

CIMMYT ECONOMICS PROGRAM
FIRST DISTINGUISHED
ECONOMIST LECTURE

*Can Everybody Be Well Fed
by 2020 without Damaging
Natural Resources?*

PER PINSTRUP-ANDERSEN AND RAJUL PANDYA-LORCH



CIMMYT

*Sustainable Maize and
Wheat Systems for the Poor*

CIMMYT LIBRARY

14 February 1997

CIMMYT ECONOMICS PROGRAM
FIRST DISTINGUISHED
ECONOMIST LECTURE

*Can Everybody Be Well Fed
by 2020 without Damaging
Natural Resources?*

PER PINSTRUP-ANDERSEN AND RAJUL PANDYA-LORCH*



CIMMYT

*Sustainable Maize and
Wheat Systems for the Poor*

14 February 1997

* Director General and Special Assistant, respectively, of the International Food Policy Research Institute (IFPRI), 1200 Seventeenth Street, N.W., Washington, D.C., 20036-3006, USA.

CIMMYT is an internationally funded, nonprofit scientific research and training organization. Headquartered in Mexico, the Center works with agricultural research institutions worldwide to improve the productivity and sustainability of maize and wheat systems for poor farmers in developing countries. It is one of 16 similar centers supported by the Consultative Group on International Agricultural Research (CGIAR). The CGIAR comprises over 50 partner countries, international and regional organizations, and private foundations. It is co-sponsored by the Food and Agriculture Organization (FAO) of the United Nations, the International Bank for Reconstruction and Development (World Bank), the United Nations Development Programme (UNDP), and the United Nations Environment Programme (UNEP).

Financial support for CIMMYT's research agenda currently comes from many sources, including the governments of Australia, Austria, Belgium, Canada, China, Denmark, the European Union, the Ford Foundation, France, Germany, India, the Inter-American Development Bank, Iran, Italy, Japan, the Kellogg Foundation, the Republic of Korea, Mexico, the Netherlands, Norway, the OPEC Fund for International Development, the Philippines, the Rockefeller Foundation, the Sasakawa Africa Association, Spain, Switzerland, the United Kingdom, UNDP, the USA, and the World Bank

Responsibility for this publication rests solely with CIMMYT.

Printed in Mexico.

Correct citation: Pinstrup-Anderson, P., and R. Pandya-Lorch. 1997. *Can Everybody Be Well Fed by 2020 without Damaging Natural Resources?* First Distinguished Economist Lecture. Mexico, D.F.: CIMMYT.

Abstract: Failure to assure sustainable food security will foster the very conditions that will further destabilize and polarize the world in the years to come, with tremendous consequences for all people. This lecture discusses six kinds of action required for global food needs to be met without damage to the environment: selective strengthening of the capacity of developing-country governments; investing more in poor people; accelerating agricultural productivity; assuring sound management of natural resources; developing competitive markets; and expanding and realigning international development assistance. Projections of the incidence of malnutrition, population growth, cereal supply and demand, cereal prices, and advances in food production underscore the seriousness of potential threats to food security and the environment. To illustrate the opportunities associated with alternative actions to mitigate threats to sustainable food security, the authors demonstrate how numbers of malnourished children would be affected under two scenarios, a pessimistic scenario (slow income growth and low investment in national and international agricultural research) and an optimistic scenario (rapid income growth and higher investment in national and international agricultural research, as well as investment in public goods such as health and education).

ISSN: 1405-5112

AGROVOC descriptors: Food production; food security; food supply; development policies; state intervention; resource conservation

AGRIS category codes: E10

Dewey decimal classification: 338.19

CONTENTS

Can Everybody Be Well Fed by 2020 Without Damaging Natural Resources?	1
Future Food Production	9
Required Action	10
Conclusion	16
References	17

Can Everybody Be Well Fed by 2020 without Damaging Natural Resources?

PER PINSTRUP-ANDERSEN AND RAJUL PANDYA-LORCH

The answer to the question posed in the title of this paper is, "Yes, but not with business as usual." The main message of recent research by the International Food Policy Research Institute (IFPRI) and others is that the extent of future food insecurity, hunger, and malnutrition will depend on the action taken or not taken rather than on absolute limitations of the earth's carrying capacity. However, failure to take appropriate action now to assure sustainable management of natural resources may lead to a situation where the earth's carrying capacity is reduced to a level where it does become the limiting factor to the well-being of future generations. The current large number of food-insecure and malnourished people combined with the risk to future generations call for action now. This paper focuses on the action required.

Enough food is being produced around the world today that nobody should have to go hungry. Yet more than 800 million people go hungry, 185 million preschool children are seriously underweight for their age, and diseases of hunger and malnutrition are widespread (FAO 1996; UN ACC/SCN 1992). During the next quarter century, about 80 million people will be

added every year to the world's population (UN 1996), the largest annual population increase in history. Assuring food security for the current population as well as for future generations is a fundamental challenge confronting farmers and policymakers around the world. The widespread food insecurity, unhealthy living conditions, and abject and absolute poverty in many developing countries today are already threatening global stability. Poor, hungry people who are marginalized in economic processes and disenfranchised in political processes are desperate people. Failure to assure sustainable food security will foster the very conditions that will further destabilize and polarize the world in the years to come, with tremendous consequences for all people.

Prospects for reducing malnutrition among the world's children are grim. One-third of all children under the age of five years are malnourished (UN ACC/SCN 1992). Close to 100 million of these 185 million malnourished children are in South Asia, while about 30 million are in Sub-Saharan Africa (Table 1). Projections to the year 2020 (Rosegrant, Agcaoili-Sombilla, and Perez 1995) suggest that, under the most likely or baseline scenario, the number of malnourished children could decrease to 155 million or 25% of the preschool children population. This baseline scenario incorporates the best assessment of future growth in population, income, and productivity of staple crops and livestock. Large decreases in the number of malnourished children are expected in South and East Asia, but in Sub-Saharan Africa their number could increase by 50% to reach 43 million.

While the baseline may be the most likely outcome, action that is taken now and in the next few years will greatly influence

the outcome in 2020. Two scenarios illustrate the opportunities associated with alternative actions. In a pessimistic scenario of slow growth and low investment — a situation where nonagricultural income growth has been reduced by 25%, international investment in national agricultural research systems has been eliminated, and direct core funding of the international agricultural research system has been phased out — the number of malnourished children could increase to 205 million in 2020 (Table 1). The increase will be particularly pronounced in Sub-Saharan Africa. In an optimistic scenario of rapid growth and high investment — a situation where nonagricultural income

Table 1.

Number of malnourished children (millions) in developing regions, 1990 and 2020

Region	2020			
	1990	Baseline ^a	Slow growth and low investment ^b	Rapid growth and high investment ^c
West Asia and North Africa	6.76	6.30	11.05	1.87
Latin America	11.71	8.12	13.23	3.12
Sub-Saharan Africa	28.61	42.67	52.75	33.61
East Asia	41.45	24.70	35.58	14.26
South Asia	95.81	72.94	92.54	56.01
Developing countries	184.34	154.73	205.15	108.87

Source: Rosegrant, Agcaoili-Sombilla, and Perez (1995).

^a The baseline scenario incorporates the best assessment of future trends in population, income growth, urbanization, and rate of increase in food production arising from technological change and productivity growth, commodity prices, and response of supply and demand to prices.

^b The slow growth and low investment scenario simulates the combined effect of a 25% reduction in nonagricultural income growth rates and reduced investment in agricultural research and social services.

^c The rapid growth and high investment scenario simulates the combined effect of a 25% increase in nonagricultural income growth rates and higher investment in agricultural research and social services.

growth has increased by 25%, national and international agricultural systems have been strengthened, and investments in public goods such as health and education have increased by 20%— the number of malnourished children could decline to 109 million, about 50 million less than in the baseline scenario. However, even in this more optimistic scenario, the number of malnourished children in Sub-Saharan Africa is projected to increase relative to the 1990 level.

We do not have to accept the “most likely” scenario of large magnitudes of child malnutrition and food insecurity. The conditions that will assure that all people are fed without damaging the environment can be created if we take the necessary action. Continuing with business as usual is certain to lead to persisting hunger and poverty and to continued degradation of the environment, catalysts for an increasingly unstable world.

It is, in the best of cases, going to be a tremendous challenge to achieve the 2020 Vision.¹ In the quarter century between 1995 and 2020, world population is expected to increase by about 35% to a total of 7.7 billion people (UN 1996). About 98% of the population increase is expected in developing countries, whose share of world population will exceed 80% by 2020. While the absolute increase will be largest in Asia (1.2 billion), the rate of growth will be most rapid in Sub-Saharan Africa, where the population could double to 1.2 billion in 2020. Although the global population growth rate is slowing down and is projected to reach 1.0% by 2015–2020, compared to about 1.5% in 1990–1995,

¹ *The 2020 Vision is a world where every person has access to sufficient food to sustain a healthy and productive life, where malnutrition is absent, and where food originates from efficient, effective, and low-cost food systems that are compatible with sustainable use of natural resources (IFPRI 1995).*

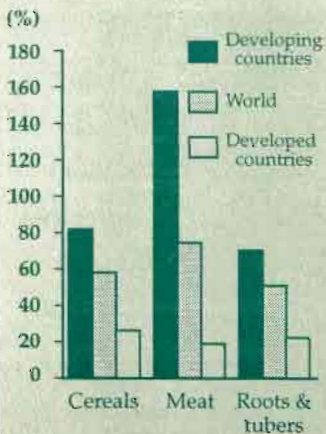
Africa's projected population growth rate of 2.2% will be more than twice that of other regions.

Most of the population increase in the next 25 years is expected in the cities. Rapid urbanization could more than double the urban population in developing countries to 3.6 billion by 2020, by which time urban dwellers could outnumber rural dwellers (UN 1995). While the rural population will continue to grow, the growth rate will be much greater in urban areas. It is of critical importance that investment in rural areas be accelerated. About 80% of the developing world's poor live in rural areas. There is still a window of opportunity to solve the poverty and nutrition problems in rural areas before they become urban problems, but that window is gradually closing. Meeting the increasing and changing food needs resulting from population growth, rising incomes, and changing lifestyles will

be a fundamental challenge for the world's farmers.

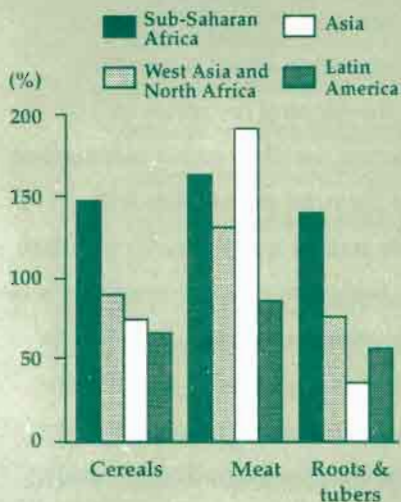
Developing countries are projected to increase their cereal demand by about 80% between 1990 and 2020, while the world as a whole will increase its cereal demand by about 55% (Figure 1). Meat demand in developing countries will increase by a staggering 160%, and world meat demand will increase about 75%.

Figure 1. Percent increase in total demand, 1990-2020.



Source: Rosegrant, Agcaoili-Sombilla, and Perez (1995).

Figure 2. Percent increase in total demand in developing regions, 1990-2020.



Source: Rosegrant, Agcaoili-Sombilla, and Perez (1995).

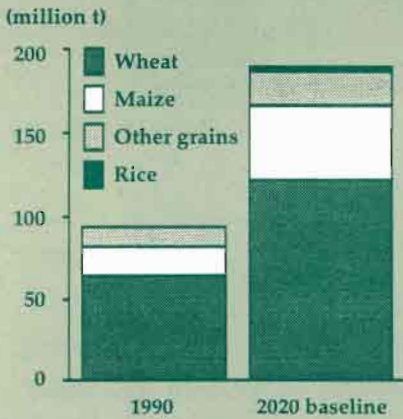
The percent increase in demand for roots and tubers will be slightly lower than that for cereals. These large increases will put tremendous pressures on future agricultural production and marketing and, unless current policies are changed, on the environment.

The projected increase in the demand for cereals, meat, and roots and tubers varies significantly among developing-country regions (Figure 2). Sub-Saharan Africa is projected to

increase its demand for these three commodity groups by at least 150%. Of note is the very rapid increase in meat demand in Asia.

So, how much of the demand is likely to be fulfilled through developing-country production? In the early 1990s, developing countries had net cereal imports—the difference between consumption and production—of around 90 million tons. Rosegrant, Agcaoili-Sombilla, and Perez (1995) project that these will increase to about 190 million tons by 2020. Because Sub-Saharan Africa is expected to continue its poor production performance relative to population growth, its net import requirements for cereals are projected to triple during this period.

Figure 3. Composition of imports.

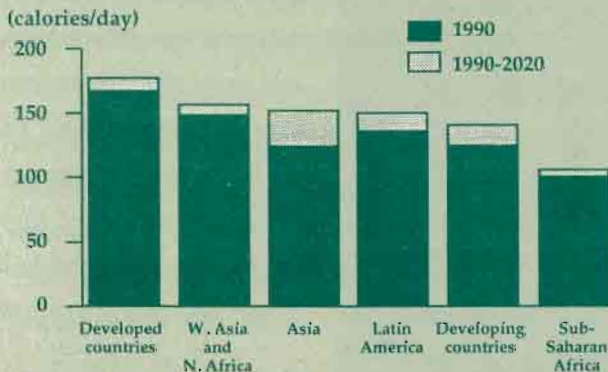


Source: Rosegrant, Agcaoili-Sombilla, and Perez (1995).

The composition of these additional imports is shown in Figure 3. Research by IFPRI suggests that the net cereal import requirements of developing countries in 2020 will consist primarily of wheat and maize. There will also be a very large increase in net imports of meat in response to more rapid economic growth in developing countries, especially Asia.

Assuming that the projected production and import requirements are correct, per capita food availability will increase in all regions, but the increase will be very small in Sub-Saharan Africa (Figure 4). By 2020, average daily calorie consumption per person in Sub-Saharan Africa will

Figure 4. Per capita food availability, 1990 and 2020.

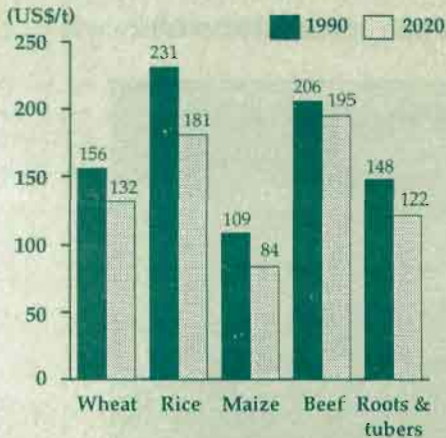


Source: Rosegrant, Agcaoili-Sombilla, and Perez (1995).

still be only about 2,100 as compared to 3,000 calories in Asia and 3,500 calories in the developed countries. The largest improvement is likely to occur in Asia, and there is—unfortunately—strong evidence to suggest that some of this improvement will result in increasing obesity and related health problems in that part of the world.

Notwithstanding the rapid increases in maize and wheat prices during 1995 and the first half of 1996, we believe that the long-term trends for real food prices will continue to fall. In fact, maize and wheat prices decreased very significantly during the second half of 1996. As Figure 5 shows, prices for wheat, rice, maize, beef, and roots and tubers are projected to fall significantly in real terms between now and 2020.

Figure 5. Projected world prices (in 1990 US\$).

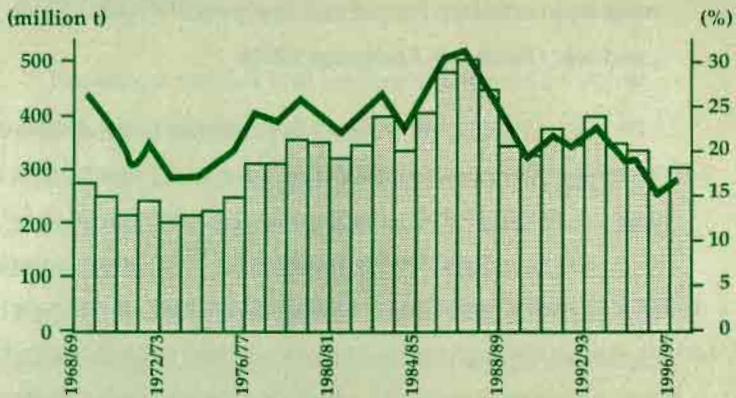


Source: Rosegrant, Agcaoili-Sombilla, and Perez (1995).

Note: Beef prices are US\$/100 kg.

World grain stocks have decreased markedly during the last 10 years (Figure 6) although they have recuperated slightly from a low of about 13% of annual world consumption in mid-1996. Rapidly falling cereal prices during the 1980s and early 1990s have contributed to the falling stock levels. Changes in the European Common Agricultural Policy and the GATT agreement have also contributed to lower stocks, and world grain stocks will

Figure 6. Global grain stocks: level and percent of consumption, 1968/69-1996/97.



Source: USDA (1996).

be considerably lower in the future than they have been in the past. This is likely to be reflected in the availability of food aid, which is currently about one-half of the level it was four years ago. Lower future grain stocks may imply larger price fluctuations in the future, because the buffer available in periods of bad weather and production shortfalls in general will be smaller.

Future Food Production

While the world is far from approaching the biophysical limits to food production, there are indications that growth in food production has begun to lag. For instance, food production increases did not keep pace with population growth during the 1980s and early 1990s in 49 developing countries with a population of one million or more (FAO 1995). The annual rate of

growth of global grain production also dropped from 3% in the 1970s to 0.7% during 1985–95. In addition, yields of rice and wheat have been constant for the last few years in Asia, which is a major producer (Pinstrup-Andersen 1994).

World cereal production is projected to grow on average by 1.5% per year between 1990 and 2020, meat production by 1.9%, and production of roots and tubers by 1.4% (Rosegrant, Agcaoili-Sombilla, and Perez 1995). Production growth rates are expected to be substantially higher in developing countries than developed countries. Cereal production is projected to grow at an average annual rate of 1.9% in developing countries (compared to 1.0% in developed countries), meat production at 2.9% (compared to 0.9% in developed countries), and production of roots and tubers at 1.7% (compared to 0.8% in developed countries). Aquaculture production, which doubled between 1984 and 1992, is projected to increase at a slower rate between 1990 and 2020, and marine fish catches are likely to be no higher than current levels in 2020 (Williams 1996).

² Information about the 2020 Vision initiative is available from IFPRI.

Required Action

The 2020 Vision initiative² has identified six priority areas of action in order for global food needs to be met without damage to the environment (IFPRI 1995). These are:

1. Selective strengthening of the capacity of developing-country governments;
2. Investing more in poor people;
3. Accelerating agricultural productivity;
4. Assuring sound management of natural resources;

5. Developing competitive markets; and
6. Expanding and realigning international development assistance.

The action needed will require changes in behavior, priorities, and policies, and it will require developing and strengthening the needed relationships between individuals, households, farmers, local communities, nongovernmental organizations (NGOs), national governments, and the international community. Each country must design its action program; the six priority areas of action identified here should serve as a point of departure for designing country-specific strategies.

The first priority area of action is to selectively strengthen the capacity of developing-country governments to perform appropriate functions such as establishing and enforcing property rights, promoting private-sector competition in agricultural markets, and maintaining appropriate macroeconomic environments. Predictability, transparency, and continuity in policymaking and enforcement must be assured. Governments must also be assisted to get out of areas that are best handled by the private sector or civil society. In many countries, NGOs have come to play a much more important role in areas traditionally covered by government, such as poverty relief, health care, nutrition, and management of natural resources. For the 2020 Vision to be realized, the efforts and contributions of NGOs and other elements of civil society must be fully recognized and supported, and a more effective distribution of labor between government and civil society, including NGOs, be achieved.

The second priority area of action is to invest more in poor people. One billion people lack access to health services; 1.3 billion people consume unsafe water. Almost two billion do not have access to adequate sanitation systems. One-third of primary school enrollees drop out by Grade 4. For a large share of the world's population to be malnourished, illiterate, sick, and without resources is not only unethical but wasteful. Governments, local communities, and NGOs must assure access to primary education, primary health care, and clean water and sanitation for all people. They must work together to improve access by the poor to productive resources and remunerative employment.

The rate at which population grows in developing countries is one of the key factors conditioning when and whether the 2020 Vision is realized. Strategies to reduce population growth rates include providing full access to reproductive health services to meet unmet needs for contraception; eliminating risk factors that promote high fertility, such as high rates of infant mortality or lack of security for women who are dependent on their children for support because they lack access to income, credit, or assets; and providing young women with education. Female education is among the most important investments for realizing the 2020 Vision.

The third area of action is to accelerate agricultural productivity. Agriculture is the lifeblood of the economy in most developing countries. In the lowest-income countries, it provides up to three-quarters of all employment and half of all incomes.

Agriculture has long been neglected in many developing countries, resulting in stagnant economies and widespread hunger and poverty. Yet there is considerable evidence that East Asia's rapid economic growth in recent years has been facilitated by a vibrant and healthy agricultural sector that supported the nonagricultural sector.

Agricultural growth and development must be vigorously pursued in low-income developing countries for at least four reasons: (1) to alleviate poverty through employment creation and income generation in rural areas; (2) to meet growing food needs driven by rapid population growth and urbanization; (3) to stimulate overall economic growth, given that agriculture is the most viable lead sector for growth and development in many low-income developing countries; and (4) to conserve natural resources. Poverty is the most serious threat to the environment in developing countries: lacking means to intensify agriculture appropriately, the poor are often forced to overuse or misuse the natural resource base to meet basic needs.³

³ See Per Pinstруп-Andersen and Rajul Pandya-Lorch (1995a) for further discussion of these issues.

Existing technology and knowledge will not permit production of all the food needed in 2020 and beyond. National and international agricultural research systems must be mobilized to develop improved agricultural technologies and techniques, and extension systems must be strengthened to disseminate the improved technologies and techniques. Developing countries must increase their national agricultural research expenditures in the near term to 1% of the value of agricultural output with a longer term target of 2%. Interaction between public-sector

agricultural research systems, farmers, private enterprises, and NGOs must be strengthened to assure relevant research and appropriate distribution of responsibilities. A clear policy on and agenda for biotechnology research that focuses on the problems of developing-country farmers must be developed.

The fourth priority area of action is to assure agricultural sustainability and sound management of natural resources. Governments, NGOs, and local communities must work together to establish and enforce systems of rights to use and manage natural resources, to improve the way water is allocated and used, to reverse land degradation where it has occurred, to reduce the use of chemical pesticides, and to implement integrated soil fertility programs in areas with low soil fertility. Local control over natural resources must be strengthened and local capacity for organization and management improved. Investments in less-favored geographical areas, that is, areas with agricultural potential, irregular rainfall patterns, fragile soils, and many poor people, must be expanded. About one-half of the world's poor people reside in less-favored areas, yet most investment, including agricultural research investment, is still focused on the more-favored areas. If reducing poverty and protecting the environment are serious goals, the balance between less-favored and more-favored areas must be redressed. Poverty and environmental degradation are closely linked, often in a self-perpetuating negative spiral in which poverty accelerates environmental degradation and degradation results in or exacerbates poverty.

Continuing to neglect the less-favored, vulnerable areas where many of the world's poor live will make degradation worse and perpetuate poverty. Whereas the long-term solution for some of these areas may be outmigration, most countries cannot accommodate the movement of large numbers of mostly poor and uneducated people in the short term. While failure to address the problems effectively in the less-favored areas themselves will accelerate degradation, outmigration transfers poverty and population pressures to urban areas and rural areas with better natural resources. There is growing evidence that agricultural intensification in fragile lands is possible and that degraded natural resources can be rehabilitated. Accelerated investments in agricultural research and technology, rural infrastructure, family planning, education, primary health care, and appropriate policies are urgently needed to eradicate extreme poverty and associated food insecurity and environmental degradation. Agricultural research and resulting technologies can simultaneously increase food production and protect the environment. There does not have to be a trade-off between meeting future food demands and maintaining the natural resource base.⁴

⁴ See Per Pinstруп-Andersen and Rajul Pandya-Lorch (1995b), as well as Peter Hazell (1996), for a fuller discussion of these issues.

The fifth priority area of action is to develop competitive markets. As a result of inefficient markets and poor infrastructure, the cost of bringing food from the producer to the consumer is very high in many low-income countries, particularly in Africa. Governments should phase out inefficient state-run firms, invest in or facilitate private-sector investment in developing and maintaining infrastructure, especially in rural areas, and provide

technical assistance to help strengthen small-scale competitive rural enterprises.

The sixth priority area of action is to expand and realign international development assistance. Many years ago, industrialized countries agreed to allocate at least 0.7% of their GNP to foreign assistance. Most countries do not maintain this target. Besides increasing international development assistance to reach the 0.7% target, it must be realigned to low-income developing countries, primarily in Sub-Saharan Africa and South Asia where the potential for further deterioration of food security and degradation of natural resources is great. Developing countries in turn must seek measures to diversify sources of external funding and to stem capital flights.

Conclusion

If the global community does not get its act together soon, hunger and malnutrition and resulting illnesses will persist, natural resources will continue to be degraded, and conflicts over scarce resources such as water will become even more common. For most of humanity, the world will not be a pleasant place to live. Yet it does not have to be this way. With foresight and decisive action, we can create a better world for all people. We have the resources to do so; let us act while we still have choices.

References

- Alexandratos, N. (ed.). 1995. *World Agriculture: Towards 2010*. Rome, Italy: Food and Agriculture Organization of the United Nations.
- FAO (Food and Agriculture Organization of the United Nations). 1996. *Food, Agriculture, and Food Security: Developments since the World Food Conference and Prospects*. World Food Summit. Technical Background Document No. 1. Rome, Italy: FAO.
- FAO (Food and Agriculture Organization of the United Nations). 1995. FAO Agrostat-PC, production domain. Rome, Italy: FAO.
- Hazell, P. 1996. Sustainable development of less-favored lands: IFPRI's research agenda. Notes prepared for International Centers Week. Washington, D.C.: International Food Policy Research Institute (IFPRI), October.
- IFPRI (International Food Policy Research Institute). 1995. *A 2020 Vision for Food, Agriculture, and the Environment: The Vision, Challenge, and Recommended Action*. Washington, D.C.: IFPRI.
- Pinstrup-Andersen, P. 1994. *World Food Trends and Future Food Security*. Food Policy Report. Washington, D.C.: International Food Policy Research Institute (IFPRI).
- Pinstrup-Andersen, P., and R. Pandya-Lorch. 1995a. *Agricultural Growth is the Key to Poverty Alleviation in Low-Income Developing Countries*. 2020 Brief No. 15. Washington, D.C.: International Food Policy Research Institute (IFPRI).
- Pinstrup-Andersen, P., and R. Pandya-Lorch. 1995b. *Poverty, food security, and the environment*. 2020 Brief No. 29. Washington, D.C.: International Food Policy Research Institute (IFPRI).
- Rosegrant, M.W., M. Agcaoili-Sombilla, and N. D. Perez. 1995. *Global Food Projections to 2020: Implications for Investment*. Food, Agriculture, and the Environment Discussion Paper No. 5. Washington, D.C.: International Food Policy Research Institute (IFPRI).
- UN (United Nations). 1995. *World Urbanization Prospects: The 1994 Revisions*. New York, New York: UN.

- UN (United Nations). 1996. *World Population Prospects: The 1996 Revision*. New York, New York: UN.
- UN ACC/SCN (United Nations Administrative Committee on Coordination—Sub-committee on Nutrition). 1992. *Second Report on the World Nutrition Situation*, Volume 1. Suffolk, England: Lavenham Press Ltd. for the UN ACC/SCN Secretariat.
- USDA (United States Department of Agriculture). 1995. *Grain: World markets and trade*. Foreign Agricultural Service Circular Series FG 8-95, August. Washington, D.C.: USDA.
- Williams, M.J. 1996. *The Transition in the Contribution of Living Aquatic Resources to Food Security*. 2020 Discussion Paper No. 13. Washington, D.C.: International Food Policy Research Institute (IFPRI).



International Maize and Wheat improvement Center
Centro Internacional de Mejoramiento de Maíz y Trigo
Lisboa 27, Apartado Postal 6-641, 06600 México, D.F., México