



## **IFA-FAO AGRICULTURE CONFERENCE**

***“Global Food Security and the Role of Sustainable Fertilization”***

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### **GLOBAL FOOD SECURITY: FACTS, MYTHS AND POLICY NEEDS**

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**“Global Food Security: Facts, Myths and Policy Needs”**

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It is a fact that past successes in food production have resulted in significant increases in per capita food availability. Global food supplies per person are greater today than ever before. In fact, current global food supplies are sufficient to meet calorie requirements of all people, if the food were distributed according to needs. Furthermore, recent rates of increase in the production of cereals have exceeded the increase in economic demand resulting in world prices for maize and wheat that are at an all time low. Per capita food supplies are projected to increase further over the next 20 years (Rosegrant et al. 2001a, 2001b). Thus, the world food problem now and in the foreseeable future is not one of global shortage. It is a myth that re-distribution of existing food is the solution to the world's food insecurity and malnutrition and that increasing production and productivity are of minor importance. First, about 75 percent of the world's poor and food insecure people live in rural areas and depend directly or indirectly on agriculture. Productivity increases in small-scale agriculture is essential to help them out of food insecurity and poverty. Secondly, the logistics involved in moving the necessary food from surplus to deficit areas and households would overwhelm current infrastructure and transportation facilities. Thirdly, moving surplus food to areas with food insecurity can do very severe harm to the same food insecure people supposed to be helped because they lose the market for the food they produce. So, it is a fact, that productivity increases on small-scale farms in developing countries are an essential part of a solution to the food insecurity problem.

It is a fact that rapidly increasing yields per unit of land in large parts of East and Southeast Asia, United States, and parts of Europe, reduced the expansion of agriculture into new lands and thus had positive effects on biodiversity, wildlife, soils, and forests. But it is also a fact that it introduced large quantities of chemical pesticides and caused water and soil degradation. It is also a fact that in many areas, stagnating yields combined with rapid population growth forced farmers into new lands poorly suited for agriculture, causing deforestation and land degradation. It is a myth that productivity increases in agriculture must necessarily harm the environment. In fact, when productivity fails to increase, the resulting poverty and struggle for survival are much more likely to result in negative environmental effects. Improved production methods and appropriate use of inputs and technology can boost productivity in ways that benefit the environment whether in developing or industrialized countries.

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The challenge is to help farmers design and implement such win-win solutions. The challenge confronting us is to continue the expansion of food production to meet future demand without negative effects on the environment.

Elimination of food insecurity, hunger and malnutrition in a manner consistent with an ecologically sustainable management of natural resources is of critical importance. It is a myth that the current stock of natural resources is insufficient to feed current and future generations. The key question confronting us is whether appropriate policies and technologies are introduced to avoid continued degradation of natural resources and to continue the downward trend in population growth. It is likely that failure to deal with these issues will bring us to a situation where the world's productive capacity will not be sufficient to meet the demand for food, but we are not there yet.

The failure of a large share of the world population to meet food needs is a reflection of widespread poverty, which in turn is associated with a very skewed and deteriorating relative income distribution. Thus, the richest 1 percent of the world population now earns as much as 57 percent of the rest (UNDP 2001). About 1.2 billion people (about 20 percent of the world's population) earn less than a \$1 a day and 800 million are food insecure. Poor countries are falling further behind as illustrated by changes in per capita incomes during the 1990s: They increased by \$ 5,000 in high-income countries, \$40 in low-income countries, and they fell by \$20 in Sub-Sahara Africa. (UNDP 2002).

About 165 million preschool children, corresponding to about one-third of all preschool children in developing countries, are malnourished and therefore unable to grow to their full potential. This is roughly the same number of preschool children who were malnourished 20 years ago. Five to 10 million of them die every year from hunger and nutrition-related illnesses. Micronutrient deficiencies, including iron, vitamin A, and zinc deficiencies, are widespread and very serious public health problems affecting large numbers of women and children in developing countries.

It is, I believe, a fact that, although some progress has been made during the last 20 years, the future is not bright. Even though the average fertility (number of children per women) has decreased from 5.4 during the early 1970s to about 3.0 today, more than 70 million people will be added to the world population annually during the next 10–15 years (UNDP 2002). At the World Food Summit in 1996, high-level policymakers from more than 180 countries agreed to the goal of reducing the number of food-insecure people by half to 400 million between 1990 and 2015. At the follow-up World Food Summit this year, high-level policymakers from the same countries reaffirmed the goal. Unfortunately, action does not seem to follow rhetoric. For most, but not all governments, a high priority on the eradication of food insecurity is a myth. Recent developments indicate that the goal will not be achieved. During the 1990s, less than one-third of the countries managed to reduce the number of food-insecure people while one-half of the countries experienced an increase.

Furthermore, rapid improvements in China overshadowed failures elsewhere. Excluding China, all other developing countries as a group experienced an increase rather than a decrease in the number of food-insecure people during the 1990s. Thus, leaving China out of the equation, a continuation of the trends of the 1990s will result in an increase in the number of food-insecure people rather than a decrease by year 2015.

It is a myth that food insecurity is limited to developing countries. It is also found in high-income countries as illustrated by estimates showing that more than 10 percent of all U.S. households and 37 percent of U.S. households below the poverty line suffer from food insecurity (Nord and Andrews 2002).

At the other end of the nutrition spectrum, we find a rapidly increasing incidence of obesity. In the United States, the proportion of the population that is obese doubled during the last 20 years to the current 27 percent. Currently, 61 percent of the U.S. population is either overweight or obese, with obesity accounting for 300,000 deaths annually—putting it in the same league as tobacco (U.S. Department of Health and Human Services 2001). Twice as many children and three times as many adolescents are overweight now as in 1980 (US-CDC 2002). The prevalence of obesity also doubled in the United Kingdom during the last 20 years to the current 16 percent. About one-half of the British and German population is either overweight or obese and one-in-five OECD citizen is obese (WHO 2002).

However, it is a myth that obesity only affects high-income countries. Many developing countries also show dramatic increases in overweight and obesity. Every year during the 1990s, an additional 1 percent of the population in China and 2.5 percent of Mexican women became obese. The prevalence of overweight and obesity in China is projected to increase from 14 percent to 33 percent for male and from 21 percent to 36 percent for female by 2020. Except for the poorest developing countries where obesity is primarily found among the nonpoor, the prevalence of obesity tends to be higher among the poor than among the nonpoor. Under nutrition and obesity are often found in the same families. Thus, it is a myth that obesity is a rich-person's problem.

Obesity and the resulting heart diseases, stroke, diabetes, and cancer are becoming serious public health problems that are a significant drain on scarce health care resources, not only in the United States and other industrialized countries, but also in China, India, and a number of other developing countries. The primary causes of this impending epidemic are dietary changes towards more refined sugar and fat and reduced physical activity.

The world food situation is complex and heavily influenced by narrow political interest. Action does not follow rhetoric, apparent contradictions are common, and the debate and policy-making is flawed by myths including those mentioned above. There is a widespread lack of political will among governments in developing and industrialized countries alike to take the necessary action to achieve the World Summit goals and to pursue food and agricultural policies that make sense from either a global welfare or a social justice perspective or, ideally, both.

## **DRIVING FORCES AND RELATED POLICIES**

The design and implementation of policies for the future should pay particular attention to key driving forces. I have identified 10 such driving forces that I believe we must understand in order to design and implement appropriate food and agricultural policies for the future. They are:

1. Increasing globalization;
2. Sweeping technological change;
3. Degradation of natural resources and increasing water scarcity;
4. Climate change;
5. Rapidly changing structure in farming and agricultural marketing;
6. Rapidly changing consumer behaviour;
7. Emerging and re-emerging health crises;
8. Rapid urbanization;
9. Accelerated national and international instability and conflict; and
10. Changing roles and responsibilities of key actors

In the following, each of these 10 driving forces will be briefly discussed along with the associated food and agricultural policy I believe will be needed to achieve sustainable economic growth, improve equity, and reduce hunger and malnutrition.

### **Increasing Globalization**

Current trends towards increasing globalization, including international trade liberalization, more integrated international capital markets, and a freer flow of labour, information, and technology are likely to continue. Globalization has benefited hundreds of millions of people but many others have been made worse off (Stiglitz 2002). Effective food and agricultural policy and institutions are needed to complement and guide globalization to achieve sustainable economic growth, improved equity, and reduced poverty and hunger.

While the World Trade Organization was created to facilitate rules-based trade and an orderly transition towards more trade liberalization, it appears that the negotiations that take place are better characterized as negotiations to maintain as much trade distortion for oneself as possible while putting pressure on the rest of the world to liberalize. There is an urgent need to move away from negotiated trade distortions towards free and fair trade with an adjustment period for low-income countries to permit them to deal with temporary competitive disadvantages due to poor domestic infrastructure, lack of technology, and related policies further discussed below. The content of the green, blue, and amber boxes within the WTO regime should be reviewed for the purpose of eliminating quantity- and area-related trade-distorting subsidies while creating a development box needed to protect low-income developing countries during a transition period.

Globalization is progressing considerably faster than institutional innovation in the international arena. This is resulting in increasingly worrisome accountability problems with respect to the public and private sectors as well as nongovernmental organizations. The direction and content of globalization should not be left solely to the market. Guidance and regulations are needed to help assure that globalization achieves societal goals. Increasingly, one country's decisions affect other nations and their populations. Yet, without a democratically representative set of international institutions, national decision-makers cannot be held accountable by those affected in other countries. International institutions are needed to deal with international externalities such as spillovers in health, environment, trade, security, labour, capital, and technology, and market developments that conflict with society's interests.

Multinational nongovernmental organizations and corporations must be held accountable to the people affected. Trade-distorting national and regional policies affect people outside the accountability domain of national or regional policymakers. For example, high import tariffs for sugar in the European Union and the United States for the purpose of protecting sugar producers in those countries have very significant negative effects on potential or actual sugar producers and workers in other countries. Yet, those making decisions about these tariffs cannot be held accountable to people affected outside the European Union and the United States. It is difficult to imagine a viable global food system that does not assure international accountability of national and local decisions.

While many existing international institutions are inappropriate for a global world in general and a global food system in particular, the recently created World Trade Organization attempts institutional innovation by consensus decision-making. However, even in this case, low-income countries are poorly represented because of lack of capacity both in terms of access to knowledge and in the number of qualified individuals who can be spared by the countries to participate in negotiations. Thus, consensus may be reached without the full input and understanding of the consequences for low-income countries and their poor people.

One reflection of the lack of international accountability in an increasingly global world is the recent street demonstrations, violence, and alternative conferences held by nongovernmental organizations. It behoves all of us to take these demonstrations, protests, and violence seriously because they are, at least in part, an outcome of a long-standing accountability problem which, if left unresolved, will either bring globalization to a halt or will forego the opportunities embodied in an appropriate globalization process.

At the national level, it is of critical importance that the industrialized countries phase out trade-distorting agricultural policies including those providing subsidies based on quantity produced or acreage used. Industrialized countries have repeatedly committed themselves to open their markets for exports from developing countries but with little has been done (Oxfam 2002).

Large trade distorting quantity-related agricultural subsidies primarily in the OECD countries complicate the world food situation. Expanded output in response to quantity-related subsidies in the OECD countries depress food prices on the international market to the detriment of the many millions of rural poor, whose sole or principal source of income is farming. Seventy-five percent of the world's poor people live in developing countries' rural areas and most of them depend directly or indirectly on agriculture. Depressed international prices, along with various kinds of dumping and food aid as well as tariffs and non-tariff barriers put in place by industrialized countries, make competition virtually impossible for the small farmers. As subsidies are capitalized into land value and expanded output further depresses prices, calls for additional subsidies are made as illustrated by the recent U.S. Farm Bill.

While a great deal of lip service is being paid to trade liberalization for agricultural commodities, action by OECD countries is not following the rhetoric. Even the EU decision to open its markets for "everything but arms" from the least-developing countries include a number of exceptions for agricultural commodities for which developing-country farmers could effectively compete in a truly open European market. Similarly, the U.S. Africa Growth and Opportunity Act provide free market access for selected commodities and products from 39 least-developed African countries. Unfortunately, most of the products these countries could competitively export, including virtually all agricultural commodities, are excluded to protect U.S. agricultural and other interests, and a variety of conditions are attached to those products not directly excluded (Oxfam 2002).

In addition to high tariffs, high-income countries impose a variety of non-tariff barriers, including food safety and sanitary levels that few developing countries can meet. The new standards for aflatoxin content currently being considered by the EU is a case in point. These standards, which are estimated to have no significant health benefits over existing international standards, would, if implemented, result in a loss of \$620 million in export earnings for Africa (Otsuki, Wilson, and Sewadeh 2001). Tariffs and non-tariff barriers for commodities and products from developing countries such as foods and textiles should be gradually eliminated along with subsidized exports and non-emergency related food aid. It is particularly critical that tariff escalation related to the degree of processing of agricultural commodities be phased out as soon as possible. Tariff escalations are in stark contrast to efforts by development assistance agencies as well as national governments of developing countries to promote employment-generating value-adding processing of agricultural commodities as a tool for development and poverty reduction.

Stiglitz (2002) states the problem in a rather straightforward manner: "The Western countries have pushed poor countries to eliminate trade barriers, but kept up their own barriers, preventing developing countries from exporting their agricultural products and so depriving them of desperately needed export incomes" (p. 6). He continues: "It not only hurt the developing countries; it also cost American, both as consumers, in the higher prices they paid, and as taxpayers, to finance the huge subsidies."

In the case of developing countries, investments in public goods and institutions to promote effective and efficient private markets, rural infrastructure, credit and savings institutions, primary education, primary health care, and publicly funded agricultural research to generate knowledge and technology for the smallholder farming community are essential for developing countries to facilitate economic growth and poverty alleviation and to reap the benefits from trade liberalization and other aspects of globalization. Policies and institutions are needed to facilitate access by women to land and purchased inputs (IFPRI 2000). The de facto importance of women in agriculture should be recognized by eliminating discriminatory policies and practices in land tenure and access to credit, inputs, technology, extension, and education.

Large spatial and year-to-year price differences illustrate the critical importance of improving markets and infrastructure. Maize prices in surplus areas of Ethiopia are frequently only half of the prices in deficit areas. Maize prices in Ethiopia almost tripled from 1997–98 to 1998–99 only to fall in 2000–01 to one-fifth of the 1999–2000 prices. In Malawi, maize prices increased by about 400 percent between April 2001 and April 2002. Price fluctuations of those magnitudes are extremely harmful to the poor and show that existing infrastructure is inappropriate to allow the rural poor to benefit from globalization.

Underinvestment by developing-country governments in agricultural research is another serious bottleneck to productivity increases and competitiveness. Developing countries invest 0.6 percent of the value of agricultural output on research compared to 2.6 percent in industrialized countries if only public funding is considered (Pardey and Beintema 2001). If private research funding is added, the difference becomes much larger.

In a recent review of studies of how smallholder farmers may be affected by globalization, Narayanan and Gulati (2002) conclude that policy interventions to enhance the benefits to these farmers should consist of “enabling policies” aimed at removing the constraints and “coping policies” to minimize or avoid adverse effects. Enabling policies should focus on greater vertical coordination between farmers and processors-traders-exporters, removal of credit constraints, reduction of transaction costs, building of social capital, public investment in rural infrastructure, and institutional innovation. Coping policies should provide social safety nets, risk management instruments, facilitate competition, promote exit options by enhancing rural nonfarm income generating opportunities, and investment in research and technology for small farmers.

### **Sweeping Technological Change**

Rapid scientific and technological developments in molecular biology, information, communication, and energy are placing new demands on government policy to guide the design and utilization of these new scientific and technological opportunities for the benefit of farmers, consumers, and natural resources, while managing new risks and uncertainties. It is, unfortunately, a widespread myth that these technologies are not suited to solve poor peoples’ problems. The impact of the new technology on both poor and non-poor people and their food security will to a very large extent depend on accompanying policies.

The choice, design, and implementation of appropriate policies to guide technology development and use for the benefit of the poor are critical (Pinstrup-Andersen and Schiøler 2000; Pinstrup-Andersen 2001c). Currently, action by governments, the for-profit private sector and civil society tends to be excessively influenced by ideology and unsubstantiated claims about risks and opportunities. Lack of appropriate facilitating and regulatory policies and related low levels of public investment in public goods creating research is a major reason why potential benefits from the new technology are not reaching low-income people in developing countries. An exception is the recent rapid expansion of the use of Bt cotton by small farmers in China, India, and South Africa and the use of genetically modified soybeans in Argentina.

The area planted with Bt cotton in China increased from about 2,000 hectares in 1997 to 700,000 hectares three years later. This corresponds to 20 percent of China's cotton area (Huang et al. 2002). Farmers using Bt-cotton seed reduced pesticide application by 80 percent and total production costs by 28 percent. Health problems associated with the use of pesticides dropped dramatically (Huang et al. 2002).

Much of the technology needed by smallholders is of the public goods nature and unlikely to be produced by the private sector. Furthermore, where the private sector could establish exclusive rights to technology needed by small farmers, lack of access to credit and own capital amongst small farmers frequently make it impossible for them to express their needs for such technology in effective economic demand. Thus, the private sector will be unable to capture enough returns to cover the research investments unless technology developed for farmers in the United States and Europe can be directly transferred as, for example, Bt cotton. For these reasons, there is an urgent need for substantial increases in public funding of agriculture research for smallholder farming in developing countries. Research aimed at biofortification, e.g. improving the nutritional value of staple foods, offers a particularly exciting opportunity for reducing micronutrient deficiencies.

Policies and new institutions are urgently needed on intellectual property rights questions, biosafety and food safety regulations, facilitation of markets for improved seed, solar panels, cell phones and other information and communications technology and a variety of facilitation and regulatory policy issues. Policies and investments to strengthen national agriculture research systems with a clear problem-solving focus and using all appropriate scientific methods including agroecological approaches and genetic engineering is urgently needed. One of the challenging policy questions is how food security for the poor can benefit in an environment where property rights are moving towards more exclusive patterns for biological technology and how the TRIPS obligations can be met by individual developing countries without taking away farmers' rights to replant their seed.

## **Degradation of Natural Resources and Increasing Water Scarcity**

Failure to achieve yield increases on land that is well suited for agricultural cultivation has pushed farmers into areas less suited for agriculture, causing deforestation, land degradation and unsustainable exploitation of surface and ground water. On the other hand, efforts to expand yields have frequently been based on excessive and inappropriate use of fertilizers and pesticides, which in turn damaged the environment. The challenge to policymakers is to put in place institutions and incentives that will guide farmers towards productivity increases that will be compatible with sustainable management of natural resources. Keeping in mind that management of natural resources may be sustainable when natural resources are replaced with technology and other human made capital, there is no reason to believe that the world cannot continue to increase food production to meet future demands without reducing the productive capacity for the future. Thus, the challenge to policymakers is not to maintain natural resources in their current state at all cost but to gradually increase the productive capacity of the combined set of resources taking into account society's desires for all eco-services including but not limited to agricultural output.

### ***Soils***

Concerns are growing about the extent and rate of soil degradation in the world and its effects on agricultural productivity and preservation of natural resources, including biodiversity. In the past half century, about two billion of the 8.7 billion hectares of agricultural land, permanent pastures, and forests and woodlands have been degraded. Most of the degraded land could be restored but with rather high costs. It is estimated that about five to ten million hectares annually become unusable and impossible to restore. Overgrazing, deforestation, and inappropriate agricultural practices account for most of the degradation. These problems often result from inadequate property rights, poverty, population pressure, inappropriate government policies, and lack of access to markets, credit, and technologies appropriate for sustainable agricultural development.

Losses in soil fertility are a particularly serious problem in large parts of Africa where more plant nutrients are removed from the soil than put back. African farmers have access to insufficient amounts of organic materials and fertilizer prices are excessively high particularly in landlocked countries with poor infrastructure. Rates of fertilizer application are extremely low at around 12 kilograms per hectare. Investments in rural infrastructure and institutional innovation to make private markets work are of paramount importance.

### ***Forests***

During the last 20 years, about 0.8 percent of the world's tropical forests were converted to other uses annually. Poor farmers clearing land for agriculture to meet food needs accounted for roughly two-thirds of the world's deforestation during that period. It is projected that this rate of conversion of forested area will continue during the next 20 years unless smallholder farmers get access to productivity increasing means such as improved technology, fertilizers, and pesticides. Rapid population growth in many rural

areas of developing countries further contributes to the pressure on forested area. Productivity increasing policies in agriculture are urgently needed to slow deforestation.

### ***Water***

Enough fresh water is available worldwide to meet needs for the foreseeable future if the water were evenly distributed. But water is poorly distributed across countries, across regions within countries, and across seasons. Competition for water is becoming more acute, increasing the potential for conflicts between sectors and water wars between countries.

Investment in irrigation projects has decreased even though increased production from irrigated lands is likely to be decisive in meeting future food needs. Efficiency of water-use in agriculture, industry, and urban areas is generally low. Degradation of land and water resources through water logging, salination, and ground water mining are mounting while excessive use of water in some locations causes lack of access to water elsewhere (Rosegrant, Cai, and Cline 2002). In many locations, water is still treated as a free good with little or no clearly defined property and user rights.

Policy reforms are needed to provide secure water rights vested in individuals or groups of water users that increase incentives for investment, improves water use efficiency, reduce the degradation of the environment, and encourage flexibility in resource allocation. In some countries and regions, these rights should be tradable, providing further reason to conserve water. Irrigation infrastructure and management should be turned over to water user associations where well-defined water rights provide incentives for user groups to economize on water use. Governments should reform distorted price incentives and reduce or remove subsidies on water to prevent overuse or misuse. In estimating the true value of water, one must include such issues as the time spent transporting it and the health benefits that accrue from access to clean water (Meinzen-Dick and Rosegrant 2001).

The precise nature of water policy reform will vary from country to country, depending on underlying economic conditions and institutional capabilities, relative water scarcity, and level of agricultural intensification. Water policy reforms must transcend national boundaries. In many regions, long-term solutions will require cooperation between countries that share scarce water resources.

### ***Energy***

Although energy use by agriculture has grown significantly in recent decades, it accounts for less than 5 percent of the global commercial energy. It is a myth that agricultural development is responsible for a large share of the increase in energy demand during the last 20 years. Chemical fertilizers account for a large share of the energy used in agriculture. Increasing agricultural production and agro-processing will call for substantial increase in the use of commercial energy in developing countries although agriculture will remain a minor energy user.

While policies should focus on efficient use of energy in agriculture, efforts to reduce commercial energy consumption should probably not focus on agriculture in view of its very small share of total energy consumption.

### ***Pesticides and Fertilizers***

Pre- and post-harvest losses in crop production due to pests are very large. However, past practices of pesticide use should be replaced by a more enlightened approach combining integrated pest management including biological pest control with the use of the best scientific approaches to build pest resistance into crops. Overuse or misuse of pesticides compromise human health, contaminate soils and water and damage ecosystems. However, it is of critical importance that legislation against chemical pesticides be coordinated with the development of alternative crop protection measures including those mentioned above. Efforts to reduce the use of pesticides without having alternative pest control measures available are likely to cause unacceptable production losses.

With respect to chemical fertilizers, incentives should be developed for farmers to increase use-efficiency through precision farming and other appropriate application methods while at the same time avoiding the use of excessive quantities. In much of the developing world, the problem is insufficient rather than excessive use of chemical fertilizers and policies are needed to help reduce the fertilizer prices faced by farmers while at the same time assuring timely access to the fertilizers needed.

### ***A Focus on Less-Favored Areas***

A large share of the world's poor and food-insecure people lives in rural areas of developing countries, which has significant agricultural potential but limited and unreliable rainfall and fragile soils. In the fight for survival, they often engage in unsustainable use of natural resources and the land in these areas is increasingly degraded and deforested. Public and private sector investments are needed in infrastructure, market development, natural resource conservation, agricultural research, reproductive health services and family planning, primary education, and primary health care.

Recent IFPRI studies in India and China show that many investments in less-favoured areas now give comparable or higher economic returns than investments in irrigated and high-potential rainfed areas, and they have a greater impact on poverty. Targeted investments in roads, agricultural research, and education in many such areas offer particularly good prospects for increasing productivity and reducing poverty (Fan, Zhang, and Zhang 2000; Fan, Hazell, and Hague 2000; Fan, Zhang, and Zhang 2002).

### **Climate Change**

Agriculture may contribute to or reduce the concentration of carbon dioxide in the air. Thus, while agriculture is seen by many as part of the global warming problem, it can also be part of the solution. More research is needed on the relative contributions made by agriculture and other sources and sinks. Clearly, this is one of many areas where food and agricultural policy must be designed and implemented within a broader policy framework, which takes into account opportunities outside the agricultural sector. In the

absence of such a broader framework, efforts to focus agricultural policies on the mitigation of the consequences of climatic change may be misplaced. Increasing climatic fluctuations such as drought and floods, which appear to be associated with global warming, are introducing new risks and uncertainties in the food and agriculture area. New and innovative approaches to risk management including new instruments for financial risk control should be further developed to assist in managing the consequences of climate-induced risks and uncertainties for food security and agriculture. Better climatic forecasting and the availability of data from geographic information systems may facilitate improved risk management and results from recent work on coping strategies including social and food security safety nets add to the arsenal of approaches for managing risks and consequences for food security and agriculture. This general area is ripe for new innovative thinking in food and agriculture policy analysis.

### **Rapidly Changing Structure in Farming and Agricultural Marketing**

A number of demographic factors such as the aging of the farm population, the feminization of agriculture, the labour shortages and depleting asset bases resulting from the HIV/AIDS crises and the changing capital/labour cost ratio are likely to cause rapid changes in the structure of farming in many developing countries over the next few years. In order to guide these structural changes towards achieving society's goals, new and innovative approaches to agricultural policy and rural institutions are needed. Small-scale family farms which traditionally has been considered the backbone of much of developing-country agriculture, are under threat as labour scarcity caused by out-migration and disease becomes more pronounced, while globalization and domestic investment in infrastructure improve markets, change relative prices, and make capital available for larger production units. While microfinance schemes have successfully made credit and savings institutions available to the poorest segments of the rural population, small farmers with significant marketable surpluses often do not have access to such institutions. The future of small-scale farming is increasingly uncertain in many developing countries. The importance of off-farm rural incomes has increased dramatically in the United States (Mishra et al. 2002) and many developing countries.

In the United States, addition analysis is needed to further enlighten the debate on whether a continuation of recent trends in market concentration and larger production and processing units are in the public interest. Economic analysis is needed to help throw more light on whether these rapid concentrations in production and marketing are caused by true size economies or by implicit or explicit subsidies and failure to endogenize environmental costs into the private costs of production and marketing. These analyses need to take into account the increasing concerns about animal welfare and the desire for identity preservation, food safety, and locally produced foods.

### **Rapid Changes in Consumer Behaviour**

While population growth, increasing urbanization and changes in prices and household incomes continue to be the principle driving forces behind changes in food demand in developing countries, other factors are taking on increasing importance among the non-poor in both developing and industrialized countries. The most important of these

are increasing concerns about food safety and the related increases in the demand for organically produced food, identity preservation, natural foods, and the increasing desire to consume locally produced food. European and to a lesser extent American consumers are complementing their market power with the exercise of power over the regulatory and other policy processes. Nowhere is this more obvious than in the case of the European consumer reaction to genetically modified food. Widespread demands for labelling both with regard to nutritional content and increasingly with respect to production and distribution processes are other illustrations of the increasing consumer power over regulatory and other policy processes. These changes in consumer behaviour raise a number of policy issues and requirements for improved knowledge to be generated by policy research.

Within the context of increasing globalization, one of the policy questions deserving additional analysis relates to food safety concerns as a function of income level. While food safety problems are much more severe among the poor in developing countries, one of the ironies of the recent developments is that high-income people in industrialized countries express much more concern about food safety than the poor in developing countries. High-income people express desires for very high and increasing food safety standards and they are willing to pay for it. Poor people, on the other hand, are frequently facing a trade-off between food safety and food security in the sense that higher levels of food safety are likely to be translated into higher prices and therefore lower real purchasing power among the poor who frequently spend 50 to 80 percent of their income on food. When these trade-offs occur at a level above the most basic requirements for food safety, one of the globalization-related policy questions is whether different standards are compatible with globalization and if not, who sets the standard. A related policy question is whether very high levels of food safety standards in industrialized countries are in fact being used as non-tariff barriers towards developing countries who wish to export but who cannot meet the high standards. Another interesting policy question, which deserves analysis, is whether identity preservation and the desire for locally produced food will conflict with trade liberalization and thus at least implicitly discriminate against food-exporting developing countries.

In addition to food safety concerns, the rapid increase in the demand for organically produced food is driven by a consumer perception that organically produced food is healthier or more nutritious and that organic agriculture is sustainable whereas other agriculture is not. While lower levels of pesticide residues, synthetic hormones, and antibiotics may make organic food healthier, there is no evidence of positive nutrition effects. Identifying organic agriculture as the only production system that uses natural resources sustainable is misleading and can lead to policy decisions with adverse effects on agriculture, the environment, and consumers. More policy research is urgently needed to inform the debate and decision making on the extent to which nonorganic agriculture is sustainable and whether subsidies to promote organic agriculture can, in fact, be justified on environmental or health grounds.

Another aspect of the change in consumer behaviour relates to the impact of globalization, particularly trade liberalization on relative consumer prices and promotion of specific kinds of foods. As developing countries open their markets for imported food, there is a tendency for highly processed food with high sugar and fat content to be more readily available at lower prices. With the support of strong advertisement and other promotional campaigns, these changes are likely to result in a reduction in the consumption of staple foods with high fiber content leading to increasing risks of obesity and chronic diseases. Where these developments are likely to occur, policies are needed to counter negative health effects.

### **Emerging and Re-emerging Health and Nutrition Crises**

The tragic pandemic of HIV/AIDS, the persisting threats from malaria, the re-emergence of tuberculosis, the widespread prevalence of micronutrient deficiencies and the epidemic expansion of overweight and obesity causing a variety of chronic diseases compromise food and nutrition security in both developed and developing countries (Flores and Gillespie 2001). In addition to the welfare effects on those affected, the global health crisis contributes to rising health care costs, labour shortages, and declining asset bases. Labour scarcity and low productivity among people affected by HIV/AIDS along with the disintegration of both rural and urban households call for very different food and agricultural policies and agricultural research priorities with focus on labour saving rather than labour using technologies and food safety nets for displaced individuals as well as affected households (Piot and Pinstrup-Andersen 2002; Gillespie and Haddad 2002).

Innovative policy research and interventions are urgently needed to slow down and reverse the strong trend of increasing overweight and obesity. Such interventions should focus on changing consumer behaviour through the dissemination of information, price incentives, and peer pressures similar to those used to reduce smoking. Reducing sugar, salt, and fat contents in school lunch programs would be a good place to start. Research to alter the composition and tastes of food along with regulation of corporate behaviour on advertising and promotion should also be pursued.

### **Rapid Urbanization**

During the next 20 years, the urban population of developing countries will double while the rural population will increase by only 4 percent. In 1975, about a quarter of the population of the developing countries resided in urban areas; by 2015, it will have increased to one-half (UNDP 2002). This rapid urbanization will present new challenges to providing employment, education, health care and food in urban areas. Increasing attention must be paid to the growing poverty and food insecurity in urban areas. The best data available indicate that urban poverty and under nutrition are increasing at a faster rate than in rural areas (Ruel, Haddad, and Garrett 1999).

Policies and programs are needed to reduce the cost of food to urban consumers and create income-generating opportunities for them, provide low-cost efficient safety nets and stimulate the generation of social capital, provide acceptable and affordable childcare substitutes, ensure the safety of prepared and processed foods sold in the streets, improve primary health care, water, and sanitation services, and enforce property rights for low-income urban people (Ruel, Haddad, and Garrett 1999).

Government intervention may also be needed to counter dietary changes towards excessive sugar, oils, and fats resulting from more severe time constraints, greater exposure to advertising, and easier access to fast-food and processed foods (Garrett 2001).

### **Accelerated National and International Instability and Conflict**

Armed conflicts continue to cause severe human misery in a large number of developing countries. About half of the African countries are currently experiencing some form of instability or armed conflict. While humanitarian assistance may be effective in providing food and shelter for the many millions of refugees and displaced persons, policy action is needed to deal with the underlying causes and the resulting impact on the people in war-torn and neighbouring areas. Recent research shows a clear causal link between poverty, hunger, and natural resource degradation on the one hand and the probability of armed conflict and instability on the other (Messer, Cohen, and Marchione 2001; Homer-Dixon 1999; Esty et al. 1999). While these studies have been undertaken at the national level, it is reasonable to hypothesize that continued extreme inequalities and poverty among nations along with further information globalization will lead to similar relationships at the international level. Widespread hunger, hopelessness, and lack of social justice generate anger and provide a perceived justification for international instability and terrorism instigated and supported by non-poor individuals and groups. Research is urgently needed to test the above hypothesis and to provide guidance for future national and international policy action. Failure to recognize and deal with these underlying causes of international instability will render much of the current investments in military solutions and intelligence ineffective.

### **The new role of government**

The roles of the state, the market, private voluntary organizations, and the for-profit private sector have changed markedly both internationally and in countries exposed to globalization, structural adjustment, and related policy and market reforms. However, lack of knowledge about the proper role of each of these agents in the new socioeconomic and political environments within which many countries find themselves is a major bottleneck to successful transformation. Failure to arrive at proper roles and appropriate institutions is a major reason why reforms have been disappointing in many developing countries.

The role of the public sector appears to be shrinking in many aspects of food security, while civil society and the private sector have taken on increasing importance. While such a shift may be appropriate, recent research and experience clearly show the importance of an effective public sector in many areas related to food security such as agricultural research to develop appropriate technology for small farmers, rural infrastructure, health care, education, development and enforcement of a legal system, and the creation of public goods in general (Paarlberg 2002). Market liberalization and globalization require new institutions, rules and regulations (Kherallah et al. 2000). An effective government is needed to facilitate privatization and guide the transformation of the agricultural sector in a direction beneficial for the poor.

The impact of governance (including democracy, adherence to human rights principles, the rule of law, and empowerment of civil society) on transaction costs and efficiency of food systems and poor people's access to food should take high priority and efforts should be made to identify appropriate governance structures. Current efforts in many developing countries to decentralize public-sector decision-making and resource allocation are hampered by a lack of understanding of how best to implement local government action.

Market liberalization often assumes that the private sector is capable and willing to take over the roles traditionally managed by the government. Where that assumption has been taken too far, the elimination of inefficient government agencies and institutions have not been replaced by effective public goods creation and the private-sector performance has been disappointing. Where market fundamentalism (see Stiglitz 2002 for definition) has directed economic reforms, the results have been disappointing. Strong and effective public sectors are essential for successful privatization.

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