

The Economics of Global Food Security

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This article outlines a *food security synthesis*: that food insecurity traces to poverty, that poverty must be addressed by economic development, and that economic development flows from application of the *standard model* which is now mainstream economics. Food insecure countries do not follow the standard model; their policies for agriculture and other sectors deter development. Why don't they follow a policy that could feed their people? Reasons lie in institutions such as government. Attitudes including culture in turn underlie many institutional failures to provide food security. Resource endowments and economic circumstances help to create institutions and culture, hence, causality in the food security synthesis is by no means strictly unidirectional.

The Setting

The World Bank, Food and Agriculture Organization of the United Nations, and the U.S. Agency for International Development define *food security* as *access* by all people at all times to sufficient food to meet dietary needs for a productive and healthy life (USAID 1992, p. 1). Progress is apparent in reducing global food insecurity or chronic undernourishment, but major challenges remain.

Numbers of undernourished people in developing countries fell from 917 million in 1969–71 to 839 million in 1990–92 and are projected to fall to 680 million in 2010 according to FAO estimates (Table 1). The spectacular 207 million reduction in East and Southeast Asia more than offsets the 112 million addition to the number of undernourished people in Sub-Saharan Africa between 1969–71 and 1990–92.

Per capita dietary energy supply (DES) increased 0.52 percent per year for the world and by even more (0.78 percent per year) in developing countries between 1969–71 and 1990–92 (Table 2). Progress is expected to slow—FAO predicts DES will increase only 0.33 percent annually from 1990–92 to year 2010.

One region of the world, Sub-Saharan Africa, seems to be losing the capacity to feed itself. The International Food Policy Research Institute (Rosegrant, et al. 1995, p. 15) projects that the region's imports of all cereals will grow from 9.4 million metric tons (mmt) in 1990 to 26.1 mmt by 2020. Paying for such imports will be a major challenge. The subsequent paper by Robert Paarlberg details the special problems encountered in the search for food security in Africa.

Table 1. Actual and Projected Undernutrition in Developing Countries.

Country	Actual			Projected
	1969–71	1979–81	1990–92	2010
	million persons (percent of region total)			
Latin America and the Caribbean	53 (19)	48 (14)	64 (15)	40 (7)
South Asia	238 (33)	303 (34)	255 (22)	200 (12)
East and Southeast Asia	475 (41)	378 (27)	268 (16)	123 (6)
Near East and North Africa	48 (27)	27 (12)	37 (12)	53 (10)
Sub-Saharan Africa	103 (38)	148 (41)	215 (43)	264 (30)
TOTAL, developing countries	917 (35)	904 (28)	839 (21)	680 (12)

Source: FAO 1996a.

Table 2. Average Per Capita Dietary Energy Supply.

Classification	Actual		Projected
	1969–71	1990–92	2010
	calories (output)/day (annual % increase from previous period)		
Developed countries	3190	3320 (0.23)	3390 (0.06)
Developing countries	2140	2520 (0.78)	2770 (0.50)
World	2440	2720 (0.52)	2900 (0.33)

Source: FAO 1996b, p. 2.

This paper outlines a strategy to alleviate food insecurity, emphasizing the basic *economic* framework. Economic failure to provide food security is rooted in cultural and institutional

factors touched on in this article, but addressed in more detail in subsequent articles by Robert Paarlberg and Joseph Molnar. Before outlining an economic strategy for food security in this paper, selected perspectives on the economic, social, and institutional foundations of food security are presented.

Perspectives on Food Security

The widespread practice (see opening sentence) of defining food security as *access* to food does not recognize two other important dimensions of food security—availability and utilization. *Availability* of food, referring to the supply of food from production, imports, or stocks, is not now of overriding interest, given the rising per capita global supply apparent in Table 2.¹ With perennial availability of food in world markets for anyone with buying power, perhaps it is not surprising that *accessibility*, defined as ability to acquire available food from earnings and transfers, is the major constraint to food security. Landless peasants, smallholders, and hired agricultural workers experience especially high incidence of food insecurity (Barracough 1991, 42). Because most food insecure people live in rural areas of developing countries, food production (availability) is also buying power (accessibility) for many people. It is important to emphasize that food consumers outnumber producers in every country, hence, arbitrarily raising food prices by government programs or other nonmarket means usually raises rather than reduces food insecurity even though food producers gain. Nonetheless, raising access to food by raising productivity and real incomes of food insecure people remains the principal route to food security.

The third critical dimension of food security, *utilization*, refers to actual metabolization of food by the body. Food that is available and accessible does not alleviate food insecurity if people do not utilize food properly because of inadequate nutrition education and food preparation, bad habits, eating disorders, or poor health such as intestinal parasites from unsanitary water. Thus, food security is not achieved without *utilization* by all people at all times of sufficient nutrients for a productive and healthy life. It follows that sanitation, education, and health care are important instruments for food security.

Despite per capita world food supplies being more than adequate to provide food security to all, food or income transfers cannot be the principal instrument to end food insecurity. One reason is because altruism is too limited and fickle to provide sufficient, reliable transfers. Heavy dependence on transfers could create an unhealthy dependency of poor nations and individuals on rich nations, agencies, and individuals. Massive food transfers would destroy incentives for local food producers.

Because it is the poor who lack access to food, alleviating food insecurity means alleviating poverty. Most of the world's poor, the 1.3 billion people with income of less than \$1 per day (updated from World Bank 1990, p. 29), will have to escape poverty and food insecurity through economic growth. Economic growth largely was responsible for the 158 million reduction in numbers of undernourished people in East, South, and Southeast Asia from 1979–81 to 1990–92 (Table 1).

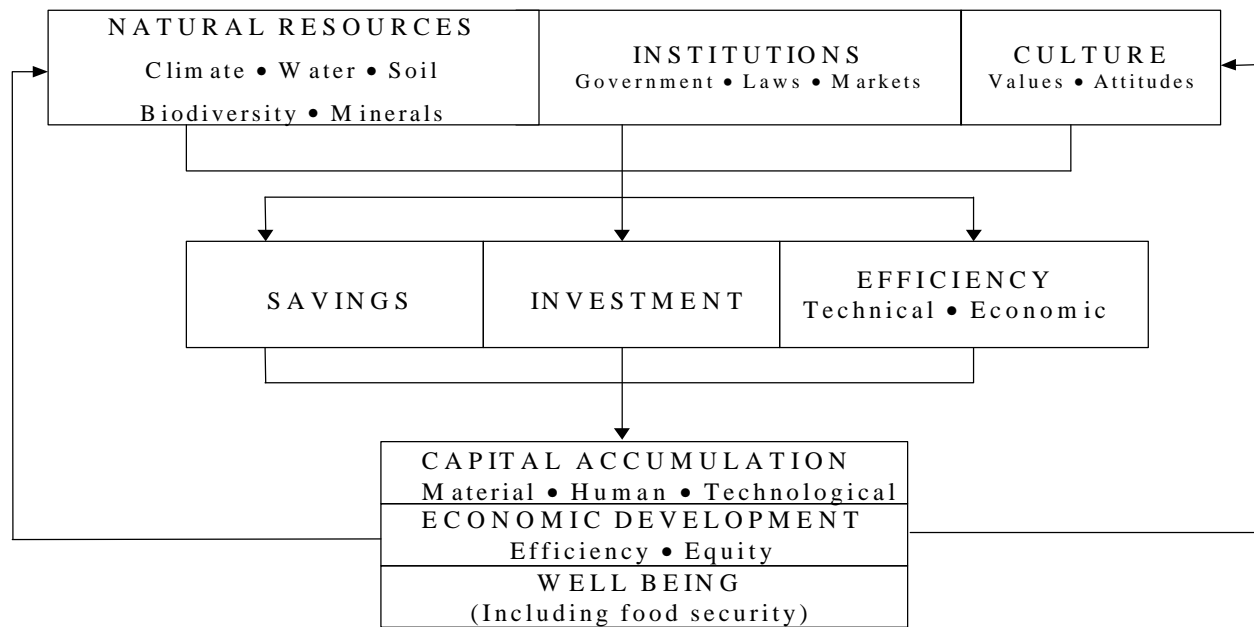
Ingredients for Economic Progress

Figure 1 presents a stylized paradigm of economic progress beginning with the underlying cultural (socio-psychological), institutional, and economic dimensions. Natural resources include

air, soil, water, climate, minerals, and biodiversity. Geography may be regarded as a natural resource. For example, Sachs (1997, pp. 19,20) found that income per capita of landlocked countries grew 0.7 percentage points less and of tropical countries grew 1.3 percentage points less than income of other countries, other things being equal.

The biosphere as an ecosystem provides raw materials such as petroleum and phosphate as well as a “sink” absorbing effluents. Some (see Daly 1996) contend that living standards of people will be more constrained by pollution—overburdening the absorptive capacity of natural resources as a sink—than by limits on the supply of fossil fuels and other stock resources. Nations (e.g. Japan, Hong Kong, Singapore) can have high living standards and food security without being rich in natural resources. Other basic ingredients are more important for economic progress of nations but global natural resource constraints will limit future economic progress as noted later.

Figure 1. Elements of Economic Progress and Food Security



Source: Tweeten and Brinkman 1976, p. 60.

The second basic ingredient for progress is institutions such as government, markets, and laws (Figure 1). Institutions form and impose the rules of the game underlying the allocation of resources to meet the wants of people. Institutions such as universities are repositories of accumulated knowledge and gene banks are repositories of biodiversity essential to agricultural science and technology. Institutional innovations such as limited liability corporations, legally enforceable property rights, and investment banks have invigorated markets. In many ways institutions are mediators between culture, the third ingredient of economic progress, and natural resources. However, a case can be made that, over time, institutions such as government and markets change culture.

The third basic ingredient of economic progress, attitudes, constitutes a range of attributes commonly called social organization, customs, goals, beliefs, and values of society. Cultural features conducive to economic progress and food security include morality (e.g., not taking advantage of others even if presented the opportunity), enterprise (entrepreneurship), industry (work ethic), thrift (deferred gratification), acquisitiveness (wealth and knowledge seeking), and national community (civil society) (see McClelland, 1961; Tawney, 1926; Tweeten, 1979; Weber, 1930). Nations with generally favorable attitudes for growth supply a reservoir of lenders who possess attitudes, such as morality, that are important for sound private and public decision making.

Most of these attributes are self explanatory and need little elaboration. The Protestant ethic (Tawney, 1926; Weber, 1930) and Confucist ethic (Johnston, 1966) contain elements of morality, work ethic, and enterprise believed to be conducive to economic progress. Other attributes have shown increasing importance in recent decades. For example, knowledge seeking, apparent in disciplined personal and collective commitment to education as a means to economic progress, has played no small part in the development of personal competence and economic success of East Asians in their home countries and as ethnic groups in the United States and elsewhere. A sense of community implies not only identification with others and civility towards them, but also a willingness to sacrifice (e.g. pay taxes) for their benefit (e.g. education). The importance of community is apparent especially in the negative—lack of a sense of national community evident in tribalism or sectarianism has been the major cause of civil violence underlying most famines since World War II.

Fundamental ingredients for economic growth have numerous trade-offs. Favorable attitudes and/or institutions can compensate for lack of natural resources, for example. Thus lack of agricultural resources in a country (e.g. Singapore) does not relegate it to food insecurity. Natural resources in other countries can offset resource deficiencies at home if countries are open to trade. And inadequate financial and other institutions as in China can be offset by enterprising people and a strong work ethic. Presence of all three basic ingredients in Figure 1 ensures economic progress.

Food security and economic progress is largely a matter of accumulating material, human, and technological capital per unit of raw labor (Figure 1). For example, an industrious, civil society with a high propensity to save and to invest wisely in high payoff activities (efficiency) creates capital (Figure 1). Well-being of people derives from the level (efficiency or the economic size of “pie”) as well as the distribution of benefits (equity in dividing the “pie”). Food security is best served when economic progress is broad-based with human resource investments and opportunities open to the disadvantaged, minorities, women, and others. Such development must also provide public goods and correct externalities for sustainable progress.

The Standard Model

The broad framework for economic progress in Figure 1 requires a policy blueprint for the process by which attitudes, natural resources, and institutions create capital and economic progress to alleviate poverty and food insecurity. A seminal development in economics since World War II is validation of the *standard model* for economic progress (see Tweeten 1997a).

The standard model relies on markets to allocate goods and services that are rival and exclusionary.² There is no one optimal size for the public sector but Tanzi and Schuknecht (1995) concluded that economies with the lowest rise in public spending from 1960 to the 1990s were more efficient and innovative and had more rapid employment and patent registration growth. A public sector of no more than one-fourth of GDP appears to be adequate for economic progress and food security if military spending is restrained and social security is privatized. Most decisions of when, where, and what to produce are left to prices reflecting market supply and demand; the standard model calls for a lean public sector doing a few things well. The standard model has triumphed, not because of its elegant neo-classical economic origins, but because it works. Economies of Hong Kong and Chile following it have succeeded spectacularly while those of nations rejecting it such as the Soviet Union, North Korea, and Cuba have failed spectacularly. Anecdotal evidence for the standard model is telling, but analytical studies make the case even more compelling (Agarwala, 1983; Bale and Lutz, 1981; Gwartney et al., 1996; Holmes and Kirkpatrick, 1996; Sachs, 1997; Zhao et al., 1991).

Of course, economic progress differs among countries adopting the standard model because countries differ in natural resources endowments, institutions, and culture (see Figure 1). No country fully follows the model, and some countries appropriately choose the trade-off of more safety net and less economic growth. It is important to emphasize that following the standard model is most important for food security in countries with the least favorable attitudes and natural resources. To save space, I outline below those public functions of the standard model required for broad-based, sustainable economic progress and food security.

1. The macroenvironment needs:

- Honesty and competence in public administration. Corruption in government undermines economic progress (Sachs, 1997). Corruption, like sin, cannot be eliminated. But performance of civil servants and political office holders is enhanced by merit hiring, proper training, competitive salaries, a free press to expose corruption, checks and balances between branches of government, and by minimizing government interventions that create economic rents, bribes, and kickbacks.
- Security, stability, order. The rule of law and order needs a judicial system to administer justice and interpret laws. Government needs to strive for an institutional environment including business codes that enable business plans (contracts) to be made and carried out with minimal transaction costs.
- Property rights. To encourage investment and improvements in property, investors must be able to “reap what they sow.” Property rights enable investors to receive their payoff from their efforts and also allow property to be used as collateral for loans. A favorable investment climate avoids capital flight and attracts foreign direct investment and technology.
- Competition. Governments need to avoid giving protection to firms exercising monopoly power. In the case of natural monopolies (only one firm can operate in a

market at low cost per unit of output), regulation or cooperatives are sometimes helpful. But open foreign trade to counterbalance the economic power of domestic firms is often the most effective option. Parastatals (state-owned enterprises) need to be avoided where possible. Although the private sector acting alone will not properly supply public goods, often the appropriate role of government is not to produce such goods, but to induce private firms to supply them.

2. Sound macroeconomic policies include:³

- Fiscal responsibility. Countries need to avoid persistent deficits in their operating account. A deficit is justified in the capital account only for investments with the strong chance of a return that will pay the principal and interest, plus leave a social dividend.
- Monetary restraint. A useful rule of thumb is to increase money supply at the real national income (output) growth rate, with appropriate adjustments for foreign exchange and direct investment. A central bank at “arms length” from political pressure, and with the sole objective of price stability has proven successful in many countries, the most notable being Germany.
- Appropriate taxation. One of the most difficult challenges in any developing country is to collect taxes to pay for even minimal public services without discouraging investment. Successful governments try to tax “bads,” (consumption, tobacco, alcohol, emissions), not “goods” (investment, savings, exports). They charge user fees to cover costs for electricity, irrigation water, and the like provided by the public sector. The sales tax, value-added tax, and property tax distort the economy less than taxes on corporate profits and exports (Ballard *et al.* 1985).

3. A successful developing economy utilizes foreign markets. Chief elements of a liberal trade policy include:

- A proper foreign exchange rate achieved by the market (flexible rate) and sound monetary-fiscal policy. In cases where the exchange rate of a developing country is pegged to a hard currency such as the American dollar, regular exchange rate devaluation and occasional market floats may be necessary to correct for high inflation relative to trading partners. Such devaluation avoids the *macroeconomic degradation process* (see footnote 3).
- Openness to trade in investment, goods, and services with allowances for infant industry, national security, and sanitary-phytosanitary protections as allowed by World Trade Organization rules. Several East Asian nations had early success pursuing export led growth and neomercantilism featuring large trade surpluses and subsidies to export industries. The so-called “industrial” strategy emphasized close cooperation among business firms, banks, and government. Business firms under the Asian model acquired most of their financing from bank loans rather than from equity (stock) markets emphasized in the United States. Reliance on bank financing encouraged by government escaped the “short-termism” profit critique of equity markets, but tolerated accumulation of financial losses by firms and banks to national crisis levels. Such behavior provided short-term gains in employment at the expense of domestic consumers, encouraged excessive exports, invited over-investment in unprofitable industries, and hid accumulated bad loans in banks. Secrecy and cronyism under the system reduced confidence of investors and prolonged the financial crisis which began in 1997.

4. A proper infrastructure requires investment in:
 - All-weather roads for food security and to encourage commercial activity consistent with comparative advantage.
 - Bridges, seaports, airports, electricity, and the like.
5. Some public services offer high returns:
 - Agricultural research. Africa spends less than 0.5 percent of agricultural GDP on agricultural research. Raising public and private spending to 1 percent of agricultural GDP could pay high dividends because agriculture frequently accounts for 60-80 percent of the labor force, 40-60 percent of national income in less developed countries, and offers high returns to research and extension (see Tweeten and McClelland 1997).
 - Human resource investments. Human resource investments often have positive externalities and are essential for broad-based development for women and men, including minorities. Because rates of return on elementary schooling investment are especially high, universal elementary schooling is a priority for food security and broad-based, sustainable development.
 - Sanitation for food security. Such services require attention to water and waste. Parasites and bacteria interfere with digestion of food and sap vitality.
 - Health services. Clinics staffed by volunteers and paraprofessionals can provide cost-effective services such as immunization, vitamin supplements, oral rehydration, family planning, and pre- and post-natal care.

6. Environment. Sustainable development requires attention to the environment. This is especially urgent where poverty attends high population growth and density. Agriculture can benefit from integrated crop management (forage legume rotations, alley cropping, etc.), conservation tillage (no-till, ridge till, mulch till), integrated pest management (economic threshold intervention, biological pest controls, pest resistant crops and livestock, best management practices), integrated crop-livestock systems (including forage legumes), and integrated forest management (plantation forests, ecotourism, etc.).

7. Food and income safety net. Building of an economic “pie” is a necessary but not sufficient condition for food security. Transfers must occur between “haves” and “have nots” to provide food security but without a pie there is nothing to transfer. The bulk of food transfers will be within and between families. Private charities such as religious organizations also are important. The public safety net is for those unable to depend on themselves, the market, family, or other private sources for sustenance. Landless peasants, smallholders, and urban poor are especially vulnerable. Options include targeted humanitarian food assistance and food for work. The height and breadth of the safety net is a political decision, and is not dictated by the standard model. A high safety net as characterized by the term “welfare state” often means slow economic growth and lack of Schumpeterian “creative economic destruction” pruning economic deadweight. Nations tend to expand their public safety net as development progresses and more resources are available for transfers.

Of course, not all elements of the standard model can be pursued simultaneously. Priorities are policy reform, agricultural technology, elementary schooling, and infrastructure (Tweeten and McClelland 1997). Because proper policies are essential to most other dimensions of the standard model, it is an overarching priority (Burnside and Dollar 1997). Lagging

countries need to show a commitment to reform *before* significant development aid begins, except for humanitarian assistance.

Foreign assistance is especially critical in early stages when the economic base of a developing country is inadequate to provide even minimal development tools such as improved agricultural technology (Burnside and Dollar 1997). Development assistance can be decisive for countries to break the poverty cycle of too little income to support public infrastructure and services necessary to raise income. But the most important contribution of developed countries to many developing countries is open global markets. Many African countries, for example, will not be able to prosper on agriculture alone. They will need to shift to manufacturing products for export after advancements in agriculture first provide the economic base to improve human capital essential for competing in nonfarm industries and attracting foreign investment.

Food security problems differ by length of run. In the short run with given food supplies, the challenge is buffer stocks and open trade to match food availability with individual food needs. In the intermediate run, the challenge is economic growth featuring greater productivity to raise food production and consumer buying power. In the long run, the challenge is for the demographic transition to run its course to zero population growth (ZPG). Family planning alone will not suffice; higher incomes are necessary to support schooling, urbanization, gender equity, health care for child survival, social security, and other contributors to lower birth rates and ZPG in developing countries.⁴ Developed countries are mostly near or below crude fertility rates needed for ZPG. The *food security dilemma* is how to raise incomes of the masses in developing countries of Sub-Saharan Africa, South Asia, and elsewhere to levels bringing ZPG without jeopardizing the global environment and natural resource stocks over time. Measures such as fossil fuel or carbon taxes to slow petroleum use and greenhouse gas emissions in the United States and elsewhere can make natural resource-economic growth tradeoffs less onerous for developing countries and for the world.

World Food Summit

Heads of governments and their representatives met at a World Food Summit (WFS) in Rome in November 1996. The Rome Declaration from Summit participants pledged eventual food security for all with an immediate target of reducing the number of undernourished people by half by no later than year 2015 (FAO 1996c, p. 1).

Given the FAO projection in Table 1 of only a 14 percent reduction in undernourished persons from 1990-92 to 2010, the WFS commitment to a 50 percent reduction from 1996 to 2015 (the same number of years) is challenging and probably unattainable. It may be as quixotic as Henry Kissinger's call at the 1974 World Food Conference for no person to go to bed hungry by 1984. More realistically, the Summit Declaration called for policies generally consistent with the standard model including:

- An enabling political, social, and economic environment.
- Full and equal access to opportunity for all, including men and women.
- Public and private investments, including "technical...and financial resources from all sources" to promote food security.
- "Overall trade policies...fostering food security for all through a fair and market-oriented world trade system."

- Sustainable development for food security through human resources development, research and extension, infrastructure investment, and access to health care.
- Measures to combat drought and natural resources degradation including desertification and erosion of biological diversity.

Some of the Declaration was controversial for mainstream economists. The call for public and private investments “in high and low potential areas” violates the principle that, *ceteris paribus*, more food insecurity can be alleviated with a given investment in high than in low potential areas. The best strategy in many low potential areas is to encourage resources, including people, to shift to high potential areas—often to off-farm employment.

An area of contention was the reluctance of the United States to embrace a strong “right to food” commitment. Other WFS participants contended that the right to food should come before the quest for profit. The Summit affirmed rights to safe and nutritious food, and to development for the purpose of reducing hunger. The U. S. representatives interpreted the “right to food” as only “an objective or aspiration, and not a binding commitment or obligation” (ODI 1997, p. 4).

The U. S. objected to enshrining the right to food as a universal human rights principle in part for practical reasons: Federal welfare reform allows states to terminate food stamps to some able-bodied recipients after a prescribed period if they fail to seek employment. If food is a universal human right, such action could embarrass the U. S. through Amnesty International and the World Court. An unenforceable, unimplementable “human right” unattended by personal responsibilities could become a source of cynicism and complacency among the world’s rich and poor nations alike.

The principal challenge to the World Food Summit proclamation and the standard model it resembled came from the non-government organization (NGO) forum held coincidentally with the Summit and representing over 1,000 organizations from 80 countries. The NGOs and WFS differed on several points:

- A major point of disagreement was over the concept of sustainable agriculture. The NGOs wanted low-input farming systems built on agro-ecological principles including minimal intervention in nature and minimal use of synthetic chemical pesticides, commercial fertilizers, and biotechnology. In contrast, the WFS was very supportive of science and technology to raise yields especially on environmentally less fragile land to reduce soil erosion, deforestation, and desertification while protecting wildlife and biodiversity.
- Another difference was over benefits of trade. The NGOs favored *fair* trade based on principles of food security—emphasizing self-sufficiency and fossil energy conservation. In contrast, the WFS favored *free* trade, the Uruguay Round agreement, and continuing trade liberalization consistent with food security.

Trade cannot be separated from the issue of export cropping. Empirical evidence does not support the alternative agriculture position that export cropping reduces food security. Eppin and Musah (1985) estimated that Liberian farmers could have three times as much rice by producing tree crops for export and buying rice imported from neighboring countries, rather than by producing their own rice. Tree crops would also save soil. Data from two Kenya studies “suggest that increased household income

from commercialization of agriculture can make a major contribution to the solution to the hunger problem...” (Kennedy 1989).

- NGOs were highly critical of transnational corporations, noting their lack of accountability for environmental degradation and for depleting natural and biological resources such as rainforests. The WFS recognized the need to impose restraints on transnationals to protect resources, but also recognized that countries experiencing widespread food insecurity are unlikely to progress without the technology, capital, management, and access to markets provided by transnational corporations.
- The NGOs were critical of structural adjustment programs of the World Bank and International Monetary fund, contending that these have imposed undue burdens on poor, food insecure people. The counter argument is that, while more needs to be done to cushion adjustment impacts on disadvantaged people, the principal cause of food insecurity is failure to follow the standard model. Current misguided policies cannot be corrected quickly or painlessly.
- Finally, the most serious difference between the NGOs (including alternative agriculture advocates in general) and mainstream economics as embodied in WFS proclamations is over economic growth itself as discussed in the following section.

The Case for Economic Growth

The principal challenge to economic growth as a means to food security comes from environmentalists. Estimates of the world’s carrying capacity by Cohen (1995) based on water availability range from 1.1 billion to 137 billion people. Estimates by other analysts cited by Cohen range from 1 billion to 1,000 billion people. Daly (1996, Chapter 2) proposes imposing specific limits on growth, contending that the world can provide neither natural resources nor emission absorptive capacity for global living standards at levels currently found in industrial countries. Such thinking fails to account for the ability of markets to ration scarce resources as growth proceeds, the move to service economies requiring fewer natural resources per unit of output at higher living standards, the ability of science to find substitutes for resources in short supply, and the trend to zero population growth.

Kuznet’s Curves depict the impact of economic growth on the environment. Curves for several environmental impacts such as soil erosion, desertification, carbon emissions, species loss, acid rain, water quality, and deforestation are an inverted “U”—things get worse before they get better with economic growth (see World Resources Institute, 1996, pp. 162-165). At least three problems continue to worsen with growth, however: (1) carbon dioxide accumulation in the atmosphere, potentially creating global warming, (2) solid waste accumulation, and (3) fossil fuel and other nonrenewable mineral stock resource depletion. Global warming would cause sizable realignment in food and fiber production among regions, but would not necessarily reduce global production (Balling 1995; Schimmelpfennig 1997). Solid waste accumulation and proper disposal do not pose a significant threat to food supplies. Fossil fuel and rock phosphate depletion poses a greater challenge to sustainability of agriculture, but science and technology could develop options to minimize threats to living standards and food supplies.

A principal advantage of economic growth is that it provides resources to fund critical services such as education and research, infrastructure such as all-weather roads and irrigation

facilities, and well-paid civil servants to protect common property such as tropical forests from destruction. Indiscriminate logging of tropical forests rich in biodiversity but with fragile soils often occurs because poorly paid members of government are “bought off” by logging companies which in turn do not replant or otherwise practice good environmental stewardship. Loggers are followed by hungry poor peasants who convert the land to farming.

Economic growth funds science and technology essential to improve agricultural and national productivity. An economic base to fund research in developing countries is essential to adapt agricultural technology from elsewhere to local circumstances and to develop environmentally friendly farming systems. Greater productivity on “safe” cropland reduces pressure for peasants to expand cropping to tropical rain forests and other fragile lands rich in biological diversity. Improved science and education also can address problems of disease, pestilence, ignorance, and tribalism that threaten food security.

However, the most important long-term contribution of economic growth to food security is to reduce population growth—eventually to zero. Income from economic growth also is essential to fund health clinics providing immunization, vitamin and mineral supplements (especially for young children and pregnant and lactating women), oral rehydration, family planning, and the like. Demographers (United Nations 1996) project zero global population growth (ZPG) by year 2100 or before, one of the most promising portents for future food security. While growing income and population (before reaching ZPG) could double global food demand, and food demand will continue to rise slowly even after reaching ZPG, there can be little doubt that the challenge of doubling or even tripling food supplies can be met with the help of science and technology made possible by economic progress.

Achieving Economic Equity

While a large “pie” of income is essential to provide food security and other basic needs for all, how that “pie” is distributed is of concern. Simple ideas of producing food for profit rather than for people (as in “Peoples” republic, meaning the state) and providing an economic climate favorable to foreign direct investment have raised tens of millions of Chinese out of poverty and food insecurity, but the absolute gap in income between the poorest and richest Chinese has grown. The same distributional trends are occurring globally. The per capita income gap is widening between the poorest and richest nations although the share of the world’s income held by developing countries is likely to grow as their population expands.

Gini coefficients (0 = perfect equality of income to 100 for complete inequality) reported by the World Bank (1996, pp. 196-197) range from an average of 40.9 for 27 low income economies and 39.2 for 30 middle income countries to 44.9 for eight upper middle income countries. (Gini coefficients were not shown for high income countries.) The proportion of income held by the poorest 20 percent of the population ranged from 6.2 percent for low income countries and 6.5 percent for middle income countries to 5.9 percent for upper middle income countries. The similarity in distribution coefficients among countries ranked by income is striking. The results suggest that the tide of economic progress tends to lift, if not all, most boats and that the fruits of economic progress do indeed reach lower income people either directly as earnings or indirectly as transfers from those who earn more.⁵

Berry (1997) observed that liberalization of Latin American economies widened income distribution in most instances. The widening distribution of income under structural adjustment may be a manifestation of Kuznet's hypothesis that economic growth first widens and then narrows the distribution of income. Liberalization may initially depress economies because aggregate demand first falls when a nation stops living beyond its means under structural adjustment. Also, more open trade often displaces low wage workers from factory jobs. However, one country, Costa Rica, did not conform to the pattern of widening distribution of income with liberalization perhaps because of its more equal initial distribution of human capital in the form of education. Other countries investing broadly in human capital eventually are likely to narrow their income distribution as growth progresses.

Unequal initial distribution of assets more than unequal income slows economic growth according to analysis by Deininger and Squire (1997, p. 40). They found almost no association between income inequality and growth but noted that "even when inequality has worsened, its negative effect on the poor has been more than outweighed by the positive effect of growth" (p. 40). The prospect of narrowing income distribution with growth in the long-term is one reason why Berry (1997, p. 239) concluded that "...the best policy to reduce poverty in economies mired in stagnation and underutilization of capacity is to get the economy moving."

Economic outcomes will be more egalitarian and food security greater if the standard model is applied to countries with more equal initial distributions of asset ownership. Barraclough (1991, p. 130), after reviewing substantial land reform literature, notes that in countries where rural poverty is widespread and closely associated with power of the landowning class, "Land reform becomes the only option for improving rural livelihoods rapidly and substantially." Yet he cautions that land reform "cannot normally be a policy option for governments" (p. 130).

Other redistributive options offer greater promise.⁶ With economic growth, opportunities for redistribution through human resource investments dwarf those from land redistribution and are likely to induce less violence. For example, of the \$16 trillion in U. S. wealth in 1990, up to 85 percent was human capital and only 4 percent was farm real estate (Tweeten 1997a). In the poorest regions of Africa and Asia in 1994, human resources comprised 60 percent of all assets and "natural" capital including agricultural land comprised only 10-20 percent (Dixon and Hamilton, 1996, p. 16). Property taxes are not widely used in developing countries, but property taxes have been used for a century or more in developed countries and, if rates are graduated, could be a force for more equitable asset distributions. A sense of community and public administrative capability are required, however, for asset redistribution. As such, devolution of authority to local communities is overdue in many countries. Smaller places often have a sense of community helping them to see the connection between taxes and services. That civil cohesiveness can enhance their capacity to tax property to fund local schools and roads.

Conclusions

This paper outlines the *food security synthesis* for poor developing countries:

1. Transitory and chronic food insecurity is caused mainly by poverty. People with adequate buying power overcome the frictions of time (e.g., unpredictable, unstable harvests from year to year) and space (e.g., local food shortages) to be food secure.

2. Poverty is best alleviated through broad-based, sustainable, economic development.

3. The most effective and efficient means to such economic development is to follow the *standard model*, which assures an economic “pie” to divide among people and among functions

such as human resource development, infrastructure, family planning, a food safety net, and environmental protection. The standard model is not merely an ideal, but is applicable to any culture and provides a workable prescription for economic progress ensuring buying power for self-reliance and food security. Eventually, in conjunction with family planning, it brings zero population growth. Although no country has adopted every component, many countries have adopted enough components of the standard model to demonstrate its capacity for economic success.

4. The standard model is not followed in food insecure countries partly due to economic illiteracy but mainly due to *political failure*. Individuals and groups with power and authority often lose with political change—even if current policies are egregiously incongruent with the public interest. Economic distortions provide economic rents for those in authority who bestow licenses and enforce regulations. Parastatals provide employment for friends and relatives of power brokers. Hence bad public policy carries powerful momentum.

5. Political failure is inseparable from *institutional failure*. Food insecurity and economic stagnation are not the result of limited natural resources, environmental degradation, or ignorant people. Rather they are the result of misguided public policies, which in turn are the product of weak institutions and corrupt governments serving special interests. Institutional change is required to adopt the standard model.

6. Poorly structured, inadequate institutions often trace to *cultural factors* such as tolerance by the public of unrepresentative, corrupt, incompetent government. Government leaders often view their position as an opportunity for personal aggrandizement rather than to be a servant of the public interest. Socioinstitutional change and hence standard model adoption are blocked by cultural characteristics such as caste and ethnic animosities which provide a fertile climate for governments not representing the public interest to play one group against another.

7. Thus, the challenge of food security for our time is socioinstitutional change. Understanding development processes and how to bring about constructive change is a multidisciplinary challenge.

Notes

1. The future food supply-demand balance may be tighter. Global grain yield percentage rates of growth are declining and yields are likely to grow at a slower rate than global demand to year 2030 (Tweeten 1997b).

2. Where goods are nonexclusionary, markets under-produce because private firms cannot capture enough of the monetary benefits to cover their costs. Where goods are nonrival, consumption by one consumer does not compete with or diminish consumption by another, hence, a private firm that charges a price to cover development or other sunk costs unduly limits consumption and economic progress. The government ordinarily provides such nonrival, nonexclusionary public goods and corrects for other externalities causing social costs (benefits) to deviate from private costs (benefits).

3. Failure to pursue sound macroeconomic policy energizes the Macroeconomic Degradation Process (Tweeten 1989). The process sequence usually is as follows: (1) government attempts to live beyond its means as apparent in domestic budget and foreign trade deficits, (2) the government borrows to the limit, perhaps first domestically and then internationally. Debt service becomes high relative to export earnings. (3) To meet payrolls and debt obligations, the government, in desperation, prints money. The result is inflation, (4) with exchange rates in the developing country pegged to one or more hard currencies, inflation causes an overvalued exchange rate; (5) foreign exchange is depleted as the overvalued currency discourages exports and encourages imports; and (6) shortages of fuel, spare parts, and other critical imports emerge, creating a national crisis in the worst scenario.

4. Studies (Westoff 1996, pp. 74–80) show that desired total fertility rates, though less than actual total fertility rates, are still well above ZPG total fertility rates of about 2.1 child per woman in most developing countries, but especially in Sub-Saharan Africa. Hence, family planning enabling parents to have their desired number of children will not alone bring ZPG.

5. Recent estimates indicate that one-eighth or less of growing intracountry income inequality is due to trade; the remainder is mainly due to technology (Crook 1997, p. 41). Because living standards are determined mostly by trade and technology in the long run, it makes little sense to sacrifice trade and technology to promote equality. Rather, it makes sense to channel more benefits of progress to lower income people through human resource investments, wage supplements, and the like.

6. Some (see Barraclough 1991) advocate organizing the poor and food insecure to provide political bargaining advantage to obtain more of the public “pie.” Poor people are notoriously difficult to organize, however. In the organizing process, the near-poor or wealthy are likely to feel threatened and to organize more effectively, perhaps leaving disadvantaged people even more disadvantaged. Thus, broad-based development requires a multifaceted strategy, but grounded in human resource investments and access to opportunity.

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