garden/orchards. *Economic Geography, 69*(4), 349–365.

Shiva, V. (2000). *Stolen harvest: The hijacking of the global food supply*. Boston, MA: South End Press.

Shrum, W. (1988). Review essay: The labyrinth of science. *American Journal of Sociology, 94*(2), 396–403.

Stanford, L. (2006). Response to Michael Cernea. Special section: Peer commentaries on Michael Cernea's "Studying the Culture in Agriculture: The Uphill Battle for Social Research in CGIAR." *Culture and Agriculture, 28* (1), 20–24.

Stockholm Environment Institute, SEI. (2008). *Food, feed and fuels: Consequences of land use change patterns for livelihoods of marginalised people in the South*. Stockholm and The Hague: SEI and HIVOS.

Verma, R. (2001). *Gender, land and livelihoods: Through farmers' eyes*. Ottawa: IDRC.

Verma, R. (2009). Inside the development machine: Power, culture and disconnect in the central highlands of Madagascar. Unpublished Ph.D. Thesis, School of Oriental and African Studies.

World Bank. (2004). *The CGIAR at 31: An independent meta-evaluation of the consultative group on international agricultural research*. Washington, DC: Operations Evaluation Unit. The World Bank.

Chapter 13
Who Is Fooling Whom? Participation, Power, and Interest in Rural Development*

Patrick Sikana

Abstract In the early 1980s the Zambian Ministry of Agriculture formed provincially-based Farming Systems Research (FSR) units called Adaptive Research Planning Teams (ARPTs). By locating these teams in the Research Branch, Zambia assumed exemplary status with regard to successful institutionalisation of FSR within an existing national agricultural research set-up. While institutionalising FSR within government structures was viewed as advantageous for a number of reasons, some compromises had to be made in terms of flexibility and accountability to local people. Following a description of frustrations associated with a particular development interface (that between the ARPT – Northern Province and local communities), I explore some of the more general institutionalised factors hindering truly participatory development. The paper concludes with a few recommendations for working within the constraints of existing development institutions and priorities while better supporting the aspirations of local communities.

Keywords Development projects, practice of • Development projects-Interface with local communities • Farming systems research • Participation, limitations of • Zambia

---

* Patrick Sikana joined the Tropical Soil Biology and Fertility Programme (TSBF) as its Social Science Officer in 1998 but was killed in the crash of Kenya Airways flight 431 on the evening of January 30th, 2000, off the coast of Abidjan en route to Lagos. This paper originated as an invited presentation at IDRC (the International Development Research Centre) in Canada (Sikana, 1995) that Sikana had revised in 2000 for publication in the form reproduced here. Next of kin could not be traced or contacted as potential copyright holders. If notified, Springer will be pleased to rectify any errors or omissions at the earliest opportunity.

P. Sikana (✉)
Tropical Soil Biology and Fertility Programme
e-mail: joshua.ramisch@uottawa.ca; rvermapuri@gmail.com

L. German et al. (eds.), *Beyond the Biophysical: Knowledge, Culture, and Power in Agriculture and Natural Resource Management*,
DOI 10.1007/978-90-481-8826-0_13,

Background

In the early 1980s the Research Branch of the Zambian Ministry of Agriculture formed provincially-based Adaptive Research Planning Teams (ARPTs) based on the Farming Systems Research model. ARPTs are multidisciplinary teams comprised of an agronomist, a rural sociologist, an agriculture economist, an agricultural extension expert and, in some cases, a livestock scientist. These teams also received technical backstopping from nutritionists based at the national headquarters in Lusaka. At the time of writing, I worked as a rural sociologist for one of these teams (ARPT – Northern Province). In most countries, FSR operates outside government structures. By locating these teams in the Research Branch, Zambia made a decisive move to institutionalise FSR within an existing national agricultural research set-up (Farrington and Martin 1988; Kean and Singogo 1988). In this paper, I argue that whereas institutionalising FSR within government structures was viewed as advantageous in terms of official recognition, accountability to a government bureaucracy, and continuity, some compromises had to be made in terms of flexibility and accountability to local people.

The version of farming systems research initially adopted in Zambia was that developed by the *Centro Internacional de Mejoramiento de Maíz y Trigo* (CIMMYT). In 1988, this approach came under increasing scrutiny because of its positivist and elitist nature. In Zambia, critiques of the conventional FSR approach were given by myself (Sikana 1989, 1990; Gatter and Sikana 1990) and Drinkwater (1992). Meanwhile, the Farmer-First approach advocated by Robert Chambers (1983) and the concept of what Paul Richards (1986) termed "rural populism" were steadily becoming influential. In 1988, ARPT – Northern Province put the ideas of the Farmer-First approach into practice by forming village level groups of farmers called Village Research Groups (VRGs). This strategy was later adopted and ratified by the Research Branch as a model for other provincial ARPTs to follow. By 1992, all the provincial ARPTs were working through various types of grassroots groups. I should stress here that this new approach was not a substitute to, but merely a modification of FSR.

The new orientation to involve local people in project planning and implementation was not a localised affair within the Research Branch of the Ministry of Agriculture. Local participation was fast becoming a "buzz word" in all spheres of rural development, and was increasingly being demanded of development projects by several interest groups such as donors, academics, bureaucrats, and politicians. This new development fad generated an innovative repertoire of skills and approaches such as Participatory Rural Appraisal (PRA), community theatre, village animation, community forestry, etc. (see, for example, Cornwall et al. 1994). In retrospect, I view our own VRGs as a product of this new proliferation of participatory "technologies" (or methodologies). In this paper, I argue that whereas this rediscovery of the "grassroots community" may be well-intended and desirable from both ideological and epistemological points of view, there is a danger that this resultant sense of "ideological correctness" may mask the hidden interests of different actors "on stage," and prevent us from asking critical questions. In the discussion which follows, I try to show how this facade of participation may translate into a "conspiracy" for furthering the interests of economically and politically powerful social actors.

Subsequent Disillusionments

Although the formation of VRGs in the Northern Province was a significant milestone in efforts to achieve farmer involvement in the formulation and ratification of research agendas, our 5 years of experience with this approach left me disillusioned. There were a number of administrative reasons why this strategy could not achieve the desired degree of farmer participation (staffing levels, lack of adequate training, etc.), but these will not concern me here. Instead, I will concern myself with the more fundamental issues of power, interests, and conflict, which characterise the multiple layers of relationships both within the "grassroots community" itself, and more importantly, between the grassroots community and the development agency. I am using the term "development agency" in its broadest sense, to include not only those who execute the development project on the ground, but also those who make decisions about the *modus operandi* of the project, and those who provide funds for project execution.

On paper, the VRGs have been given new roles and responsibilities to drive the research programme. These groups, which ideally should involve all interested farming households in a village, are supposed to meet regularly to submit "farming problems" to an elected committee. These committees in turn liaise with a resident ARPT field technician, who should help the community identify local solutions to the problems (if possible) or, as is often the case, to submit these problems to senior researchers at the research station. In turn, researchers should undertake a multidisciplinary diagnosis of the problem and suggest possible solutions to the community through the VRGs. After the VRG has appraised and ratified the suggested solutions, farmer representatives are chosen by the VRG to host on-farm experiments. The emphasis throughout this process is on continuous researcher–farmer dialogue, up to the final stage of recommendation formulation.

After 5 years of experimentation with this approach, it became apparent that this new vision could not be translated into qualitatively different outcomes. For reasons which will become clear below, the input of local people into the formulation of the research programme remained minimal. Initially, when the new approach was put in place, it met with a lot of enthusiasm by local people. As the rural sociologist in the team I was the officer responsible for VRGs, and my office was soon inundated with a flurry of requests and submissions from the VRGs. Was the ARPT in a position to secure a lorry for community X to ease transport problems? Could the ARPT provide loans for those intending to grow cash crops? Could the ARPT help secure a market for a specified crop? Could we provide mills? And so on. As should be expected, the response from the ARPT in most of these instances was negative, or at best a weak promise to inform "those responsible for these issues, as we are only agricultural researchers". This scenario led to a gradual loss of interest in the VRGs for most farmers, leaving only a small core of dedicated and "development-oriented" individuals. As I will indicate below, it is possible to suggest a number of reasons why this small core of individuals seemed to retain interest in VRGs.

The other observation I want to note here is that at the beginning of each agricultural season, when the ARPT allocated on-farm experiments to be hosted by farmers, interest in the VRGs was again rekindled, although only for a short while – as those who were unable to successfully lobby to host an experiment would stop attending meetings afterwards. As demand to host on-farm experiments is often greater than the requirements of the ARPT agronomist, only a small fraction of aspiring experimental farmers manage to secure an experiment – the small core of "development-oriented" individuals referred to earlier. The most visible incentives for hosting on-farm experiments is that these experiments often involve material inputs from ARPT in the form of new varieties (to be compared with the farmer's own), a new pesticide (to be compared with the farmer's control methods), or fertilisers (to compare different levels of chemical fertilisation with farmers' practice). There are other more complex, often hidden forms of spin-offs which accrue to experimental farmers – which will be touched on later.

The negative response of local people towards the VRG programme defeated the imagination of ARPT scientists. We could not find a satisfactory explanation for why this novel approach, which endeavoured to empower local people, was not enthusiastically embraced by the community. The only reason we could come up with at the time (and one which has since proven wrong) was that perhaps the local people were not "sufficiently aware" of their new roles and responsibilities in the context of this new set of relationships where the traditional researcher–farmer roles have been reversed. With this in mind, we resolved that the way forward would be to organise "village animation programmes" (see Hope and Timmel 1984) to raise awareness among VRG members. At the time I was leaving Zambia for my graduate studies, the first round of these "awareness raising" programmes was in progress, at great cost to the project (in the form of consultancy fees). I only realised in retrospect that it is not the local people who lacked awareness of their new roles and responsibilities, but rather ARPT which lacked mechanisms to deal with local people's most felt needs.

The above discussion sheds light on the way in which local people see development agencies. Given the skewed pattern of resource distribution in underdeveloped economies, and given the resultant expectations that the state should redress this imbalance "by taking development to rural areas", development agencies are primarily viewed by local people as conduits through which resources emanating from outside are channelled to the community. Thus, the primary concern of the local people is *how to access resources* from the development project rather than *how to be involved* in programme execution. What I am suggesting is that participation is a "development technology" which is being pushed by the development agency (to satisfy a range of economic, intellectual, and political objectives) rather than being demanded by the local people themselves. At the level of project implementation, participation represents a "break-through" for social scientists in the same manner that a high yielding variety does for breeders and agronomists. In the Zambian case, participation has proven especially useful for sociologists and anthropologists, whose professional contribution and legitimacy within the agricultural research establishment had been a subject of protracted debate (Cernea 2005; Fujisaka 1994; Chapter 12).

Development agencies must be mindful of the fact that participation is not necessarily a "local" discourse, because the prime mover is the "development agency" itself. This is by no means intended to imply that participation is not a good thing. The example from the Northern Province suggests that while well-meaning models of participation can be constructed by the project and sold to the local people, the primary concern of people will often be the desire to access resources from the project. As I have shown, the local people or segments of the local community may in fact go along with the idea of participation not because of an ideological quest for "empowerment", but as a means to achieve personal goals. I elaborate on this position below.

Deconstructing the "Grassroots Community"

The experiences of ARPT in the Northern Province have shown that the "grassroots community" is a problematic category because it masks the diversity of interests within local communities which may be based on wealth, age, gender, political connections, education, urban experience, etc. In the account given above, we have seen how the "small core of development-oriented individuals" continued to retain interest in VRGs when the great majority of other villagers had lost interest. I now suggest possible reasons why this category of individuals behaved in this manner. In the main, "development-oriented" individuals tend to be economically better-off than the average villager on account of their previous experience as salaried employees now able to invest savings and pensions into cash-cropping. This also means that these individuals are generally better educated than other villagers and are therefore better able to establish rapport with agents of the development institution, for example by "speaking the same language" – both literally and metaphorically.

There are a number of reasons why it is advantageous for these individuals to forge closer links with the development institution. In the case of the VRGs, these individuals do not only get preferential access to inputs and new technologies as earlier noted, but they also have the opportunity to expand their networks of relationships with the outside world. For example, the secretary of one of the most active and successful VRGs (whom I shall call Clement) is a recent retiree formerly employed as a manager of a provincial branch of British Petroleum in the town of Kasama. Clement lives in a large, modern house and as local people say, he has transformed his village into "a little town" by putting up concrete corrugated houses for his relatives, an input storage shed (which now serves as a village depot), and a grinding mill. Clement is so good at organising that ARPT staff find it prudent to work through him whenever they are in the area. In return, Clement takes advantage of ARPT transport by sending for commodities not obtainable within the community – such as diesel to run his grinding mill. Recently, with the encouragement and help from ARPT (following a PRA exercise which identified a need for a store in the community), Clement established a grocery shop which he now runs, for a commission, on behalf of a Kasama-based Asian trader.

Apart from direct economic benefits, I also argue that for local elites like Clement, the interface between rural communities and development institutions represents a political arena where hierarchies of community status are contested and reasserted. Membership to externally-sponsored grassroots institutions such as VRGs does not only increase the social visibility of community elites, but also affords them the opportunity to develop and practice their leadership and rhetorical skills. Thus, it is no coincidence that Clement is not only a VRG member, but also the Chairman of the local Parent–Teachers Association, a prominent member of the local Multi-Purpose Cooperative Society, and, above all, the Ward Councillor of the ruling MMD (Movement for Multi-party Democracy party).

To conclude, certain segments of the "grassroots community", by virtue of their power and influence, can take advantage of externally-advocated models of participation to further their own private interests. A case study from Turkana, Kenya (Sikana et al. 1992) provides additional evidence of how the politically-powerful segments of the community can take advantage of well designed "participatory projects" to obtain access to resources for their personal benefit. In the Turkana case, the development project chose to work through "indigenous institutions" to implement its participatory strategy. The institution which was chosen was the "council of elders" drawn from nomadic Turkana neighbourhoods. One of the most fervent demands during committee meetings was that the project should extend loans to individual members of the council of elders. In this case, generational difference, rather than education and urban background (as in Northern Zambia), was the important variable which secured preferential access to project resources and influence.

Beyond the Grassroots Community: Power and Interests in the Rural Development Industry

One of the main reasons why the VRG approach could not work as expected is because of the inability of ARPT to provide solutions to community problems and priorities which fell outside of the domain of agricultural research. Although requesting lorries and mills from a research institution may sound absurd, these requests reflected genuine community priorities. For example, the problem of transporting heavy and bulky inputs from depots to the farm, and bulky produce from the farm to central buying points, is an issue which has been raised now and again, but from which ARPT only shied away. Similarly, hammer mills are becoming more and more important because people are depending more on maize as a staple instead of finger millet which, owing to its small grains, could be easily milled on stone.

Meanwhile, the switch to maize seems to be irreversible, because of the demise of the traditional finger millet-based system of slash and burn (*chitemene*), which is becoming increasingly untenable under high population densities (Araki 2007).

The issue I address in this section relates to the fundamental contradiction between "bounded" institutional models of intervention on the one hand and farmers' conceptions of "problems" on the other. We have seen that whereas institutional intervention is based on rigidly defined boundaries, community problems are often interconnected and it is in this light that local people experience them. Thus, for local people, it does not make much sense to distinguish between "research problems", "marketing problems", "transport problems", etc. because these problems do not constitute discrete and isolated moments but are interrelated, simultaneously experienced, and directly impinge upon their livelihoods.

Why, then, must institutional interventions be based on rigidly defined boundaries? My thesis is that beyond the grassroots community, there are a number of often very powerful interest groups which have a stake in what I cynically call the rural development "industry". These interests must be carefully negotiated and balanced in a manner which allows different stakeholders to have a "share" in the development process. This negotiation and balancing is what translates into boundaries of intervention. Using ARPT as the point of reference, I now try to sketch some of the important actors whose interests must be taken into account in rural development delivery.

Donor Countries

Most rural development projects in the third world are funded by government aid agencies in developed countries through multilateral or bilateral agreements with recipient countries. For example, ARPT – Northern Province is wholly funded by the Norwegian Agency for International Development (NORAD) through the Ministry of Agriculture. Major developed countries have aid missions abroad (e.g., USAID for the USA, FINNIDA for Finland, GDS for Germany, ODA for Britain, to mention but a few). These development agencies all enter into official agreements with recipient governments which specify both geographical areas of intervention and the sphere of developmental cooperation. For example, in the case of Zambia, NORAD supports most of the agricultural projects in the Northern Province, while FINNIDA supports agriculture and cooperatives in the Luapula Province, Dutch Development Aid supports agriculture and livestock in the Western Province, and so on.

In this paper, I maintain that apart from purely humanitarian reasons (which I do not dispute), this demarcation of boundaries of intervention and spheres of influence of different donors serves important economic and political interests for the donor countries. Employment opportunities (in the form of technical assistance) are created abroad for the nationals of donor countries; back home, from which these aid missions are administered, big bureaucracies exist which again provide employment. In most cases, all of the "development hardware", such as vehicles, computers, etc. is procured from donor country companies, using suppliers and agents from the donor country. Thus, the development industry provides business to companies back home and indirectly provides employment to yet more people. The other important stake that donor countries have in the field of rural development is that development may be used as leverage to exert political influence on recipient countries. For example, when Zambia briefly pulled out from the IMF-sponsored Structural Adjustment Programme in 1990, allied aid missions such as USAID and ODA threatened to withhold their aid. At the time of writing, donor pressure could be held responsible for cabinet resignations and reshuffles in the new MMD government, on account of the government not being clean and transparent enough. Most important for the purposes of this article, this host of official mandates and personal incentives place important restrictions on how aid money is spent, thus placing limits on how participatory or "demand-driven" development can be.

Resident Aid Missions

The second group I want to consider are the representatives of aid missions resident in recipient countries. As custodians and disbursers of funds to projects, these individuals greatly influence the manner in which development projects are executed on the ground. In most cases, projects are required to develop short-term and long-term objectives as well as to specify indicators against which project success is to be evaluated after a stipulated period. Thus, projects have no choice but to set their agenda prior to implementation – limiting the extent to which a project may be defined through a participatory process. Resident aid mission representatives have the obligation to report to their governments on the success of the project, and it is therefore in their interest to ensure that project goals, inputs, and outputs are clearly specified. These technocrats depend on the success of the development projects to mould their career reputations and to secure their often very lavish lifestyles.

Recipient Governments

Recipient governments together with donor countries determine boundaries of development projects through the initial bilateral agreements, as noted above. For recipient countries, donor funds represent a boon that must be strategically allocated and deployed to meet "national priorities" defined a priori by the bureaucratic and political elites. In fact, it is not uncommon in underdeveloped countries to include "pledged" or "expected" donor assistance into national budgets and national developments plans. In the context of Zambia, bilateral donor assistance is negotiated through, and sometimes disbursed by, the National Commission for

Development Planning (NCDP). In instances where the development assistance is not already tied by the donor country to a specified ministry, NCDP will then be obliged to carefully balance the interests of different ministries and provincial administrations. This careful balancing is necessary because with donor funds come vehicles, equipment, and hefty allowances that would otherwise be difficult to finance through national resources. For the political elites, donor funds are sometimes deployed to appease specific political constituencies such as the "youth", women's lobby groups, or farmers, as a way to enlist political support from these groups. Such administrative and political requirements are a powerful determinant on the realm of "development assistance" that is proscribed and financed.

The Implementers

Project implementers include "professionals" and "technicians" (like myself) who are given the responsibility of executing development projects on the ground. I should state here that at the time of my recruitment, my peers, and contemporaries regarded me as a very lucky person because I was going to work for a "NORAD-funded" project. In one respect, they were right to feel that way, because nationals who are "seconded" to donor-funded projects enjoy material and professional privileges not found in government-run institutions. These privileges include, for example, "top-up" allowances to supplement miserable civil service salaries, access to transport and fuel, trips abroad for seminars and conferences (which often carry sizeable allowances), and project-funded scholarships for advanced degrees (often included in the donor package as the "institution-building" component). For this category of individuals, the academic label which they carry at the time of their recruitment (agronomist, rural sociologist, water engineer, etc.) already assigns them to a pre-determined field of rural development and it is within the realm of this field that careers and reputations must be developed. Thus for this group, boundaries of intervention are important. Imagine if I were to suggest to colleagues in ARPT that the project should be a "general" rural development project and not an agricultural research project – the agronomist and agricultural economist would probably say, "It's okay for you as a rural sociologist, but what happens to us?"

Intervention without Boundaries? Towards a Strategy for the Future

In this account, I have demonstrated that participatory strategies can not be expected to work properly in the context of predetermined boundaries of intervention. I have also tried to show that boundaries of intervention are important for diverse interest groups who have a stake in the rural development "industry". In a context where the agenda is already predetermined by other, more powerful interest groups, participation can at best be seen to be merely a means to lend legitimacy to external interventions. In other words, it gives an illusion that since local people are involved, then what is being pursued in rural development discourse are truly the "grassroots interests". I have shown also that the more politically powerful segments of the grassroots community are often inclined to use participation to further their own private interests. Thus, my rhetorical question, "Who is fooling whom?"

The development problem thus becomes one of designing a more participatory strategy of intervention which will be more responsive to the immediate priorities of the "grassroots community" without regard to predetermined boundaries. I am not suggesting that we should recycle old ideas such as integrated rural development (which has its weaknesses but from which we can nevertheless derive useful lessons). On the contrary, I am of the opinion that genuine demand-led participation can still be achieved by simply redefining the focus of intervention within the context of the existing Farmer-First model. For me, the quest for empowerment should not end at enabling local people to *articulate* their demands (this we have achieved already), but to also enable them to *realise* those demands. In my opinion, the greatest disadvantage of local people is not their powerlessness to voice their demands but their powerlessness to assert their interests at the extra-community level – and their inability to access and leverage external resources and services toward these ends. Because of this powerlessness, local people often expect development projects to represent their interests at the extra-community level and to lobby for resources and services on their behalf, irrespective of the stated objectives and mandates of a given project. My belief is that community apathy to participate in well-meaning participatory projects may be chiefly explained by the failure of these projects to meet this expectation. It should also be noted that powerful actors within the grassroots community, like Clement, are in fact already attempting to use the project as a vehicle to gain access to resources from outside the community which are not being provided by the project. In other words, people like Clement are using the project in an innovative way, which points the way forward for a more successful partnership between development projects and local communities.

In the context of agricultural research and extension, I tentatively propose two possible alternatives for meeting broader community expectations within the existing framework of the Farmer-First model. First, instead of exclusively focusing on community-level interventions (e.g., on-farm trials, training and visit programmes), participatory programmes should make deliberate efforts to mobilise exogenous resources and support by linking local communities to a wide spectrum of institutions and services outside the local community. In short, the project should act as a broker between the local community and the outside world. I should emphasise that this should constitute a full-time and institutionalised responsibility assigned to a designated officer with appropriate skills to mediate on behalf of the local community and to attract resources and services into the community. The tendency in the past has been to overlook this important role, or at best to undertake it on ad hoc basis.

A second option would be to design participatory projects in a manner which allows for a substantial budgetary allocation over and above what is required to carry out the mandatory research/extension functions of the project; in short to create a "miscellaneous development fund" for participatory projects. This miscellaneous fund can then be deployed to address the articulated needs of local people which do not fall within the ambit of the project's prior commitments (e.g. research and extension). This strategy will also require "brokerage" skills to mobilise the required expertise not available within the project.

Given the indisputable importance of agriculture as a rural livelihood strategy, the implication of the two models suggested above is that agricultural research and extension will continue to serve as a legitimate entry point into the local community, but with the long-term vision of generating a continuous development dialogue which accommodates the wider development needs and aspirations of the local people.

The two models are only tentative and very crudely formulated. I have no doubt that critical scrutiny of these models will reveal a number of predicaments and contradictions, and possibly lead to the conclusion that they are untenable. However, I hope this in itself will be a celebration of the need to seriously rethink conventional assumptions and approaches.

Acknowledgments The promising career of Patrick Sikana was cut tragically short. His dedication to rural people and to overcoming the barriers between scientists and the grassroots communities they work with was a true inspiration to those who knew him or his work, including the co-editors of this volume. In choosing to include this up to now unpublished paper, we wanted to honour Sikana's legacy of interdisciplinarity by ensuring that his challenge to the disciplinary and institutional status quo of development practice and agricultural research was not lost. Although Sikana had revised this paper to its present form shortly before his death, the editors added a few more recent bibliographic references, and accept full responsibilities for any errors, omissions, or inaccuracies arising from its publication.

References

Araki, S. (2007). Ten years of population change and the *chitemene* slash-and-burn system around the Mpika area, northern Zambia. *African Study Monographs*, *34*(March), 75–89.

Cernea, M. M. (2005). Studying the culture of agriculture: An uphill battle for social research in the CGIAR. *Culture and Agriculture 27*(2), 73–87.

Chambers, R. (1983). *Rural development: Putting the last first*. New York, NY: Longman.

Cornwall, A., Guijt, I., & Welbourn, A. (1994). Acknowledging process: Challenges for agriculture research and extension methodology. In I. Scoones & J. Thompson (Eds.), *Beyond farmer first: Rural people's knowledge, agricultural research and extension practice*. London: Intermediate Technology Publications.

Drinkwater, M. (1992). *Methodology evolution within ARPT: The use of farmer research groups and RRA in surveys within central and Copperbelt provinces*. Kabwe, Zambia: Kabwe Research Station.

Farrington, J., & Martin, A. (1988). Farmer participation in agricultural research: A review of concepts and practices. *AAU Occasional Papers* No 9. London: ODI.

Fujisaka, S. (1994). Will farmer participatory research survive in the International Agricultural Research Centres? In J. Thompson & I. Scoones (Eds.), *Beyond farmer first: Rural people's* *knowledge, agricultural research and extension practice* (pp. 227–235). London: Intermediate Technology Publications.

Gatter, P., & Sikana, P. (1990). Are improvements in farming systems research negotiable? Some observations from northern Zambia. *Farming Systems Bulletin, Eastern and Southern Africa, 6*(May–Aug).

Hope, A., & Timmel, S. (1984). *Training for transformation: A hand book for community workers (Books 1, 2 and 3)*. Gweru, Zimbabwe: Mambo Press.

Kean, S., & Singogo, L. (1988). Zambia: Organisation and management of the Adaptive Research Planning Team (ARPT). Research Branch, Ministry of Agriculture and Water Development. *OFCOR Case Study* No. 1. Addis Ababa: ISNAR.

Richard, P. (1986). Ecological particularities and rural populism. In T. Shanin (Ed.), *Peasants and peasant societies*. London: Penguin Books.

Sikana, P. M. (1989). *An experiment in grassroots participation: Appraisal of ARPT (N.P.).* Village Research Groups. Kasama, Zambia: ARPT.

Sikana, P. M. (1990). Deconstructing farming systems research: A post-modernist case in favour of grassroots participation. M.Sc. Dissertation, University of London.

Sikana, P., Bezeley, P., Kariuki, D., & Fre, Z. (1992). Kenya livestock and pastoral programme: Some observations and recommendations. Evaluation Report. Rugby, UK: Intermediate Technology Development Group.

Index