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Rice and Beans in Latin America

A Summary Report
on the Economic Impact
of Improved Varieties

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CIAT
Centro Internacional de Agricultura Tropical
International Center for Tropical Agriculture

Dr. Aart van Schoonhoven, Entomologist and Director,
Genetic Resources Research

Dr. Douglas Pachico, Agricultural Economist and Director of Impact
Assessment and Strategic Planning

International Center for Tropical Agriculture (CIAT)

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CIAT is part of the global agricultural research network
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CIAT supports Future Harvest, a public awareness campaign that builds understanding about the importance of agricultural research issues and international agricultural research. Future Harvest links respected research institutions, influential public figures, and leading agricultural scientists to underscore the wider social benefits of improved agriculture—peace, prosperity, environmental renewal, health, and the alleviation of human suffering.

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Nearly half of Latin Americans still live below the poverty line, as defined by FAO.

The rice and bean research imperative

Rice and beans are an inseparable pair of staple foods for millions of Latin Americans, particularly in Brazil and parts of Central America, the Caribbean, and Andean Mountain zone. Whether consumed separately or together, these crops figure importantly in the human diet and in national economies across the entire region, and trends in their production are a matter of immediate relevance to practically all of its inhabitants.

Though rice and bean production is still faced with many challenges, much of the news is positive. Improved varieties of both crops have had a large economic impact in Latin America, starting roughly two decades ago and continuing right to the present. In addition to putting more cash in farmers' pockets, the new varieties have improved rice and bean supplies, helping the region's poorest consumers keep one of the world's great culinary combinations at the center of their diet.

The urgency of continued rice and bean research in Latin America is fed by two disconcerting facts about the region.

- First, even though important economic gains were registered during the 1970s, these were erased to a large extent in the so-called "lost decade" of the 1980s. Moreover, a new set of policies, aimed at opening up national economies and reducing government subsidies, has so far done little to better the lot of less-fortunate people. Nearly half of Latin Americans still live below the poverty line, as defined by the Food and Agriculture Organization (FAO) of the United Nations.

- Second, because of grinding poverty and unrest in rural areas, urbanization and massive immigration to industrialized countries continue at a rapid rate.

These trends pose a dire threat to the fragile economic and political gains of recent years. To avert that threat requires, among other things, a renewed commitment to Latin America's agriculture, with significant investment at the international and national levels.

About CIAT and its national partners

The main purpose of this document is to summarize the progress and economic impact of improved varieties of rice and beans released by national agricultural research programs in almost every country of the region. In support of this work, they have received experimental germplasm, training, and technical assistance from the International Center for Tropical Agriculture (CIAT), which is headquartered in Cali, Colombia.

Most of this support is channeled to national programs through regional research networks in which local rice and bean researchers have a vote and a voice. The networks and CIAT's international research programs enable participating countries to solve common problems through joint efforts rather than wasting resources by working individually toward the same ends.

Established 30 years ago, CIAT is one of 16 international centers supported by the Consultative Group on International Agriculture (CGIAR), whose secretariat is located at World Bank headquarters in Washington, D.C. The US Agency for International Development (USAID) is one of the group's principal donors.

Although three of the CGIAR centers are located in Latin America, CIAT is the only one that devotes most of its resources to agricultural research for this region. In addition to rice and beans, the Center conducts research on cassava (a major tropical root crop) and forage grasses and legumes, which serve as feed for livestock.

In the last 5 years, CIAT has integrated its crop research with new initiatives aimed at improving the management of natural resources in key agroecosystems of tropical America. This work includes research on soils and cropping systems, small-scale agroenterprise development, and land management policies and strategies. In recent years the Center has also become an internationally recognized leader in developing methods for farmer participation in research.

Two crops, two cultures

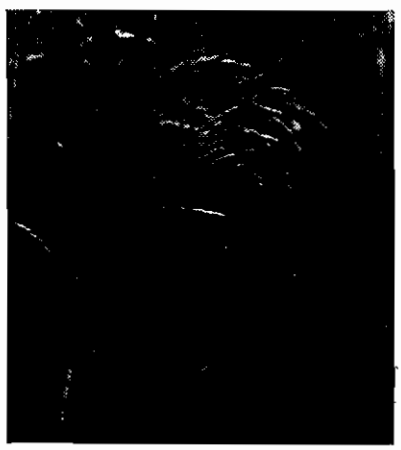
As background to the record of rice and bean research impact, it is important to understand how they became close dietary companions and acquired such large economic significance in Latin America.

The story begins with Europe's physical and cultural assault on the New World, which quickly moved from the battlefield to the indigenous kitchen. One of the many confrontations of taste that occurred there involved rice—a foreign introduction—and beans—a native staple. In some Latin American countries, people still refer to the combination of rice and beans as "Moors and Christians," reflecting an early Spanish colonial perception of this common dish.

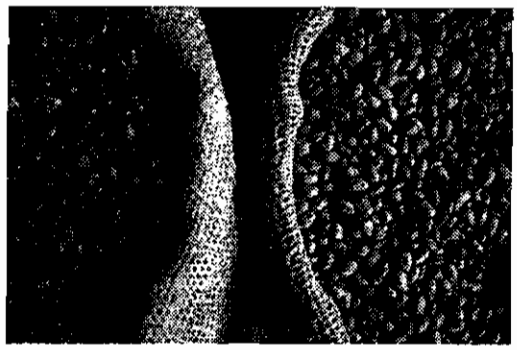
The rise of rice—Within a century and a half after the European conquest, the cultivation and consumption of rice had become well established. The crop apparently entered the New World from two directions, arriving through Spanish and Portuguese trade with Africa and Asia. It took two centuries more, though, for the Old World cereal to carve out its now predominant place in the Latin American diet. Not until the 20th century did it become the region's most important grain crop for human consumption.

Rice supplies Latin American consumers with more calories than wheat, maize, cassava, and potatoes.

Today, rice supplies Latin American consumers with more calories than wheat, maize, cassava, and potatoes. It is surpassed only by sugar as a source of energy in their diets. By the 1990s per capita consumption of rice had reached 30 kilograms, up from 10 kilograms in the 1920s.



The displacement by rice of starchy staples, such as cassava and plantain, has been driven largely by urbanization throughout the region. Today, about 70 percent of Latin Americans live in cities. Rice has clearly proved to be a more convenient food for them than the bulkier and more perishable traditional crops.



Apart from its convenience, rice has many other dietary virtues. It is rich in vitamins and minerals, low in fat and salt, and free of cholesterol.

Rice is a versatile crop, with varieties adapted to a wide range of climates, soils, and moisture conditions. In Latin America about 55 percent of the crop (3.7 million hectares) is concentrated in wetlands, and roughly two-thirds of that area is irrigated. The other 45 percent (3.0 million hectares), referred to as "upland" rice, is grown under rainfed conditions.

Most upland rice in Latin America is mechanized; only about a million hectares are cultivated manually. Upland rice has served as a pioneer crop during this century, with mechanized production spreading into Latin America's vast savannas and manual cultivation penetrating the margins of its tropical forests.

Irrigation provides the best conditions for rice production, so naturally irrigated areas have registered the most gains in recent decades. Irrigated rice is grown mainly on a commercial scale in Latin America, with almost universal adoption of modern varieties and widespread use of agrochemicals for fertilization and pest control.

Though traditionally grown for subsistence, the common bean has in recent decades found sizable markets, as Latin Americans have flocked to cities.

The native bean—The common bean is of New World origin. Archeological evidence found in Mexico, Peru, and the USA suggests that the crop was domesticated at least 7,000 years ago. In modern times it has become the world's most important food legume, far outranking chickpeas, faba beans, and lentils. Latin America is still the most important bean-producing region; its 8 million hectares account for nearly half of global output.

Since beans evolved in this region, they naturally occupy a central place in the human culture that gave rise to the crop. Farmer selection of beans over the centuries has produced a wide variety of seed colors, textures, and sizes to meet a wide array of tastes.

Even the common name of the crop in Spanish varies: The most frequently used term is *frijol*—heard from Mexico to Panama, throughout the Caribbean, and in parts of Colombia, Ecuador, and Peru. But elsewhere the common bean is called *frejol, frisol, poroto, habichuela, habilla,* and *caraota.*

Beans are grown under even more diverse conditions than rice—from sea level to elevations of more than 3,000 meters. Moreover, in contrast with rice, the crop is grown chiefly by small farmers without irrigation and using low levels of chemical inputs. Bean production is often relegated to marginal environments, such as those characterized by steep, erosion-prone slopes and by low soil fertility.

Though traditionally grown for subsistence, the common bean has in recent decades found sizable markets, as Latin Americans have flocked to cities. Unlike some other traditional staples, however, the crop has fit rather easily into urban life and eating habits. Rapid growth of demand in cities has created new cash-earning opportunities for the small farmers who grow beans.

In remaining faithful to the native bean, Latin American consumers have clearly made a healthy choice. Because of the high protein content and generous amounts of dietary fiber, complex carbohydrates, and other dietary essentials in beans, nutritionists characterize them as a "near-perfect food." A single serving provides at least half the US Department of Agriculture's recommended daily allowance of folic acid (a B vitamin that is especially important for pregnant women), 25 to 30 percent of the daily recommended iron levels, 25 percent of the daily requirements of magnesium and copper, and 15 percent of potassium and zinc.

Widely known as the "poor man's meat," the crop provides an inexpensive source of protein for low-income consumers. One hectare planted to traditional bean varieties produces 123 kilograms of protein, compared to 3.4 kilograms of protein from beef cattle raised on the same amount of land. Beans are the fourth most important source of protein in Latin America. Their nutritional advantages make them particularly beneficial in the diets of women and children.

Two crops, two research strategies

Though highly complementary in nutritional terms, rice and beans clearly belong to two quite distinct agricultural traditions. This in turn has required that crop scientists adopt two different research strategies for helping improve the production of these crops.

The ongoing Green Revolution in rice—In the mid-1960s, Latin America's entire rice area was planted to tall traditional varieties, which gave low yields and responded poorly to the chemical fertilizers introduced in that period. Through a movement that began in Asia and became known as the "Green Revolution," modern rice research largely replaced Latin America's traditional races with higher yielding semidwarf varieties, particularly in the irrigated environments. The new varieties yield better, because they channel more of the extra nutrients provided by modest amounts of fertilizer into the production of grain than into growth of stems and leaves.

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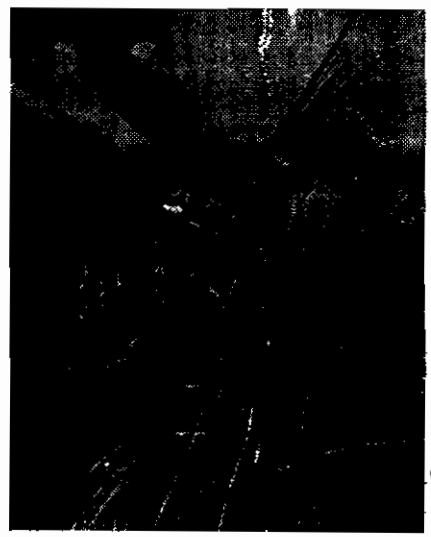
Farmers rapidly adopted the new semidwarf varieties, developed and released by national programs with help from two international centers, throughout the 1970s. But that was merely the beginning of a process that continues to the present. Over the last 30 years, national programs across the region have released, on average, a total of 10 new lowland rice varieties each year. In all some 300 varieties have been released, most of them targeted to irrigation conditions.



About 40 percent of the varieties have come from crosses made at CIAT and 11 percent from the International Rice Research Institute (IRRI) in the Philippines. The rest have been derived from germplasm identified by national programs in Latin America, Africa, and Asia. Nearly 80 percent of this germplasm—that both from international and national sources—has reached scientists in Latin

American countries through an international rice testing network coordinated by IRRI and CIAT. The network provides a way, not just for international centers to distribute their products, but for national programs all over the developing world to share their germplasm with one another.

The rapid spread of new semidwarf varieties in the 1970s naturally resulted in the displacement of many traditional landraces from farmers' fields. That in turn gave rise to legitimate concerns about narrowing the genetic base of rice production and making it more vulnerable to disease epidemics.

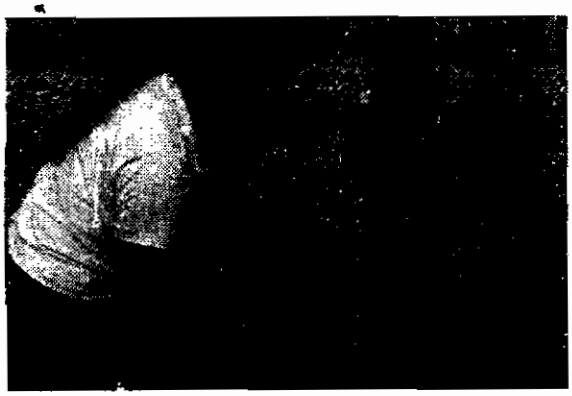
Since the early days of the Green Revolution, however, rice scientists in Latin America have broadened the genetic base by drawing on germplasm from Africa and other sources. In general, each of the new varieties has represented significant improvement for at least one key trait, on top of the gains already achieved. Better resistance to diseases and other stresses, for example, has stabilized rice yields and greatly reduced the need for fungicide and pesticide applications. The rapid spread of these new varieties has been facilitated by the effective organization of the commercial rice sector.

CIAT and its national partners embarked on intensive breeding programs to develop a wide array of new bean varieties that would offer farmers distinct advantages even under low-input conditions.

Improved beans for low-input agriculture—At an early date in bean research for Latin America, scientists concluded that a Green Revolution-style transformation of the crop was highly unlikely. In contrast with rice, beans were grown predominantly on a small scale, often in complex combinations with other native staples (especially maize), and in less favorable agricultural environments. Moreover, bean growers generally could not afford to apply fertilizers and other chemical inputs to overcome the effects of poor soils and the depredations of diseases and insect pests. A further consideration was wide variation in consumer preferences with respect to seed color and texture, which complicated the whole process of developing and disseminating improved seeds.

The very different circumstances of bean cultivation did not mean, however, that modern crop science could do less to improve it. Rather, researchers would have to pursue a different and perhaps more difficult improvement strategy than that for rice, one that would take longer to show results.

In the mid-1970s, CIAT and its national partners embarked on intensive breeding programs to develop a wide array of new bean varieties that would offer farmers distinct advantages even under so-called "low-input" conditions. To accomplish this, bean breeders placed particular emphasis on genetic resistance to combinations of widespread diseases, principally common bacterial blight, bean common mosaic, bean golden mosaic, anthracnose, and angular leaf spot. They also selected for higher yields under drought and low soil fertility, especially low phosphorus. Another goal was early maturity, which would enable farmers to fit the bean crop more easily into complex cropping systems.



Two circumstances gave this strategy a reasonably good chance of success. First was the incredible array of

genetic diversity available to bean breeders in their search for disease resistance and other traits. This diversity is well represented in the bean gene bank maintained at CIAT for experimentation by researchers and farmers and for the benefit of consumers everywhere. The bank safeguards 26,500 samples of cultivated common beans and close to 1,500 samples of wild beans.

The second favorable circumstance was the increasing market orientation of bean production. This has given the small farmers who grow beans a powerful new incentive to adopt appropriate improved varieties as an inexpensive means of intensifying production.

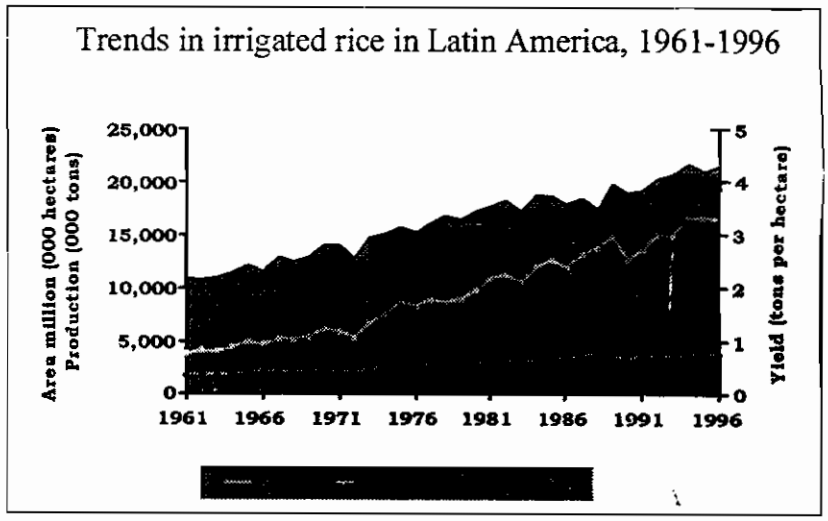
National programs have released about 180 new varieties originating from germplasm provided by CIAT and an undetermined number based on germplasm from other sources. Given the less commercial orientation of bean production, it is more difficult to monitor the spread of improved varieties than in rice. Even so, information provided by national programs suggests that the new seed is planted on at least 40 percent of Latin America's total bean-growing area. The rest is occupied by traditional landraces of the crop.

The record of impact in rice

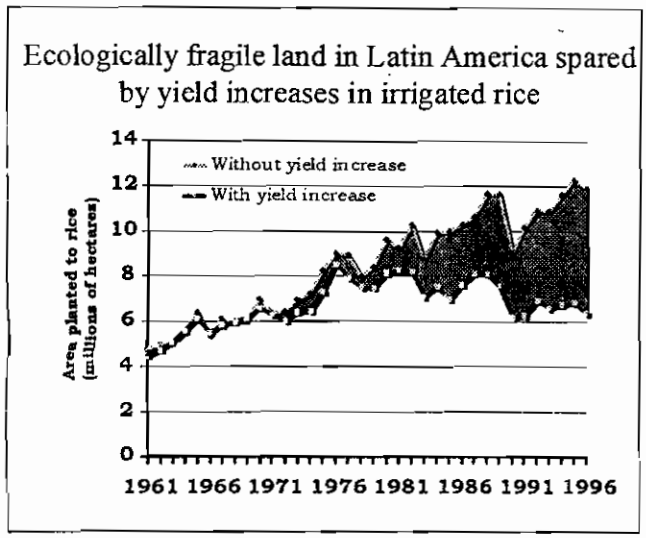
Mainly as a result of yield gains, total rice production doubled to 20.6 million tons.

To develop and deliver improved crop varieties and related technology in Latin America has required substantial amounts of public funds. These have been paid by national governments as well as by donor agencies in the industrialized world that support international agricultural research. Over the last decade, public funds have become exceedingly scarce, especially in the developing countries. It is thus vital that decision makers have the means to determine the payoffs for society from public investments in crop research, so they will have a firm quantitative basis for deciding how to allocate dwindling research budgets.

Toward that end CIAT has worked in recent years with various institutions to develop new crop databases and analytical methods. Under a project funded by the Inter-American Development Bank (IDB), for example, the Center has sought ways to anticipate the probable impacts of research investments as well as to document the impact already achieved. In this research CIAT has worked closely with many national programs as well as the International Food Policy Research Institute (IFPRI), which is headquartered in Washington, D.C., and the Inter-American Institute for Cooperation in Agriculture (IICA), based in San José, Costa Rica.



In the case of rice, IFPRI economists have applied an



"economic surplus model" to determine the stream of benefits to consumers and producers generated by the adoption of new technology from 1966 to 1995 in the various production environments. The outcomes of this and related analysis are summarized briefly below.

The modern semidwarf varieties developed and disseminated by CIAT, IRRI, and their national partners today account for 93 percent of all wetland rice production in Latin America; the figure is 98 percent for irrigated wetland rice. Altogether, the wetlands represent about 80 percent of the region's total output of the crop.

The new varieties and accompanying improvements in crop management increased the average rice yield in wetland areas from 3.3 tons per hectare in the mid-1960s to 4.6 tons (5.0 tons for irrigated rice) in 1995. Mainly as a result of the yield gains, total production doubled during that period to 20.6 million tons, making Latin America about 90 percent self-sufficient in rice. Meanwhile, the area planted to rice rose modestly, from 5.8 million hectares in the mid-1960s to 6.7 million in 1995.

Irrigated rice acted as a kind of safety valve, removing some of the pressure on ecologically fragile areas.

More efficient production of the crop on such a large scale has brought down its price by about 50 percent in real terms over the last three decades. As a consequence, consumers have been the main beneficiaries of technological change, receiving US$518 million per year since 1966. Price savings have been especially helpful to the poor (as defined by FAO), since they spend half of their total income on food and rice accounts for 15 percent of their total food purchases.

Despite lower prices, producers in irrigated areas have also captured large benefits, amounting to $437 million per year. However, these gains have been offset somewhat by losses in other production environments. Mechanized upland rice, for example, registered net annual losses of $70 million between 1966 and 1995. The losses in manual upland rice amounted to $5 million annually over the same period.

These were the result of falling rice prices—due to productivity gains in irrigated rice—combined with the inability of manual and mechanized upland rice growers to match the technical progress of their counterparts in irrigated environments. In other words rice production in irrigated areas simply proved more competitive than that in the uplands.

Bad news for upland rice producers meant good news for the environment. The discouraging economics of upland rice reduced growers' financial incentive to spread production further into the savannas and tropical forest margins. Irrigated rice thus acted as a kind of safety valve, removing some of the pressure on these ecologically fragile areas.

Were it not for the dramatic increase in yields of irrigated rice, Latin American farmers would have had to at least double the area planted in

order for production to reach its current annual level of 20.6 million tons. Most of the area expansion would have occurred in the savannas and forest margins, at a huge cost in terms of biodiversity loss, deforestation, and contamination of water from overuse of agrochemicals.

The record of impact in beans

Scientists have only recently been able to obtain sufficient reliable data on bean production to apply the economic surplus model, as was done for rice. As a result, similar data on the benefits flowing from investments in bean research are not yet available.

Overall trends—Even so, one cannot help but notice encouraging trends at the macro level, as evidenced by FAO statistics. Over the last decade or so, total bean production in Latin America has risen 25 percent—to 5.3 million tons in 1993-95 from 4.2 million tons in 1983-85. At the same time, total area has risen by only 2 percent—to 8.1 million hectares from 7.9 million—and the annual rate of growth in area has actually declined to -0.5 percent.

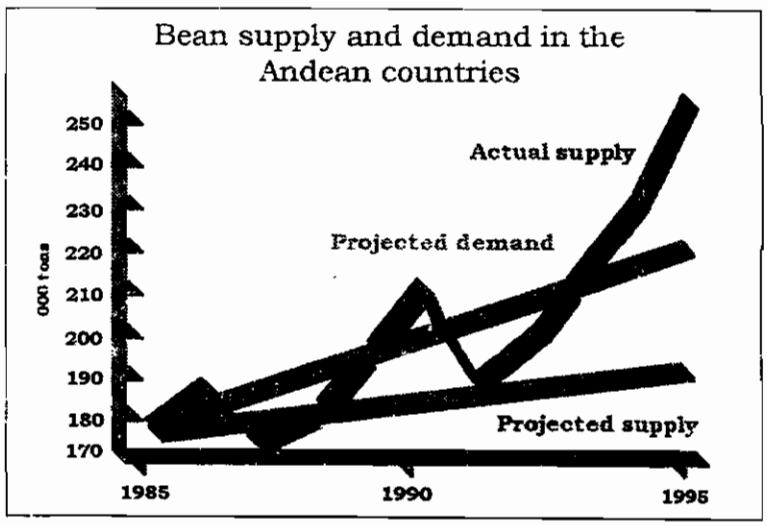
Increased production has thus resulted mainly from higher yields. The annual growth rate in yield is now at about 2.7 percent (compared to 1.9 percent a decade ago), and this is well above Latin America's average rate of growth in population (1.9 percent). With beans more readily available in the marketplace, per capita consumption has started to rise as well, and much evidence points to a continuing increase in the region's total demand for beans.

By 1995 bean production in these countries as a whole had risen sharply, apparently as a result of higher yields.

In some parts of Latin America, the changes have been even more dramatic than in the region as a whole. For example, in the Andean Mountain countries (Bolivia, Colombia, Ecuador, and Peru), bean production was essentially stagnant until the early 1990s. Rates of growth in yield and production lagged well behind population growth. The outlook for beans in the region was bleak, with trends in supply and demand pointing to large bean deficits by the year 2000. But by 1995 bean production in these countries as a whole had risen sharply, apparently as a result of higher yields.

Variety adoption studies—A growing body of evidence from field studies suggests that improved varieties have contributed importantly to yield increases. A literature database maintained on CIAT's web site contains abstracts of about 40 such studies. They have been designed mainly to determine the acceptability of new varieties to farmers and consumers and their impact on bean yields in farmers' fields.

For example, a 1990 survey carried out by CIAT economists in Peru's northern Cajamarca



department documented the success of the variety Gloriabamba, released 3 years earlier by Peruvian bean researchers. Despite the harsh growing conditions of this remote semiarid region, 65 percent of small farmers were growing the variety on about 35 percent of the total bean area, with an average yield increase of 27 percent. The additional production made possible by Gloriabamba was estimated at 3,038 tons per year, worth $1.5 million.

A 1996-97 study conducted by CIAT in Peru's Cusco department examined the adoption and impact of five new varieties that had been developed in the late 1980s through farmer participatory schemes. According to the study, 94 percent of farmers were growing the new varieties. Moreover, these constituted 52 percent of the total bean germplasm available and accounted for 64 percent of the total bean area. The study further determined that the combination of improved germplasm and higher plant densities boosted average yields by 110 percent from 1985 to 1996.

A growing body of evidence from field studies suggests that improved varieties have contributed importantly to yield increases.

The adoption studies have by no means been limited to the Andean countries. One of the earliest analyses was conducted in Costa Rica and published by the journal *Agricultural Administration and Extension* in 1986. This work cast doubt on the then conventional view that technical change generally bypasses small farmers in Latin America. The study documented widespread adoption of new bean varieties, together with a new and more profitable bean production system.

Similarly, a series of surveys conducted in the early 1990s by CIAT and several national organizations in Brazil found that improved varieties were being planted on 75 percent of the total bean production area in four states (Espírito Santo, Goias, Minas Gerais, and Rio de Janeiro). Their economic impact, through additional production, was estimated at $85 million annually.

Impact in the making—Many other positive developments are in evidence in the Andean region, and some of these will be the focus of future adoption studies.

Small farmers in Peru's barren coastal area, for example, are growing improved varieties of beans and other grain legumes for exports valued at $2 million annually. Unlike other crops cultivated in the area, such as rice and sugarcane, beans are ready for harvest in less than 3 months, and they can be grown in winter, when temperatures drop and water becomes scarce.

Adoption and yields of improved bean varieties in Peru

	Cajamarca	Cusco
Area planted in improved varieties (%)	50	65
Yield of traditional varieties (kg/ha)	264	460
Yield of improved varieties (Kg/ha)	711	840

In Bolivia's Eastern Plains, where bean production was not even a part of local agricultural tradition, the crop was introduced during the early 1980s for production in the winter. Previously, a lack of options during that period had forced farmers to seek temporary work elsewhere. But now many of them stay home to produce beans for export, mainly to Brazil, Colombia, and Japan. To increase returns from the enterprise, small farmers belonging to a bean production cooperative (whose membership consists of about 3,500 farm families) added an export arm to their organization, and it now earns $2 million annually. The

group has twice been recognized by the government for the high quality of its product and for its success in opening new markets.

In mountainous northern Ecuador, small farmers have made similar gains. Particularly in the province of Imbabura, many growers now derive much of their income from the production of beans for export to Colombia.

Maintaining the momentum

Cases like those (involving beans, rice, and other crops) need to be multiplied many times over if Latin America is to continue providing sufficient food at reasonable prices for its burgeoning urban population. Such gains are also essential for reducing rural poverty by raising the income farmers derive from the production and processing of crops and livestock products.

More effective efforts to meet the needs of both urban and rural people are vital for protecting the fragile economic and political gains of recent years and for reducing human pressure on Latin America's vast store of natural resources, especially its forests, biodiversity, and fresh water.

Not just any kind of agricultural investment will do the job, however. A narrow focus on commercial export crops, for example, or on crop diversification in areas where narcotics production and processing are prevalent would bypass the majority of the region's farmers.

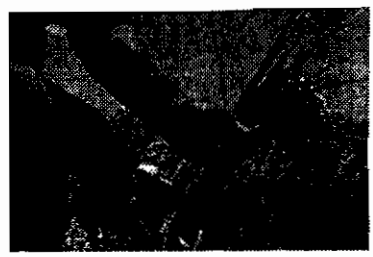
Investments in agricultural research and development must also be directed to crops that are important for large numbers of Latin American consumers and producers. To guarantee handsome returns from those investments, they should be aimed particularly at research on crops for which national and international institutions have already compiled an impressive record of achievement and impact.

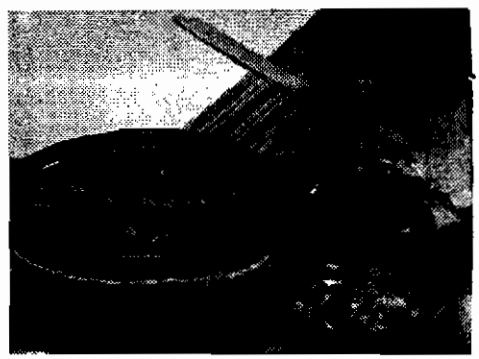
Based on the information presented in this report, rice and beans are clearly excellent candidates for the wise investor of public funds.

US interests in rice and bean research

Latin America's production of rice, beans, and other major crops is directly tied to its food security, economic well-being, conservation of natural resources, and social and political stability. A major failure on any of these fronts has large negative consequences for US citizens in the short and long term. That is the main reason why the country should invest more heavily in research for broad-based agricultural development in Latin America.

Another compelling reason is that the USA's own rice and bean producers and consumers benefit directly from the work of CIAT and its national partners. As collaborators in this work, US scientists gain better access to tropical germplasm bearing traits that are useful for rice and bean production in the temperate zone. They also glean new knowledge





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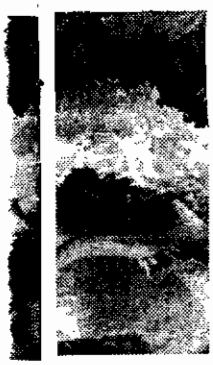

from state-of -the-art research that improves the efficiency of US crop breeding. Two examples of this collaboration are described below.

In the 1970s scientists in the USA became increasingly alarmed about the narrow genetic base of the country's major crops. Bean production, for example—which is spread over 17 states but mainly Colorado, Michigan, Nebraska, and North Dakota—depended heavily on germplasm whose prostrate growth habit made it susceptible to two major diseases, white mold and root rots. Over the years, US bean researchers, in cooperation with CIAT, have overcome those problems by introducing tropical germplasm with an upright plant type into their breeding programs.

In the early 1990s, an epidemic of rice blast—the single most important disease of the crop worldwide but not previously considered important in the USA—caused damage worth millions of dollars in Arkansas, Louisiana, and Texas. A few years earlier, researchers at Purdue University had established contact with CIAT researchers working on the disease in Colombia. The Center had compiled a wealth of data on the disease and developed with the Colombian national program a variety that shows durable blast resistance. Using molecular marker techniques, CIAT and Purdue scientists have developed quicker, more cost-effective ways to incorporate combinations of resistance genes into commercial varieties, with potential benefits for the USA and rice-producing countries around the world.

Various other projects under way at CIAT involve pioneering research that will enable national programs to generate new rounds of impact from rice and bean varieties superior to those now available. Cornell University is a key player in one such project. In it scientists are using molecular maps and markers to detect genes for higher yield in wild rice and then to transfer these into varieties of domesticated rice. This is one of the most promising approaches for breaking through the yield plateau evident in rice production worldwide.

A partnership of research investors

Given that rice and bean research in Latin America benefits both the region and its northern neighbors, what is a fair arrangement for providing public funds to support this work? Until quite recently, donor countries and organizations in the developed world bore virtually all the responsibility for funding international research on rice and beans. CIAT's work on these crops in Latin America has been generously supported over the years, mainly by the governments of the USA, Canada, Switzerland, and the UK. Meanwhile, national governments have covered most of the costs of local research programs.

In the case of beans, donor funds (especially from Switzerland) as well as national resources have been channeled into two regional research networks—one for Mexico, Central America, and the Caribbean and another for the Andean zone. The networks are voluntary associations of national agricultural research systems dedicated to strengthening local research capacity and to speeding the transfer of improved technology through regional cooperation.

The bad news for this research, as well as for the work on rice, is that donor support has declined in recent years for a number of reasons. Industrialized nations have slashed public spending and diverted resources to themes other than agriculture and to regions (such as sub-Saharan Africa) whose problems they consider more urgent than those of Latin America.

The good news is that, in the face of declining public support, new models for funding research on rice and beans have begun to emerge. An especially innovative approach is the Fund for Latin American and Caribbean Irrigated Rice (FLAR), which was established in 1995. It is a consortium of public research programs and private rice grower associations in 10 countries that have banded together to fund and influence international rice research. FLAR members are committed to the endeavor, because they have witnessed the impact of international rice research in their own countries and believe it will continue to yield good returns.

A similar logic has prompted a bean farmer association and two bean exporting firms in eastern Bolivia to join forces with a local research institute and university to share the costs of bean breeding and testing of new varieties.

In early August the Colombian government, through its Ministry of Agriculture and Rural Development, signed an agreement, under which it will contribute funds over the next 5 years to collaborative international research with CIAT on crop improvement and other tasks. This is quite an extraordinary financial commitment, given that the country is faced with grave economic problems and a costly guerrilla war.

Clearly, Colombia and other Latin American countries no longer expect donor countries to foot the whole bill for international agricultural research. But nor do they have sufficient funds from public and private sources to fully finance the international research agenda. That is why it is critical that the region continue to have investment partners in the USA and other donor countries who believe in the importance of research on Latin America's staple crops and who know that the region's economic well-being is inseparable from their own.

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