



Perspectives on Agriculture and Science



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Robert Thompson

The Challenge of Rural Development

Robert L. Thompson, the World Bank's new Director of Rural Development and CGIAR Cosponsor Representative, shares his perspective on the enormous challenge of overcoming rural poverty.

Despite today's record low food grain prices, more than 800 million people suffer from malnutrition. The vast majority live in the world's poorest countries, where poverty remains a principal cause of food insecurity.

Over the next fifty years, global food demand is likely to double due to both population and income growth. Increased incomes will change patterns of consumption in developing countries, raising demand for vegetables, fruits, meat, fish, and edible oils. Therefore the need to boost food production, while protecting the natural resources on which future food production depends, is urgent.

There is very little additional arable land in the world that is not highly erodible, subject to desertification, or forested. To increase agricultural production by expanding the area planted would require massive clearing of forests, resulting in the loss of wildlife habitats, biodiversity, and carbon sequestration capacity. These outcomes are all environmentally unacceptable. The only sustainable course is to enhance the productivity of cultivated land by using each hectare to the fullest, based on environmentally sound technologies.

The revolution in the biological sciences promises powerful new tools for genetic improvement of food crop and livestock species. But most of the critical research is in the private sector. Among the world's top 300 companies, spending on agricultural research and development surpasses \$24 billion. Although the resulting knowledge creates opportunities, the risk that poor countries will not be able to maintain access to scientific advancements protected as intellectual property is real.

The private sector's large investments in biotechnology research also have major implications for poverty reduction because their research funding priorities often miss the crops that are vital to the poor in the developing world.

Numerous studies have documented the high rate of return on investments in agricultural research, generally in the range of 50 to 80 percent per year. Unfortunately, public investments in agricultural research have declined significantly. For much of the 20th century, most agricultural research results were public goods, ultimately benefiting consumers in the form of lower food prices. Public investment in agricultural research directly benefited all consumers, especially the poorest, who spend the largest fraction of their income on food. It is essential that public support for agricultural research be sustained to complement private funding to assure food security for a burgeoning world population.

Rural development is central to the World Bank's poverty reduction mission, and the Bank has a long tradition of supporting the development of scientific capabilities in agriculture in developing countries. The Bank has been a steadfast partner of the CGIAR since its inception. Bank President James Wolfensohn has called for a comprehensive rural strategy as a cornerstone of the Bank's poverty alleviation efforts. With this intensified poverty reduction effort, the Bank will play an even stronger leadership role in international agricultural research.

As the Bank's leading advocate for increased sustainable agricultural production in developing countries, the Rural Development Department (RDV) shares goals with the CGIAR. CGIAR technologies underpin the Bank's rural lending programs that are directed at alleviating hunger and poverty, improving rural productivity and raising agricultural incomes, protecting the environment, nurturing part-

nerships, and building the capacity of national agricultural research and technology transfer systems.

The CGIAR's agenda is directly relevant to the work of RDV—from sustainable management of natural resources, to forestry and agroforestry, to improving water use efficiency in agriculture.

The CGIAR has a solid foundation of collaboration with the Bank. There are new synergies to be exploited to help confront challenges to the Bank's rural poverty agenda, such as:

■ Forest Policy Implementation

Because many of the world's poorest people are highly dependent on forests, the Bank's support for forestry must be based on the imperative of poverty reduction. A recent internal study of the Bank's forestry programs called for more strategic policies and partnerships to promote the coming together of conservation and development objectives. As the Bank reviews its forestry strategy, the CGIAR Centers' cutting-edge research on sustainable forestry management and work on forestry policy issues will be directly relevant.

■ **Water Resources** IWMI and IFPRI were both involved in the development of *A Water Secure World: Vision for Water, Life, and the Environment*, which was released at the Second World Water Forum. In his speech to the Forum, Mr. Wolfensohn emphasized that lack of access to water is synonymous with poverty in the developing world. He also announced the formation of the Water Resources Management Group within the Bank. As the Bank strengthens its approach to the management of water resources, the CGIAR Centers can provide valuable assistance.

The challenge of rural development in the 21st century is formidable. The Bank welcomes and looks forward to increasing opportunities for collaboration with the CGIAR.

Charting a Course for System Change

Emil Javier is the new Chair of the Technical Advisory Committee (TAC), which is charged with developing priorities and strategies for the CGIAR and assuring the quality and relevance of the Centers' science. In this guest editorial, Dr. Javier discusses the new vision and strategy for the CGIAR.

At ICW99, the CGIAR asked TAC to develop, in close consultation with the Centers, Members, and stakeholders, a new vision for the CGIAR in 2010. More than 1.2 billion people continue to live in conditions that are below any standards of human dignity.

Food security and poverty reduction must remain the driving forces of the CGIAR. Our vision is a food-secure world for all. Our mission is to achieve food security and poverty reduction through scientific research, improved policies, and research-related activities in the fields of agriculture, forestry, and fisheries. And these goals must be accomplished while conserving and enhancing the soil, water, and bio-

diversity resources upon which long-term, sustainable agricultural productivity depends.

There is strong evidence of the linkage between agricultural research and poverty alleviation. Agricultural research helps to produce the technology and the knowledge necessary for sustained agricultural development, which is essential for economic growth. Rural economic growth, in turn, is the most effective instrument for poverty alleviation in countries where the majority of the poor live in rural areas.

The CGIAR has made its biggest impact on poor consumers as well as on poor producers in favorable areas. We now need to tackle food security and poverty challenges in the more marginal environments where large concentrations of poverty persist. This task calls for a research paradigm that is ecologically oriented and regionally focused and that draws into active play the indigenous knowledge and political will of the affected communities.

Advances in molecular biology, information science, and communications are generating new and more powerful research tools. The massive entry of the private sector into some of the traditional domains of public agricultural research represent significant opportunities for partnerships that will harness the full power of modern science and technology for agriculture.

The task ahead is enormous and daunting. We need to help put into place an integrated global research system for agricultural development—a system that effectively links community, national, and regional efforts with the efforts of research and development groups in developed countries and in the private sector. The CGIAR's network of international agricultural research Centers should play, with relatively small resources, a nevertheless leading role in such a global system in the foreseeable future. However, to be sustainable in the long run, this international network of research capability should be increasingly owned by the developing countries.



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Agricultural Biotechnology and the Poor

Gabrielle J. Persley wrote the overview chapter ("Promethean Science") and is co-editor with Manuel Lantin of Agricultural Biotechnology and the Poor. The book, published by the CGIAR, contains the major contributions presented at a CGIAR/U.S. National Academy of Sciences-sponsored conference held in October 1999 at the World Bank in Washington, DC.

Prometheus, according to Greek mythology, was a Titan, responsible for introducing fire to humans, a remarkable innovation at the time, but having benefits and risks, depending on its use. Promethean has since come to mean daringly original and creative. Since science is an elegant way of getting at the truth, it should therefore follow that molecular biology and other tools of modern biotechnology add elegance and precision to the pursuit of solutions to thwart poverty, malnutrition, and food insecurity in developing countries.

In the debate about biotechnology, the elegance of science in the pursuit of truth is not appreciated by all. The debate has tended to focus on the potential risks to human health and the environment.

Biotechnology, however, has the potential to contribute to the solution of human problems, particularly in developing countries.

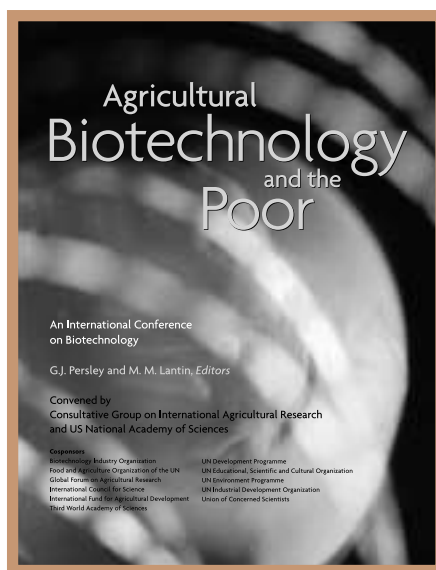
Despite the increasing availability of food, over 800 million people in developing countries are food insecure, and 200 million of these are malnourished children. It is a further paradox that food insecurity is so prevalent at a time when global food prices are generally in decline. The basic cause of this two-pronged paradox is the intrinsic link between poverty and food security. Simply put, people's access to food depends on income.

The most important global challenges are:

- Alleviating poverty, improving food security, and reducing malnutrition, especially among children;
- Providing sufficient income for the rapidly increasing numbers of urban poor; and
- Using new technologies for environmentally sustainable development.

Key issues that will affect the application of new developments in modern biotechnology for the public good are ethics, food and environmental safety, and intellectual property management.

In agriculture and forestry, biotechnology promises new ways to harness and improve the genetic potential of crops, live-



stock, fish and forests, and better ways to diagnose and control the pests and pathogens that damage them. The perils lie in the profound ethical issues surrounding the control and use of these powerful new technologies, and the assessment and management of risks to human health and the environment.

The CGIAR should enhance its role as protector of the interests of the poor and facilitator and bridge-builder in biotechnology partnerships, and facilitate public policy and innovative institutional

arrangements. The CGIAR Centers could develop, for the benefit of poor countries, more innovative partnerships with the private sector and with universities and other advanced research institutions.

There are seven activities in which the CGIAR System could play a useful role:

- Facilitating sharing of information about developments in the use of modern biotechnology in developing countries;
- Identifying barriers to and opportunities for mobilization of science to address the problems of the poor, and identifying technical, policy, and institutional issues to be addressed at national, regional, or international levels;
- Providing further technical support for building the capacity of national agricultural research systems;
- Ensuring that CGIAR Centers comply with accepted biosafety standards;
- Improving the management of intellectual property by CGIAR Centers and the NARS;
- Strengthening efforts to develop and implement public/private partnerships and explore new modalities; and
- Communicating and addressing public concerns through an open, transparent, and inclusive dialogue on the benefits and risks of biotechnology.

Biotechnology is only one tool, but a potentially important one, in the struggle to reduce poverty, improve food security, reduce malnutrition, and improve the livelihood of the rural and urban poor. The uncertainties and risks are yet to be fully understood, and the possibilities are yet to be fully explored.

It is important not to deny people and nations access to new technologies, so long as they are fully aware of the potential risks and benefits and are able to make informed choices.

The CGIAR Centers are on the threshold of a daringly original and creative Promethean science.

Calling for a New ‘Green Revolution’

Maurice Strong was Chairman and Mahendra Shah, Executive Secretary, of the third CGIAR System Review. The following is excerpted from their new book, Food in the 21st Century: from Science to Sustainable Agriculture.

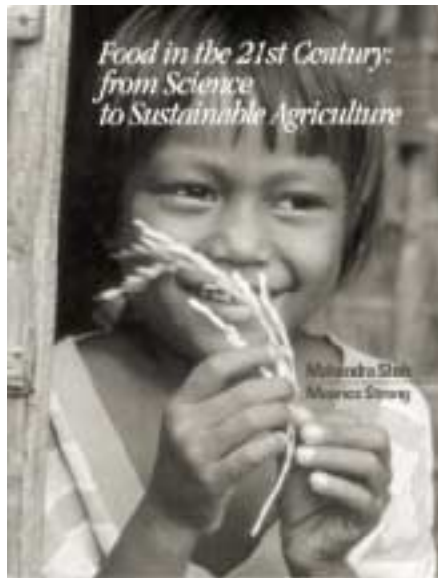
Almost three decades ago, the world faced a global food shortage that experts predicted would lead to catastrophic famines. That danger was averted because a group of public and private development agencies created a network of international agricultural research Centers and a unique alliance, CGIAR, to support the Centers.

In what came to be known as the Green Revolution, CGIAR scientists found ways to increase the yields of some of the world’s most important food crops, and the world’s farmers put the innovations to use. As the new millennium begins, the world faces another food crisis that is just as dangerous—but much more complex—than the one it confronted thirty years ago.

Each year the global population climbs by an estimated 90 million people. This means, at the very least, the world’s farmers will have to increase food production by more than 50 percent to feed some two billion more people by 2020. But the numbers don’t tell the full story. The challenge confronting the world is far more intricate than simply producing more food, because global conditions are very different than they were on the eve of the Green Revolution. To prevent a crisis, the world community must confront the issues of poverty,

food insecurity, environmental degradation, and erosion of genetic resources.

Food Security. Feeding the world in the 21st century will require not only food availability, but food security—access to the food required for a healthy and productive life. It means the ability to grow and to purchase food as needed. The basic statis-



tics on food security are grim. In addition to the expected population growth, FAO estimates as many as 840 million people—a number that exceeds the combined populations of Europe, the United States, Canada, and Japan—currently do not have enough to eat. The companion problem of “hidden hunger”—deficiencies of vital micronutrients—affects even more people

in the developing world. The shift away from the traditional food staples will make this challenge even more difficult. Simply increasing productivity of wheat and rice alone may not have the impact it did 30 years ago.

Poverty. Throughout the developing world, poverty is linked to hunger. For example, in sub-Saharan Africa, where malnutrition is rampant, every other person is poor. Rural poverty and accompanying malnutrition are usually tied to the small size or poor quality of farmland and limited off-farm incomes. In addition, more women than men live in poverty in the developing world.

The Environment. Thirty years ago, the Green Revolution’s high-yield food crops were the critical factor in preventing global famine. But an increase in crop lands and the extensive use of fertilizer and irrigation were also instrumental. As the 20th century draws to a close, environmental concerns rule out using this mix of strategies, which worked in the past, to meet the food and agriculture crisis that looms ahead.

Genetic Resources. Environmentalists warn that as much as half of the world’s remaining 2.5 billion hectares of tropical forest will come under pressure for agricultural expansion as the demand for food grows. The loss of forests would mean more than the loss of trees and the wood, fuel and other products they provide. Disappearing forests threaten the world’s biodiversity.

Meeting these new challenges has been made even more difficult because so few opinion leaders are aware of the

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urgency of food and agriculture problems. This lack of concern is reflected in the fact that public spending for agricultural research has declined sharply over the past three decades.

An Integrated Approach. Given the complex and interlinked components of the overall challenge of feeding the world in the 21st century, it is clear that solutions that deal only with one part—with crop productivity, for instance, or land use, water conservation, and forest protection—will not be sufficient. The issues are connected and must be dealt with as an interlocking, holistic system.

The CGIAR System in Action

The CGIAR system has the combination of resources and integrated approach needed to meet these complex aspects of the looming global crisis in food and agriculture. In fact, members of a distinguished international panel recently concluded that the CGIAR is the only authoritative international scientific organization capable of ensuring that the tremendous capacities of science are made available to address the problems of the poor in the developing world. CGIAR's assets include an unmatched mix of knowledge, skills, experience, and perspectives, as well as the ability to link scientists, farmers and environmentalists throughout the world. CGIAR's record of accomplishment and willingness to adapt itself to face new challenges began with the Green Revolution and has continued ever since.

A Record of Accomplishment

From its beginning, CGIAR's scientists have received world-wide acclaim for their accomplishments. Even more impressive than the accolades, though, has been the global spread of the fruits of CGIAR research.

- More than 300 CGIAR-developed varieties of wheat and rice are in use by the world's farmers.
- The Green Revolution doubled productivity of such staples as wheat and rice. In India, wheat production on existing acreage nearly tripled, achieving self-sufficiency.
- More than 200 new CGIAR-developed varieties of maize are being grown in 41 countries.
- CGIAR work has produced improved varieties of legumes, roots and tubers, pasture crops, and other cereals.
- CGIAR's research has improved farming techniques and strategies for managing livestock disease, assessing fish stocks, protecting genetic resources, and effectively managing natural resources.
- Some 85,000 researchers and scientists have worked and trained at CGIAR centers.
- More than 600,000 accessions of germplasm are held in CGIAR genebanks.

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