

## **Agriculture, Technological Change, and the Environment in Latin America: A 2020 Perspective**

**by Eduardo J. Trigo**

Latin America, like most other developing regions, faces the daunting task over the next 25 years of meeting the food needs of a growing population while reducing poverty and protecting the environment.

Of the 2.5 billion additional people who will populate the planet by the year 2020, about 200 million will be in Latin America. Though this represents a relatively small share of the world's additional population, it will nevertheless pose a real challenge for the region's agriculture sector.

Latin America's relatively poor agricultural performance is at the heart of the region's increasing poverty and rapidly deteriorating natural resource base. Between 1979 and 1990 agricultural production grew just enough to keep per capita food production constant. Since the late 1980s, food security at the household level has continued to deteriorate in 8 of the 21 countries included in the latest United Nations assessment. The number of people living below the poverty line increased from 195 million to 250 million over the 1980-92 period, with most of that increase occurring in urban areas. Natural resources of all types are under great stress. For example, in the mid- to late 1980s it is estimated that more than 2 million hectares in the region suffered from moderate to severe soil erosion.

Agricultural policies have been an important part of the problem. During the 1980s devaluation of local currencies produced better terms of trade for agriculture, but these improvements were largely offset by a decline in public investment in agriculture and the negative impact of the protectionist policies of developed countries. These conditions ultimately created incentives to degrade the environment and exacerbated poverty in the region.

Other recent developments--trade liberalization, regional economic integration, and continuing urbanization--are likely to lead to a repositioning of agriculture within national economies and a restructuring of agricultural production in response to significant increases in demand for both traditional and more diversified products.

The region has the natural resources to exploit both emerging domestic and international market opportunities. But can it develop a scientific and technological base that will permit exploitation

of these resources without further damaging the environment and increasing poverty? General answers are difficult because of the region's diversity, but some general points can be made about the potential of existing technologies and the likely contribution of new biotechnologies.

### **Prospects for Conventional Technologies**

For the moment, gains in productivity will continue to rely mostly on conventional improvements in animal and plant breeding and chemical technologies, with more efficient use of resources and agroecological considerations becoming increasingly important concerns.

The experience to date with integrated nutrient and pest and disease management technologies in both commercial and small-farm agriculture is positive. Environmental perspectives are being incorporated into the agricultural intensification strategies at a number of the region's international, regional, and national agricultural research centers, and nongovernmental organizations are playing an increasingly active and useful role.

Several factors will limit these processes, however. An initial one is the lack of information about some of the major agroecologies, particularly in the tropical areas, and the small numbers of people with adequate training to apply agroecological and environmental perspectives. A second factor is the intensity of management required by these new technologies at the farm level. Applying these technologies requires capabilities at the farm level and support services that are not currently available in most situations.

### **Prospects for New Technologies**

It is generally agreed that further developments in biotechnology offer potential benefits for Latin America, but most of these new technologies are not expected to reach agricultural markets until well into the next two decades.

Some genetically engineered crops are expected soon, including cotton with genes of the bacterium *Bacillus thuringiensis* (BT) for pest control, BT maize, and herbicide-resistant soybeans. However, these new crops will not appear on the market in significant quantities until the next decade. The results of work to improve the nutritional value of some basic food crops such as cassava, maize, and potatoes are still 5 to 10 years away from farm-level application.

Within the next five years the more technologically advanced farmers will probably be using pest- and disease-resistant and herbicide-tolerant varieties of soybeans, cotton, alfalfa, sunflowers, and

potatoes. Generalized use should not be expected before the end of the decade. Insect- and herbicide-resistant fruits and vegetables, as well as varieties with improved processing, storage, and nutritional characteristics, will also become available. Progress could be slower for wheat, maize, and rice for technical reasons.

These new technologies have been generated by research in developed countries, whose agricultural priorities and crops of interest are the focus of most of the biotechnology research currently being undertaken in the world. Some of the new developments will likely "trickle down" to commercial agriculture in the developing world, but the benefits to small and resource-poor farmers will be marginal and circumstantial.

Of great concern, therefore, is the low level of biotechnology research taking place within Latin America. By the early 1990s about 150 researchers in the region were working on biotechnology-related projects. By contrast, one multinational company, Monsanto, currently employs in its laboratories more than twice that number of scientists. It is estimated that only 33 research groups in the region have a strong capability to carry out traditional biotechnology research, and only 6 have a capacity in modern molecular biotechnology. Moreover, their links to producers are weak.

### **The Institutional Environment for Research**

In general, the institutional environment for agricultural research is in deep crisis. Latin America has been part of the worldwide trend toward a smaller public sector. The new ideological and economic perspectives call for less government intervention in agriculture, and public spending has been drastically curtailed. Between 1977 and 1992 investment in research in the region grew by only about 1.5 percent per year, down from almost 6 percent annual growth in the period 1967-77. In every Latin American country except Argentina and Colombia, the resources available per researcher fell substantially.

Current efforts to deregulate and open up economies are helping to strengthen private interest in technology development. Although direct private investment in agricultural research remains low, this diversification of options and capacities is a positive step. Foundations have also become significant players. But the magnitude of these initiatives is not sufficient to compensate for the retreat of public sector institutions. It is likely that the institutional context for agricultural research and technology will be increasingly diverse, with a growing number of public and private initiatives coming together to share responsibilities.

Beyond a doubt, technological progress is necessary to alleviate poverty and achieve food security. Technology by itself, however, can hardly produce the expected results without a conducive institutional environment.

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"A 2020 Vision for Food, Agriculture, and the Environment" is an initiative of the International Food Policy Research Institute (IFPRI) to develop a shared vision and a consensus for action on how to meet future world food needs while reducing poverty and protecting the environment. Through the 2020 Vision initiative, IFPRI is bringing together divergent schools of thought on these issues, generating research, and identifying recommendations. The *2020 Briefs* present information on various aspects of the issues."