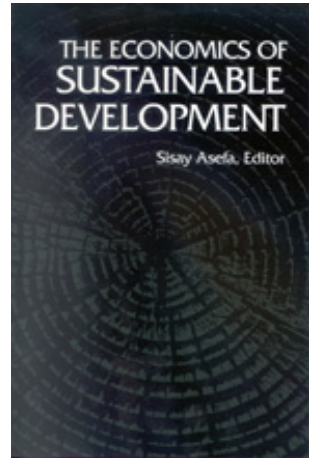


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The Concept of Sustainable Development: An Introduction

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1

The Concept of Sustainable Development

An Introduction

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Sustainable development is the concept of a relationship between economic growth and the environment. The term was first used in 1987 by the World Commission on Environment and Development (also known as the Brundtland Commission for its chair, Gro Harlem Brundtland). In the commission's report, "Our Common Future," it defined sustainable development as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (World Commission on Environment and Development 1987). Although the term has been around for almost two decades, differing interpretations have kept it from being a useful guide for development policy. However, there is now progress in moving the concept toward a more productive exploration of the relationship between economic development and environmental quality. For example, the International Summit on Sustainable Development that convened in Johannesburg, South Africa, in September 2002 provides some promise along this line (Hayward 2003).¹

Sustainable development analysis differs from the standard economics of growth and development by incorporating natural resources as a form of *natural capital*, defined as the value of the existing stock of natural resources such as forests, fisheries, water, mineral deposits, and the environment in general. Natural capital provides goods and services to people, just as do financial capital, manufactured capital, and human capital, the last created by investments in education and health. The depletion of natural capital can be compensated for, in part, by invest-

ments in manufactured and human capital. Conceptually, sustainable development can be measured by taking a country's Gross National Product (GNP) and subtracting Depreciation of Manufactured Capital (Dm) and Depreciation of Natural Capital (Dn) to find Sustainable Net National Product ($SNNP$):

$$GNP - Dm - Dn = SNNP.^2$$

It follows that Sustainable Net National Product ($SNNP$) can be expressed as

$$SNNP = GNP - Dm - Dn = C + S - Dm - Dn,$$

where Consumption (C) plus Total Savings (S) minus Depreciation of Manufactured Capital (Dm) and Depreciation of Natural Capital (Dn) forms the equivalent of the previous equation. This yields the basic sustainability criterion that Net Savings (NS) equals Total Savings (S) minus Depreciation of Manufactured Capital (Dm) minus Depreciation of Natural Capital (Dn), which must be positive:

$$NS = S - Dm - Dn > 0.$$

Moreover, if Depreciation of Human Capital (Dh), whether in the form of brain drain or in the form of deterioration in the quality of education and health, is included, Sustainable Net National Product ($SNNP$) can be adjusted as follows:

$$SNNP^* = GNP - Dm - Dn - Dh = C + S - Dm - Dn - Dh,$$

or

$$NS^* = S - Dm - Dn - Dh,$$

where

$$SNNP^* = SNNP - Dh$$

and

$$NS^* = NS - Dh.$$

The basic criterion of sustainability can now be restated as Net Savings (NS^*) must be greater than zero after depreciation of manufactured, natural, and human capital are accounted for, or

$$NS^* = S - Dm - Dn - Dh > 0.$$

This implies that an economy becomes unsustainable if it fails to reverse the depreciation of the three forms of capital—manufactured, natural, and human—or, put another way, if natural resources are degraded and the quality of education and health deteriorates. The effect would be the same if capital flight—including the flight of human capital, or brain drain—occurs in a given country.

Natural and other forms of capital, such as manufactured and human, are both complements and substitutes. Improving either manufactured or human capital can increase natural capital such as soils.

Many of agriculture's gains in land productivity are a direct result of investments in human capital and in farmers' knowledge as much as they are in manufactured capital (investments in mechanical and biological technology such as machinery and improved seeds). So it stands to reason that there is marked deterioration of natural capital in the form of soil erosion, deforestation, and water depletion in economies where manufactured and human capital is lacking, such as in Africa. It is reasonable to assume that there is a finite or limited substitutability between natural and other forms of capital; therefore the preservation of various forms of capital for future generations is crucial, since it matters what type of capital assets future generations inherit from the current generation.

SOME HIGHLIGHTS OF THE CHAPTERS

The six chapters that follow explore various dimensions of sustainable development from an economic perspective. The chapters grew out of essays that were delivered at the fortieth annual Werner Sichel Economics Lecture-Seminar Series, organized by the Department of Economics at Western Michigan University. I directed the series, and the W.E. Upjohn Institute for Employment Research cosponsored it with the university. The six authors in the volume cover a number of sus-

tainable development issues: neglected aspects of sustainability (Malcolm Gillis); inequality, conflict, and war (E. Wayne Nafziger and Juha Auvinen); scientific constraints on sustainable agricultural production (Vernon W. Ruttan); economic perspective on population growth (David Lam); the relationship between property rights and environmental sustainability (Daniel W. Bromley); and rural poverty and sustainable natural resource management (Scott M. Swinton). This introductory chapter will highlight some of the authors' main arguments, preparing the reader for more detailed discussion and analysis by the individual authors.

In the first chapter, Gillis notes that the concept of sustainable development has become quite popular in recent years; there is now even a Dow Jones Sustainability Index, intended to guide managers to opportunities to secure "green growth" based on an improved natural environment—the need for clean air, clean water, and a healthy ecosystem on which human beings depend. An understanding of sustainable development, he says, involves disciplines such as ecology, biology, ethics, economics, chemistry, physics, statistics, and engineering. Economics has a crucial role to play in this multidisciplinary endeavor. Thus, the focus of his chapter is on exploring from an economic perspective a sustainable development path that maximizes the long-term net benefits to humankind, taking into account the costs of environmental and natural resource degradation. Gillis points out that sustainable development is important for all societies but is especially critical for poor ones, which depend more heavily on natural resources such as soils, rivers, fisheries, and forests than do richer nations. Environmental problems in developing countries are primarily driven by poverty, while those of wealthier countries are driven by affluence and overconsumption (Perkins et al. 2001).

Examples of affluence-driven environmental problems include the overuse of energy and fuel, highway congestion, and congestion of fragile watersheds and beaches with vacation homes. Poverty-driven environmental degradation includes deforestation and soil erosion. Gillis points out that until a few years ago 20 percent of the land in Ghana (which was once covered with forests), still remained in forest. But the forests have now receded to less than 5 percent of the land. The problem is similar in many poor economies of Africa, Asia, and Central

America. It is estimated that 80 percent of the trees that are felled in developing countries are cut down for use in cooking.

Beyond the problems brought on by poverty and affluence, Gillis discusses two additional factors that undermine sustainable development: market failure and government policy failure. Market failure comes from the underpricing of natural resources not traded in private markets; it can also be caused by monopolies, externalities, and high transaction costs. Policy failure arises from overlooking the environmental consequences of economic policies such as those governing the tax code, the exchange rate, industrialization and agricultural and food prices. Policy failure often results from a lack of knowledge and understanding by policymakers of the role of markets and prices in resource conservation and ecological protection.

Such policy failures include short-sighted subsidy programs that undervalue soils, forests, water, and energy resources. Gillis notes that energy policy failure has led to unsustainable development in oil producing countries such as Nigeria, Indonesia, and Venezuela in at least three ways:

- 1) Subsidies lead to overconsumption of energy.
- 2) Excessive use of cars and the fuel they burn adds to congestion and air pollution.
- 3) Promotion of cheap energy results in capital-intensive industry inappropriate for a country's resource endowments.

For example, Indonesia subsidized kerosene for 15 years with the aim of helping the poor by reducing the cutting of wood for fuel. But research showed that poor rural families used kerosene for lighting and not for cooking. Furthermore, over 80 percent of kerosene was consumed not by the poor but by relatively wealthy or higher income households. Thus, Indonesia protected some 50,000 acres of forestland each year at a cost of \$200,000 per acre, for an annual program cost of \$10 billion.

Agricultural subsidy is another example of government policy failure, according to Gillis. This involves the underpricing of chemical fertilizer and herbicides, resulting in overuse of fertilizer, which actually reduces the soil's fertility in tropical agriculture. Agricultural subsidy also results in the overuse of chemicals such as herbicides and pesticides, which actually increase infestation by agricultural pests because

of their greater effects on the natural predators of pests. Thus, sustainable use of resources is possible if governments work to correct both market and policy failure.

The following chapter, by E. Wayne Nafziger and Juha Auvinen, discusses the complex relationships that spring from conditions like economic development, inequality, conflict, and war. Nafziger and Auvinen explain how economic decline, income inequality, and weakening or failing states with pervasive rent seeking by ruling elites and by rebels threaten the survival of people in developing societies. Nafziger and Auvinen maintain that competition for control of mineral exports leads to elite- and rebel-driven conflicts that contribute to wars and humanitarian disasters for these societies. Their chapter takes a political economic approach, which includes not only economic analysis but also an examination of the interests of political leaders, rebels, and economic policymakers, and the effects of their decisions on poor societies. Their data are based on a research project that began in 1996 between the World Institute for Development Economics Research (WIDER) of the United Nations University in Helsinki, Finland, and the University of Oxford in England. This project examined 17 case studies of war-afflicted developing countries for periods that ranged from the late 1960s to 2000, including Nigeria, Pakistan, Rwanda, Burundi, Congo, Sudan, Somalia, Liberia, Sierra Leone, Afghanistan, Cambodia, Iraq, Haiti, El Salvador, Colombia, Bosnia, and the South Caucasus.

Nafziger and Auvinen point out that there has been an increase in internecine conflict and humanitarian emergencies in Africa in the last two decades of the twentieth century, which is linked to negative per capita income growth. Indeed, the continent has the world's highest death rates from wars and humanitarian emergencies such as famines. These maladies revolve around economic stagnation and are driven by misguided government policies. Per capita GDP in Africa was lower in the 1990s than it was in the 1960s, when most African countries were becoming independent from European colonialism. Writing in the 1960s, the eminent economist Gunnar Myrdal of Sweden forecast great promise for Ghana and other African states, and a dismal one for Asia and for South Korea in particular. But over the next few decades, African economies declined while East Asia and South Korea burgeoned as vibrant middle income economies.

Although several factors may contribute to the economic problems of African states, the single most important one is the problem of predatory rule that results from monopoly. Political and economic power concentrate in the hands of authoritarian regimes that rule by coercion, rely on personality politics, and degrade the institutional foundations of the economy and the state, according to Nafziger and Auvinen. Such a predatory state is controlled by elites that extract rents rather than provide incentives for economic growth or the creation of wealth. Much of their revenue comes from transfer payments of bilateral or multilateral international aid. In most of these states, the authors point out, ruling elites and their clients use their monopoly on political positions to plunder the national economies through corruption, graft, and extortion. Instead of serving a public cause, the state in Africa tends to be privatized, or appropriated to the service of private interests by the dominant faction of the elite, Nafziger and Auvinen write. This, combined with rulers who stay in power for unlimited periods, leads to violent resistance by rebels. Resistance is fiercest in those states in the thrall of dictatorial rule and possessing rich mineral resources, such as the former Zaire (now the Congo) under former president Joseph Mobuto, and oil-rich Nigeria under former president Sani Abacha. What this implies is that natural resource wealth can be a curse in nondemocratic societies, where economies are subverted by elites with highly concentrated political and economic power.

Nafziger and Auvinen challenge the common view that ethnicity or tribalism is the primary cause of economic decline and state conflict in African societies. Rather, they assert, ruling political elites invent and impose ethnic tensions on society as a way of maintaining power. Thus, ethnic hostilities are merely a symptom of the real problems: poverty and lack of protection of individual rights and liberty. Furthermore, rebel organizations actively manufacture ethnic grievances, Nafziger and Auvinen say, as a necessary way of motivating their forces, which results in chaos for African societies and plunder of African economies. Consequently, where conflicts occur in ethnically diverse African societies, it will appear as though they are caused by ethnic or tribal hatreds. A good example of a state creating divisions where there were none occurred in Somalia. The state of Somalia in the Horn of Africa sub-region is one of the most homogeneous ethnic states on the continent. The Somalis speak the same language—Somali—and have the same

religion—Islam. But clan-based conflicts between the ruling elite and rebels over scarce natural resources led to a collapse of the Somali state in 1991 and the ouster of dictator Said Barre.

Thus, social scientists that study African societies and economies must rethink their claim that tribalism is the primary cause of conflict. The conflicts most often arise when authoritarian rule is challenged by rebels and rulers refuse to make credible economic and political reforms because of their selfishness, fear of losing power, and lack of a long-term vision. Decentralization and democratization are evolutionary processes that cannot be imposed from above by a dictator or from outside by foreigners. They require the emergence of enlightened leadership that focuses on growing the economy and on carrying out credible political reforms that lead to democratization.

Nafziger and Auvinen's conclusion asserts that the major changes that developing states need to make to achieve sustainable development are economic and political ones. These include the development of a working legal system, financial institutions that increase earnings (and thus taxing capacity), a well-functioning factor and exchange rate market, targeted programs aimed at helping the poorest segment of the population, and the promotion of democratic institutions of governance that lead to representative government and accommodate various ethnic and religious groups and communities.

The next chapter, by Vernon W. Ruttan, examines the sources and constraints of productivity growth in world agriculture. Ruttan traces the role of agriculture in economic development thought, beginning with the years after World War II, when agriculture was viewed as a sector from which resources could be extracted to fund the industrial sector. While this early literature recognized agriculture as a precondition for economic growth and development, he notes, the process by which agricultural growth was generated eluded most development economists.

A new perspective, informed by advances in agricultural science and economics, began to emerge in the 1960s with the recognition that agricultural technology was location-specific and that technologies developed in industrial countries are not directly transferable to developing countries. In the midst of this new thinking, a small but important book by Theodore W. Schultz, *Transforming Traditional Agriculture*, was published. Through empirical observation, Schultz (1964) induced that peasants in agrarian economies are rational persons who allocate

scarce resources efficiently, and that their poverty is a result of the limited technical and economic opportunities to which they can respond through enabling institutions. In other words, Schultz maintained that peasants are “poor but efficient” rational agents that respond to economic incentives, not irrational beings as had been argued by some economists of an earlier generation.

The Schultz thesis implies three types of relatively high-payoff investment areas in agricultural development: 1) the capacity of agricultural research institutions to generate new location-specific technical knowledge; 2) the capacity of the technology supply industries to develop, produce, and market new technical inputs; and 3) the schooling and the extension education of rural people to enable them to use new technology effectively. This high-payoff model contributed to the success of green revolution crop varieties at the time. The high-payoff input model, however, did not explain the conditions that induce the development of new institutions, such as public-sector agricultural experiment stations, which supply location-specific knowledge and technology. This required another breakthrough in development thinking under a model of induced technology, in which the development and application of new technology is endogenous to the economic system.

The new model, pioneered by Hayami and Ruttan (1985), suggested that technical change was driven by changes in relative resource endowments and factor prices, in which new technologies are developed to substitute a relatively abundant or cheap factor for a more scarce or expensive factor. This calls for a choice between two kinds of technologies: mechanical and biological. Biological technology involves “land saving” technology designed to substitute labor-intensive production practices and inputs such as fertilizer and plant or animal protection chemicals for putting new land in production. Mechanical technology involves labor saving technology designed to substitute power and machinery for manual labor. These two types of induced technology in agriculture were historically demonstrated in the economic growth of Japan, which focused on biological and chemical technologies, and that of the United States, which adopted mechanical technologies (Hayami and Ruttan 1985; Ruttan 1988).

The implication of Ruttan’s essay is that for most developing countries today with high population growth and density, the appropriate technology to pursue should include the advances and application

of biological technology that are most relevant to that country. Such technology comprises three elements, according to the author: 1) land and water development to provide a favorable environment for plant growth, 2) the addition of organic and inorganic sources of plant nutrition to stimulate plant growth and the use of biological agents and chemicals to protect plants from pests and pathogens, and 3) the selection and breeding of new, biologically efficient crop varieties specifically adapted to respond to those elements in the environment that are under management.

Ruttan maintains that in rural areas of developing countries, growth in land and labor productivity has led to a substantial reduction in poverty, especially in East Asia and India. During the next 50 years, soil degradation may present serious constraints in some fragile resource areas such as the semiarid and arid regions of sub-Saharan Africa. Subregions such as north China and northeast Africa will experience absolute or severe land and water shortages. Ruttan holds that the achievement of sustained growth in agricultural production over the next half century represents at least as difficult a challenge to science and technology as the transition to a science-based system of agricultural production did in the twentieth century. He provides a rare optimistic perspective on the current bleak state of agriculture in sub-Saharan Africa by noting that for countries where land and labor productivity levels are furthest from pace-setting levels, such as in sub-Saharan Africa, opportunities exist to enhance productivity substantially. These countries would find it beneficial to acquire capacity for agricultural research and technology transfer. In his conclusion, Ruttan warns that if the world is to meet its food demands over the next 50 years, institutional innovation must play at least as great a role as technology.

Chapter 5, by David Lam, provides an economic perspective on how the world survived the so-called population bomb. The half century from 1950 to 2000 experienced unprecedented population growth, yet mankind achieved a decline in poverty in the developing regions of the world, with the exception of sub-Saharan Africa.

Lam notes that world population, which stood at 1 billion in 1900, reached 2 billion around 1930, then added another 4 billion by the year 2000. Given the current age distribution and trends in fertility and mortality, it is unlikely that world population will double in another 40 years, which makes the 1960–2000 period unique in human history.

Before the population explosion began, the world had high birth rates, high death rates, and a relatively low population. But during the first half of the twentieth century, death rates fell rapidly and birth rates initially remained high, generating a gap that caused the rapid rise in population.

A large rise in births leads to an increase in the size of the childbearing population 20 to 35 years later, which in turn creates a powerful mechanism for population momentum. This implies that even with the sharp fertility decline in the 1970s and 1980s, the number of births in many countries will continue to grow for several decades as a result of an increasing number of women of childbearing age. Thus, population will expand for some time to come, even if countries reach replacement fertility rate.

The potential impact of population explosion was dramatized in such writings as Paul Ehrlich's *The Population Bomb* (1968) and the Club of Rome's *The Limit to Growth* (Meadows et al. 1972), both of which envisioned a doomsday scenario in terms of food production, depletion of nonrenewable resources, and rising commodity prices. But the opposite happened: food production increased faster than population between 1961 and 2003. Per capita food production grew by 0.7 percent annually and total food production by 2.4 percent annually during this period. Per capita food production in 2003 was 31 percent higher than in 1961. Moreover, in spite of the warnings made in the 1970s and 1980s that the green revolution would not last forever, the data show no indication that food production will not keep up with population growth, especially given the declining rate of population growth, Lam notes. For example, India, which suffered from famines in the 1960s in much the way Africa is currently suffering, has increased per capita food production to 23 percent above its 1961 level, even though its population has more than doubled since then.

One of the best indicators of whether the world is running out of resources, Lam says, is whether commodity prices are increasing. Here he points out that there has been a decline in four broad real price indices from 1960 to 2000. Prices decreased 40 percent for metals and minerals, 54 percent for food, 60 percent for overall agricultural commodities, and 54 percent for all nonenergy commodities. The exception to falling commodities was petroleum, which, driven by the Organization of the Petroleum Exporting Countries (OPEC) Cartel, rose by the year

2000 to 3.6 times its price in 1960, the year OPEC was formed. But over a period in which world population doubled, real commodity prices declined by more than 50 percent, excluding petroleum. Advances in agricultural production played a crucial role, as did economic globalization led by trade liberalization and advances in global transport and communication.

Lam finds that most developing countries have experienced a marked decline in poverty over the past two decades. The percentage of the population mired in absolute poverty was measured as a ratio of the number of people who earned less than \$1 per day to the total population. This percentage declined from 40 percent in 1981 to 21 percent in 2001, and the absolute number of people in poverty fell by 25 percent, from 1.48 billion to 1.10 billion. The largest decline over this period came in East Asia and the Pacific, where poverty fell by more than 40 percent. In general, poverty fell rapidly in Asia and gradually in Latin America. But in Africa, the percentage of people in poverty increased from 40 to 50 percent, and the absolute number of people in poverty roughly doubled over the 20-year period.

Lam's research shows that the total fertility rate (TFR) for major regions of the world declined over the last half century. Asia and Latin America experienced the fastest declines; Africa went through a more gradual decline. The tradeoff between the quantity and the quality of children is a central feature of economic theory of fertility as articulated by Becker and Lewis (1973), who showed that rising incomes lead to replacement of quantity of children with quality of children. Child quality is enhanced by expenditures on children such as investments in schooling, health, and nutrition. Lam points out that Brazil constitutes one of the best examples of rapid decline in fertility without a major effort at family planning. Here, parental schooling, especially of the mother, is a key factor in women having fewer children and in decreases in infant mortality.

Lam concludes that the world's ability to make gains in areas like food production and poverty reduction in the face of increased pressures on resources bodes well for challenges of the twenty-first century such as ocean fishing, global warming, and the seeming intractability of problems in Africa with food production and poverty.

Chapter 6, by Daniel W. Bromley, explores the relationship between property rights and environmental sustainability. He first discusses the

concept of property rights, which means the limits of the law as it pertains to income appropriable from control of income-producing assets, including trademarks, copyrights, and patents. Bromley reviews John Locke's notion that the key justification for the continued holding of land as property is the idea that such holdings form an essential assurance of liberty. Landholders are assured of this liberty because the state forms an implicit pact to protect them from the predations of others, including the government itself. He notes that property rights in the Lockean sense allow for those who come after to buy land from those who have justly acquired it, and that once the initial acquisition is transferred to a new owner for a particular price, all future acquisitions must be mediated with due consideration for the holder of land or property, in perpetuity. But given this right, Bromley asks, what is to preclude holders of land from engaging in social extortion? Thus it is possible for land justly acquired to become unjustly held or imprudently used.

Kant asserted that the community itself must determine whether land justly acquired continues to be justly held (Williams 1977). But how is this determination to be made? Bromley responds that property rights are created in the process of resolving disputes that originated in conflicting claims brought before a court of law. Thus, he holds, a general theory of property rights is not as simple as it appears, but requires a major dose of philosophical pragmatism.

Bromley's analysis leads him to assert that the central challenge for sustainable environmental policy is to understand the process whereby information from a community of scientists is regarded as definitive and pertinent to the problem under consideration. He notes that discussions about sustainability cannot be understood as pronouncements on what must be saved for the future. Rather, coherence in such conversations will flow from a continual dialogue—a political process in which society figures out what works and is worth saving for the future, what is revered now, and what we hope our descendants will revere as well.

The final chapter, by Scott M. Swinton, reviews the poverty-environment debate with the aim of both promoting sustainability of natural resources and improving agricultural productivity. Swinton notes that the Malthusian fears that arose about population growth following World War II were challenged by Boserup (1981), who showed that rising population triggers an intensification of agriculture, leading to higher food production on the same land. As income and demand for

food rises, it creates incentives for farmers to increase productivity on land by adding inputs such as fertilizer and irrigation. This process, under a flexible and secure land tenure system, can improve agricultural productivity and incomes and can reduce natural resource degradation. Swinton maintains that in this process it is important to understand the key factors that drive farmers' behavior. For one thing, how farmers respond to incentives and make choices is shaped by the resources at their command, following the "poor but efficient" idea of Schultz mentioned earlier in connection with Ruttan's chapter. These resources include labor or human resources as well as natural resources such as land, water, climate, and biodiversity. Other resources are physical capital, equipment, and the financial capital needed to buy inputs such as feed, fertilizer, pesticides, and related inputs. The author also considers the role of social capital, which is a network of sociocultural institutions that enable communities to gain access to and manage resources at the local level, especially when formal government institutions fail. In addition, external factors such as infrastructure in the form of roads, banks, and institutions for the education and training of farmers are crucial, and these must be provided by the public sector.

Swinton asserts that farmers can respond to demand for increased food production with two alternative strategies: 1) *extensification*, involving expansion into new lands, for which the opportunities are limited in most developing regions of the world, and 2) *intensification*, which has proven capable of increasing per capita food production through investment of capital in agriculture. He cites research in rural Kenya showing how three generations of soil erosion was reversed, as rising food and coffee prices led farmers to invest in land terracing and other soil conservation measures, thus enabling them to increase both food production per acre and environmental recovery (Tiffen and Mortimore 1994).

The distinction between labor-led and capital-led intensification offers one explanation of how a decline and an increase in agricultural productivity can correlate, according to Swinton. The phenomenon occurs when an increase in population leads to declining productivity, which in turn triggers capital investment in land. The subsequent gradual increases in land productivity from a low point result in a U-shaped population–land productivity relationship, which encompasses both labor-led (Malthusian) and capital-led (Boserupian) intensification

explanations. However, according to Swinton, the bargain subsistence farmers must make between survival for today and land stewardship for tomorrow directly undermines the goal of sustainable development, defined earlier as meeting present needs without harming the ability to meet future ones (World Commission on Environment and Development 1987). In spite of farmers' manifest preference for the present over the future, Swinton cites case studies from Peru and northern Ethiopia that show that when farmers are confident of passing their land holdings on to their children—when they have security—they are more likely to invest in soil conservation practices such as building terraces than when they expect to control their fields for five years or less—i.e., when land tenure is insecure.

Swinton's essay draws the following policy guidelines to enhance the sustainability of both agriculture and natural resources in rural development:

- 1) Provide clear and durable property rights, since secured farmland tenure is crucial for increasing farm productivity and making the long term investments needed to conserve and improve natural resources,
- 2) Develop local institutions that support natural resource stewardship, such as community systems that enforce crop rotation and maintain soil fertility at modest levels,
- 3) Provide an efficient network of transportation, roads, and communication to support markets for agricultural inputs and commodities, as well as provide a system of credit. Without these things in place, expected benefits from net investments in agriculture and natural resources will not happen,
- 4) Enhance farmers' capacity by providing quality education and training that include conservation of agriculture and natural resources. This must be complemented by access to external sources of income or credit, either through investment in nonfarm enterprises or through provision of subsidized credit,
- 5) Develop policies tailored to the specific socioeconomic and biogeophysical settings in which agriculture and natural resources are managed in developing countries.

BRIEF SYNTHESIS AND CONCLUDING REMARKS

The six chapters address the various dimensions of sustainable development under five recurring subthemes:

- 1) The challenge of promoting economic growth by maximizing the long-term net benefits to humankind and minimizing the net costs of environmental and natural resource degradation, including the challenge of correcting both market failure and policy failure to that effect,
- 2) The challenge of reducing scientific and technical constraints on sustainable growth of agricultural production,
- 3) The progress made by societies in overcoming the fear of population explosion in developing countries over the last half of the twentieth century,
- 4) The challenge of reducing poverty and achieving sustainable management of natural resources in poor societies, including the challenge of establishing property rights aimed at ensuring environmental sustainability for specific communities,
- 5) The challenge of reducing economic and political inequality and poverty, which in recent years have driven conflict and wars in many parts of the world, leading to humanitarian disasters.

While the book deals with these challenges, it also sees the opportunities available under proper policies aimed at sustainable development. In my view, the authors of the various chapters demonstrate that while societies and economies face stiff challenges, the promotion of policies that enhance human liberty by investing in human capital, democratic institutions, and improved market performance can lift millions out of poverty to sustainable development.

Notes

1. The Johannesburg summit marked a major departure, in structure and outcome, from previous United Nations conferences. This could have a positive effect on the global community's approach to sustainable development. The summit was marked by a new level of dialogue, energy, and commitment to foster collaboration among key stakeholders, including governments, civil society groups, the private sector, and nongovernmental voluntary organizations (NGOs). In particular, the summit spurred commitments to expand access to water, sanitation, and energy, improve agriculture, manage toxic chemicals, protect biodiversity, and improve the management of ecosystems.

Moreover, the World Bank, which is the leading international institution for development at the global level, laid out a path for the next half century in its *World Development Report 2003: Sustainable Development in a Dynamic World*:

Without better policies and institutions, social and environmental strains may derail development progress, leading to higher poverty levels and a decline in the quality of life for everybody. Misguided policies and weak governance in past decades have contributed to environmental disasters, income inequality, and social upheaval in some countries, often resulting in deep deprivation, riots, or refugees fleeing famine or civil wars. Today, many poor people depend on fragile natural resources to survive. Similarly, trust between individuals, which can be eroded or destroyed by civil unrest, is a social asset with important economic benefits, since it enables people to make agreements and undertake transactions that would otherwise not be possible. Development policies need to be sharply focused on protecting these natural and social assets. (World Bank 2003)

That report enlarges on the bank's *World Development Report 1992: Development and the Environment*, in which the bank first addressed the topic.

2. The equations on this page are adopted, with modification, from Perkins et al. (2001, pp. 228–231).

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The Economics of Sustainable Development

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