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**INFORMING FOOD SECURITY DECISIONS IN AFRICA:
EMPIRICAL ANALYSIS AND POLICY DIALOGUE**

by

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INFORMING FOOD SECURITY DECISIONS IN AFRICA: EMPIRICAL ANALYSIS AND POLICY DIALOGUE

INTRODUCTION

Discussions of economic and agricultural development in Africa have focused heavily in recent years on structural adjustment--i.e., basic policy changes aimed at allowing international and domestic markets to play a greater role in coordinating national economic activities. Often these structural adjustments and accompanying policies aimed at improving economic performance have been based on several implicit assumptions about how African food systems operate. Yet for many countries, there has been little empirical information to test these assumptions. Hence, designing policies too often becomes an exercise in planning without facts.

This paper argues that not only is there a need to base food security and structural adjustment policies more firmly on empirical information, but that the process by which the information is obtained is as important as the information itself. Agricultural economists and other social scientists can and increasingly should design policy research in Africa in ways that simultaneously increase effective demand for empirical information as an input into the ongoing policy process and augment African capacity continually to inform policy deliberations. We illustrate the payoffs to such an approach by drawing on selected experience in several African countries (Weber).

STRUCTURAL ADJUSTMENT AND FOOD SECURITY

In recent years food security has come to be defined as "the ability of a country or region to assure, on a long-term basis, that its food system provides the total population access to a timely, reliable and nutritionally adequate supply of food" (Eicher and Staatz, p. 216; World Bank, 1986). Food security thus involves assuring both an adequate supply of food and access of the population to that supply, usually through generating adequate levels of effective demand via income growth or transfers. Food security is therefore influenced by both micro and macro factors, ranging from the technology and support institutions available to farmers and merchants, to monetary, fiscal, and exchange rate policies that affect the overall rate of growth and distribution of income. Food insecurity can be either short-term (e.g., a famine resulting from a crop failure) or chronic (long-term undernutrition). Due to space limitations, this paper focuses primarily on chronic aspects of food insecurity, which is widespread in sub-Saharan Africa.

Because insufficient income is a major source of chronic food insecurity, there is considerable complementarity between structural adjustment, which aims at increasing long-term growth of incomes and employment, and measures to increase food security, particularly in Africa. Structural adjustments are often needed to get African economies on a path of broad-based growth that will help assure long-term access to food (World Bank, 1988). Yet as food riots in several African countries testify, assuring a minimum level of food security to key elements of the population is often a political and economic necessity in order to launch and maintain structural adjustments. Effective food security policies aimed specifically at improving the supply of and access to food therefore serve as strategic inputs into sustainable structural adjustment. Food security policies often involve structural-adjustment-like changes in relative prices and in some of the rules under which the economy operates, as well as more "traditional" elements such as targeted food subsidies and actions aimed at improving technologies and institutions

available to farmers, merchants, and consumers. A key to designing effective food security policies is gaining an empirical understanding of how these various actions affect the constraints and incentives facing various groups in the economy, and hence influence their behavior.

EMPIRICAL NATURE OF KEY FOOD POLICY DEBATES

Policies advocated to improve African food security within the context of structural adjustments are frequently based on several implicit assumptions--for example, that farmers are highly price-responsive, that most farmers are net sellers of food, that emphasis on cash crops endangers food security, and that there is a private sector ready and willing to fill the vacuum left by the dismantling of parastatals. Here we focus on two key debates: the food price dilemma and the effect of cash-cropping on household food security.

The Food Price Dilemma

Food prices play a dual role in developing countries: they act as incentives to agricultural producers and as major determinants of the real income of consumers. Higher prices may be necessary, at least in the short-run, to induce increased food production, yet this imposes a heavy cost on low-income consumers. Timmer, Falcon and Pearson term this "the food price dilemma" and argue that dealing with it constitutes the crux of food policy.

Two empirical issues are critical in dealing with this dilemma. First, who are the net producers and consumers of food? A policy to raise the relative price of food benefits net sellers of food and hurts net purchasers, at least in the short run. In arguing for higher food prices, most policy makers, analysts, and donors have assumed that the vast majority of rural Africans were net sellers of food, so that raising prices would benefit the rural majority at the expense of the urban minority. The food price dilemma is seen as less severe in Africa than in other parts of the world, largely because most of the food insecure live in rural areas where access to land is thought to be more egalitarian than in many areas of Asia and Latin America. Higher food prices, it is argued, would be a relatively easy way to raise the incomes of the vast majority of the rural poor by increasing the prices they receive for their products.

Recent empirical evidence draws this assumption into question (Table 1). In major grain-producing areas of five countries for which data are available, 50% or less of rural households were net sellers of major staples even though all of these households were engaged in food-crop agriculture. Even in Zimbabwe, widely regarded as an agricultural success story, only 45% of the households in typical low-rainfall areas were net sellers of maize in 1984/85, while 25% were net buyers. In the poor-rainfall year of 1985/86, the proportion of net buyers more than doubled. Furthermore, because 75% of Zimbabwe's smallholder lands are in low rainfall areas, national sales by smallholders are highly concentrated, with an estimated 10% of households accounting for over 70% of the sector's sales (Rohrbach, p. 274).

The data in Table 1 cast price-policy discussions in these countries in a new light. The incidence of policies to increase food prices would be highly skewed in favor of a minority of producers who are heavy net sellers of staples. The large number of households that are net buyers would be harmed by such policies, at least in the short run, while a significant number (e.g., 40% in southeastern Senegal) that have no net sales or purchases may not be directly affected one way or another. This is not to say that higher prices for food in the short-run might not be necessary as part of a long-run food

Table 1. Market Participation Profile for Rural Households in Selected African Locations

Location (year) ^a	Crop(s)	Market Involvement Indicator			Percent of Total Production Marketed (Excluding Gifts)	Sales Concentration Indicator		
		Net Buyers	No Net Sales or Purchases	Net Sellers		Percent of Total Market Sales		
		-----(% of Households)-----			---%---	-----(% of Households)-----		
Mali (1985-86)	Coarse Grain	39	13	48	8	8	16	23
Senegal (1986-87)	Coarse Grain	30	40	29	5	7	11	15
Somalia (1986-87)	Maize	61	0	39	57	--	13	20
Rwanda (1986-87)	Beans	73	5	22	10	2	4	6
	Sorghum	66	9	33	21	2	4	5
Zimbabwe (1984-85)	Maize (communal sector)	15-25 ^b	18-30 ^b	67-45 ^b	40 ^c	--	10 ^c	--

Sources: Table adapted from Jayne and Weber. Data are from USAID/MSU research conducted under Food Security in Africa Cooperative Agreement in the following locations:

Mali: Sample of 190 farm households in 16 villages in CMDT and OHV zones (Dione).

Senegal: Sample of 215 farm households in 15 villages in Southeastern Region (Goetz).

Somalia: Sample of 308 farm households in 10 villages of middle and lower Shebelle Region (Wehelie).

Rwanda: Nationally representative sample of 1000 farm households (Loveridge).

Zimbabwe: Sample of 204 farm households in 12 villages of low and high rainfall smallholder farming regions (Rohrbach).

^aAll years represent average or better rainfall periods.

^bRanges represent conditions in smallholder farming regions with high and low rainfall.

^cNational estimate for smallholder communal sector.

policy, but it does suggest that the food price dilemma is severe in these countries, even within rural areas. It also suggests that policy makers need to pay considerable attention to non-price as well as price constraints to increased farm production and to constraints to increasing nonfarm income, particularly among food-deficit rural households (Liedholm and Kilby; Reardon, et. al.).

A second key empirical question regarding the food price dilemma is the magnitude of the supply response to higher food prices. The subsistence orientation of much of staple food production in Africa (as indicated in Table 1 by the small proportion of total production entering the market) suggests that supply response to higher prices may be quite limited. Scandizzo and Bruce's survey of supply elasticity estimates for major staples in 103 developing countries supports this view; they found that 62% of the long-run elasticities were less than 0.5 and 27% were negative (pp. 72-74). Reliable econometric evidence on supply response for staples is scant for most African countries, but Martin's simulation analysis, based on separable programming techniques, shows clearly the limited cereals supply response to price increases in Senegal¹. Even with a 100% increase in cereals prices, the degree of self-sufficiency in cereals would increase only from 47% to 55% (p. 204). And most of the output response would come from maize, for which there is currently very limited consumer and industrial demand. A clear implication is that price policy alone, even considering existing intensive technological packages, is not enough to establish a successful food security strategy for Senegal.

Similar results obtain in other African countries. Rohrbach found in Zimbabwe that four interrelated factors, in addition to price increases, explain the recent tripling of smallholder maize production. These include the end of wartime disruption, improved technology appropriate to smallholder conditions, expanded farmer credit, and improvements in both public and private marketing systems that converted the technological potential into the reality of rapid growth in smallholders' purchases of improved inputs and sales of maize. Wehelie likewise shows that in Somalia access to improved seed, fertilizer, and insecticides, timeliness of tractor services and access to extension advice are the major factors explaining yield differences among farmers. Yet both the public and private marketing systems are ineffective in making these inputs available to most farmers. He concludes that without improvements in the input supply, technology generation and farmer training systems, price policy is likely to be ineffective in increasing production and improving broad-based food security.

Food Crop/Cash Crop Tradeoffs

A common belief among many studying Africa is that concentration on export crop production has undermined food security, at both the national and household levels. Dione's recent evidence from Mali draws this into question, showing that coarse grain production per capita, net grain sales per farm, and per capita grain availability in

¹Martin's agricultural sector model incorporates supply functions for each major crop in each of 13 production regions and utilizes a wealth of farm-level technical and socioeconomic data, including 181 crop budgets, developed by Martin's colleagues at the Institut Senegalais de Recherche Agricole (ISRA). The model includes five different technologies for production of each crop, so that price-induced intensification of production is captured by the model. The objective function of the model is to minimize the total cost to Senegal of achieving given levels of cereals self-sufficiency.

southern Mali are all markedly higher for cotton producers than for non-cotton producers. D'Agostino demonstrates that even after controlling for location of production, level of animal traction equipment, labor force, and several other factors, coarse grain production per household increased 240 kg. for each additional ton of cotton produced. Cotton cultivation enhanced food security through the residual effect of cotton fertilizer on coarse grains grown in rotation with cotton; by allowing farmers access to that fertilizer, some of which was applied directly to maize; through financing the purchase of animal traction equipment, which was also used to extend cereals acreage and perform agricultural operations in a more timely manner; and by financing, on a regional basis, basic infrastructure, such as roads and markets for agricultural equipment, that fostered the development of cereals production and marketing.

Cotton production also allowed individual households more flexibility in timing their cereals sales. In the non-cotton-producing zone studied by Dione, 80% of total cereals sales in 1985/86 occurred in the four months immediately following harvest when prices typically are at their nadir, as farmers sold to meet pressing cash needs, particularly to pay the head tax. In contrast, only 37% of cereals sales in the cotton area were in this period, as cotton revenues allowed farmers to meet their post-harvest cash needs and hold off selling their grain until later in the year when prices were higher (p. 75). A clear implication of Dione's and D'Agostino's work is that food strategies in Mali need to be designed in ways that build upon the complementarity of cash crop and food crop production.

Goetz shows for Southeastern Senegal that farm household coarse grain production is complementary with cotton and rice production but may be competitive with peanut production. For the households sampled, a 1% increase in rice (cotton) production is associated with a 12% (7%) increase in coarse grains production. A 1% increase in peanut production leads to a 6%, but statistically insignificant, decline in coarse grain production.

In Rwanda, Loveridge found that a much higher proportion of households that were net purchasers of beans (a major staple) depended on coffee and tea revenue to finance food and other household purchases than did households that were net sellers of beans. Under these circumstances, the income effect of higher coffee and tea prices would have a much greater short-run beneficial impact on the food security of food-deficit households than would higher bean prices.

CONSTRAINTS TO INFORMING FOOD SECURITY POLICY

Bringing the type of empirical analysis discussed above to bear on food policy issues in most African countries has been constrained by factors influencing both the supply of and the demand for such analysis. On the supply side, until recently there has been severe underinvestment in training local policy analysts and in supporting ongoing indigenous research institutions. Governments have not, in general, provided secure budgets for policy research institutions and training, and donor support, while important, has often terminated prematurely. Consequently, while there is a growing interest in policy reform, there is still too little institutionalization of sustainable systems of policy formulation and evaluation. Because of the lack of indigenous capacity, donors rely heavily on expatriate consultants, which, while understandable in light of a desire for rigorous analysis as an input into pressing policy discussions, often does little to build local policy analysis capacity.

Until recently, the lack of policy-relevant information also reflected a very limited effective demand for local policy research, partly because of ideological factors on the

part of both African governments and donors. Governments that tried to forbid private trade in agricultural staples or tightly regulate prices have often viewed official prices as the only ones that mattered; research into open markets and the private trade's constraints was considered contrary to public policy. Furthermore, the tradition of planning in many countries, often encouraged by donors, concentrated the government's economic analysis capacity on the development of multi-year plans and individual investment projects rather than using it to monitor the evolution of the economy as part of a continual process of policy readjustment, or "learning by doing" (Johnston and Clark). The dogmatism with which some donors as well as African governments entered the discussions about structural adjustment and food security in the early 1980s also limited demand for empirical information. If one already knows the prescription, diagnostic information is considered unnecessary.

The limited demand for applied policy research also reflects policy makers' disappointment with much of the agricultural economic and other rural social science research conducted in Africa over the past 20 years, particularly by expatriates. Often this research has not responded well to policy makers' perceived needs nor has it effectively demonstrated the payoff to timely and improved information. The research often is not structured in a way that starts with a specific policy issue and provides timely, relevant results to potential users in an easily understandable form. Delays in data collection, processing and analysis result from research designs that are too complex and data collection that is too extensive given available time and resources. Too frequently, results appear in tomes geared towards an academic or donor audience, after months, if not years, of analysis back in Europe or the U.S., and long after the issues of immediate concern to local policy makers have been resolved, one way or another.

If applied research is to inform the design of food policies adequately, it needs to be designed in more effective ways that simultaneously address these supply and demand constraints. On the supply side, the small pool of trained, experienced African analysts is the greatest constraint to sustained in-country policy analysis. This shortage is so critical that a major criterion for allocating donor research funding should be how effectively contractors use local analysts while at the same time expanding the supply of researchers through in-service and other training. A critical element in the training is in-country processing and analysis of data, which is now feasible if adequate attention is given to research design, training, and microcomputer use (Crawford et al.). If most of the analysis is conducted outside the country, much of the opportunity for a training component is lost as is the potential demonstration effect on local researchers not directly involved in the project.

Building effective demand for policy research requires an iterative program of research and policy extension. Policy extension work requires timely data analysis. The goal of timely analysis forces researchers to define carefully the key policy questions, decide on the minimum amount of data needed to address them (this involves tough decisions on what data not to collect), and design questionnaires to facilitate data entry and analysis (ibid.). This process involves sequencing research instruments and outputs rather than trying to address all relevant policy issues in one or two massive studies. Sequencing outputs places initial emphasis on working papers that present preliminary results, based on relatively simple analysis and that serve several purposes. They are a vehicle to quickly diffuse selected results, thereby gradually upgrading the empirical quality of policy deliberations. They can be used to solicit feedback on the usefulness and validity of the findings and suggestions for future topics for the ongoing research program. Based as they are on relatively straightforward analysis, they serve as useful in-service training exercises for local research staff. Properly designed, they can also constitute the building blocks for more sophisticated analysis, such as the Senegalese agricultural sector model discussed above.

JOINT PRODUCTS: APPLIED RESEARCH, EXTENSION AND TRAINING

The demand and supply constraints to local policy research are most effectively addressed when applied research, human capital formation, and policy extension are conceptually and operationally treated as joint products. This has major implications for the design of research and for graduate training in agricultural economics in African, U.S., and European universities, since many Africans will eventually require advanced training in order to upgrade long-run policy analysis skills.

We have found it useful at our university to set a goal of pursuing applied research opportunities in developing countries that simultaneously involve graduate student and other types of training. Achieving this goal requires, among other things, university support for a strategy to concentrate in selected geographical areas, and to build and maintain a faculty with relevant subject-matter, language, and cross-cultural skills. Most importantly, it requires rewarding faculty who pursue a combination of teaching, extension, and research, producing multiple types of output for multiple audiences, many of whom are in the Third World.

A critical issue is what to expect in a Ph.D dissertation, since advanced doctoral students, whether from Africa, North America or Europe, usually are key long-term participants in field research. We have found it useful to require Ph.D candidates to: a) help conceptualize and design the field research, in collaboration with host-country participants and campus-based faculty; b) assist at least two local analysts in designing and implementing selected components of the research, from design to write-up and extension activities; c) coordinate and help manage overall field implementation, including the selected components of the research that will eventually serve as dissertation material; d) work collaboratively with local analysts to complete timely working papers and reports; and e) train local analysts in research methods and computer use. The time required to complete a dissertation under these circumstances is a minimum of 18 to 24 months. The overall investment by host-country participants, funding agencies, faculty, and students is significantly higher than in the normal model of graduate research. Yet our experience, and that of most of the participating institutions, is that the return to this approach greatly exceeds the costs. More importantly, the result is more than just research reports and graduate degrees but a joint product, comprised of more informed policy and analysts with experience in approaching research and extension in a way that more effectively addresses the supply and demand constraints to improved policy.

Empirical Examples of the Joint-Product Approach

Evidence from Rwanda illustrates such a payoff. In 1986, the government of Rwanda, at the instigation of the president's office, instructed the food product parastatal to raise farm-level floor prices for domestic food crops 75% above existing open-market levels in order to improve production incentives. Michigan State University (MSU) became involved in analyzing this issue because of a 1985 agreement to assist the Ministry of Agriculture's survey unit (SESA) in collecting information to inform policy on dry beans and sorghum. Two Rwandan analysts, a Ph.D. candidate from MSU, and campus-based backstop faculty formed the basic research team. The goal was to collect minimal additional information to complement data from SESA's 1984 national survey of agricultural production and household characteristics and its related on-going production surveys. The policy-analysis component would have been impossible without a prior four-year investment by the Ministry, with assistance from USAID, to build a foundation of data and analytical capacity in SESA. In November, 1985, the SESA/MSU team added weekly transaction surveys for beans and sorghum to ongoing surveys and analyzed the

resulting data entirely in Rwanda within two to three months after they were collected. By August, 1986, the accumulated data and analysis began indicating results similar to those shown for Rwanda in Table 1. Higher floor prices for beans would benefit only a small portion (6%) of rural households selling the majority of marketed surplus, while hurting the 73% found to be net bean buyers. Especially affected would have been the 30% of rural households purchasing about half of their available supply. In a related survey, net buyer households indicated that given current technology, non-price factors such as insufficient land, unfertile soil and poor access to fertilizer, not low prices, were the principal constraints to expanding output. Equally important, the data showed that Rwanda was not self-sufficient, as had been assumed, but was importing through informal channels an estimated 15% of total national consumption (60% of rural purchases). Despite the president's good intentions, a relatively high floor price paid to all wanting to sell would have simply drawn in a greater volume of imported beans, adding to treasury costs and economic adjustment problems without much hope of increasing output.

A strategy to begin sharing this information with policy makers while it was still being collected resulted in a working paper utilizing the first six months' data. The Director of SESA approached selected officials for feedback, thus beginning a process of gradual sharing and discussion of results. In March, 1987, less than 3 months after completing field data collection, a series of seminars was undertaken that presented results of analysis of the full 12 months of data. The series further stimulated interest in the results and gave SESA staff additional experience in presenting and discussing policy-relevant information. In June, 1987, the government unofficially withdrew attempts to implement the new price policy, and in April, 1988, officially reverted to its prior price policy. Feedback from a number of sources in the public sector indicate that SESA's data and extension activities were instrumental in helping the government reconsider its approach to farmer incentives.

Dione and Staatz report that in Mali there was no tradition of issuing preliminary results in the form of working papers, and that Malian policy makers were at first skeptical of these reports and slower than donor technical staff to grasp the usefulness of their findings for policy design. After Dione and colleagues conducted a series of workshops over a two-year period to discuss various reports with members of the Malian food strategy commission, local policy makers became strong advocates of the need to foster local research capacity to inform policy and to utilize empirical information. This led in 1988 to the creation of a research unit within the grain marketing board, which is responsible for conducting marketing research on an on-going basis.

Martin's work in Senegal is likewise an example of the payoff to sequencing research outputs and training, especially when building complex analytic tools. As model building progressed, Martin wrote working papers jointly with other ISRA staff on the evolution of supply and demand for food in Senegal, international trade in inputs and outputs, and crops budgets. These provided information on the basic behavior of the cereal system being modeled and helped generate interest in the eventual model results. Model results were presented in Senegal and the U.S. in several fora, most recently at a national food policy conference organized by ISRA, and are currently being reviewed by various technical advisors in government. A Senegalese researcher who recently completed an M.S. degree in the US is working at ISRA to extend the model and to collaborate with Martin to analyze various food self-sufficiency scenarios of interest to the government and donors. The Senegalese interest in using the model represents a major payoff to the extension work that accompanied its development.

CONCLUDING COMMENTS

There is much to be hopeful about in current policy deliberations concerning African food security and structural adjustment. Foremost is the growing African and donor interest in critically examining both domestic and international policies. USAID and other funding agencies have growing interest in projects to improve policy analysis capabilities. Currently the World Bank is formulating a policy to introduce new elements to deal with food insecurity in Africa (1988). It is also undertaking a joint project with the African Development Bank and others to assist selected countries in establishing permanent household surveys to track the effects of structural adjustment on different socioeconomic groups.

In this paper we have argued that to capture the benefit of this interest in policy, we must take the long view, going beyond the propensity to hire our best scientists to search, frequently on short-term assignment, for the policies that will once and for all set things straight. Even when such prescriptions are well grounded in reality and analytical logic, they do little to stimulate African demand for better information, and will be short-lived in dynamic settings where supply and demand forces change constantly. The long-term challenge is to help Africans develop their own effective demand for and supply of policy analysis, both in government and private-sector institutions that have the ability to continually deliver information useful in the uncertain and ever-changing environment in which improved food system technologies, institutions and policies must evolve.

We believe this goal is feasible and will have a high payoff across Africa, where many governments are undertaking bold changes, often with little more to guide them than good intentions. We have illustrated in this paper, drawing on collaborative work with African and USAID colleagues in several countries, that three factors are critical to converting good intentions into effective policy and programs: (1) A recognition on the part of policy makers of the empirical nature of key policy questions and a willingness to seek improved empirical information on which to base policy rather than relying simply on ideology or conventional wisdom; (2) An approach to informing policy that views research, extension, and human capital formation as joint products and seeks to maximize the complementarity among these activities. For such an approach to succeed, donors and host governments must be willing initially to accept local policy analysis based on relatively simple tools and support the process of building local capacity over the long haul. The approach also requires that both the African and expatriate professionals involved be rewarded for producing joint products of research, extension, and training rather than judged purely on their ability to produce outputs for their academic peers; (3) Graduate and other training programs that stress the skills necessary to carry out such empirically oriented work, especially a firm foundation in both micro and macroeconomic theory, survey research tools and computer skills, as well as experience with teaching and extension.

Just as economists have learned over the past decade that food security depends on both supply and demand factors, so too must we learn that instituting sustainable systems for food policy formulation depends on both the local supply of and demand for improved policy analysis. If we appreciate this and act on its implications over a long enough period, a great deal can be done to assist Africans in establishing policy and programs that effectively reduce hunger and poverty.

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