



For Nelson Maturi, a Kenyan farmer, the impact of agricultural research is very real: children in school.



impact of the cgiar:  
everybody's business

# impact of the cgiar

Impact is indeed everybody's business, and impact assessment is the business of the Science Council's Standing Panel on Impact Assessment (SPIA). The standing panel was formed to facilitate better assessment of impacts, raise awareness and promote accountability. For this special impact-focused Annual Report, the SPIA highlights some recent assessments. A detailed account of all CGIAR impact assessment reports is available through the Science Council website at [www.sciencecouncil.cgiar.org](http://www.sciencecouncil.cgiar.org).

## Benefits and Costs of the CGIAR

Since its founding in 1971, the CGIAR has invested approximately \$7.12 billion in research and research-related activities. It is reasonable to ask:

*Do the documented benefits from CGIAR research justify the total investment in the CGIAR so far?*

During 2003, the SPIA commissioned David Raitzer to analyze compiled estimates of large-scale benefits for selected activities for which the benefits are widely known and generally accepted, and to compare those with the total investment in the CGIAR to date.

Raitzer constructed five scenarios within which to assess cost-benefit ratios. Against an aggregate investment of \$7.12 billion (in 1990 US dollars, with \$6.90 billion invested in the CGIAR, in addition to relevant pre-CGIAR costs), all five scenarios produced cost-benefit ratios in substantial excess of one, indicating investment efficacy. Including only "significantly demonstrated" studies that empirically attribute CGIAR-derived contributions to collaborative efforts (an extremely conservative scenario) results in a ratio of 1:9; if all "significantly demonstrated" studies are considered, with assumed attributive coefficients applied, this ratio rises to 3:8. The "plausible" scenario results in a ratio of 4:8, which when extrapolated to the present rises to 9:0 and when extrapolated to 2011 rises to 17:3.

Thus for every dollar invested in the CGIAR, \$9 worth of additional benefits have been produced in the developing world, catalyzing substantial additional "multiplier effects" for poor producers and consumers in the process.

None of this could have been achieved without the investment in staff and resources by the national agricultural research programs.

## Impact on Poverty Reduction

During 2003, Michelle Adato and Ruth Meinzen-Dick of the International Food Policy Research Institute (IFPRI) assessed the impact of the research conducted by several CGIAR Centers.

A wide variety of direct impacts on adopting households were identified. Positive effects included increased production and knowledge, as well as empowerment of women. Negative effects included increased vulnerability, decreased soil fertility, and debt from fertilizer purchase. The research indicates that where technologies and their delivery are specifically designed to reach the poor, and especially women farmers, the poor are more likely to benefit. Significantly poor consumers, who typically spend more proportionately on basic commodities, benefit more from falling real food prices derived from the application of agricultural technologies than small farmers or other consumers.





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The study concludes that a very significant impact of CGIAR agricultural research on poverty is the indirect impact of productivity growth on reducing real food prices, which benefits both urban and rural poor.

### Positive Impact on Environment

The SPIA has recently commissioned assessments of the impact of application of the Green Revolution technologies. The conclusion from these studies is that, while some negative environmental impacts have been associated with the agricultural intensification process, there have also been some counterbalancing positive environmental impacts, particularly with respect to land savings. More intensive production and greater output per hectare means that less land has been required to produce a given output of food crops than would have been the case without CGIAR research.

The SPIA-commissioned study estimates that CGIAR research contributed to production increases that, given the 1960 productivity levels, amount to about 100-240 million hectares in land equivalent terms for developing countries alone; i.e., that much more land would have been needed to produce the output of today at 1960 productivity levels. CGIAR research has led to higher land productivity, thereby reducing pressure on forests, grasslands and the associated biodiversity.

### Impact of CGIAR's Crop Germplasm Improvement Research

Research by Robert E. Evenson and Douglas Gollin involving input from eight CGIAR Centers provides the most comprehensive documentation of the beneficial impacts of CGIAR crop genetic improve-

ment. The study covers the production, diffusion and impact of improved crop varieties for 11 important CGIAR-mandated food and feed crops in developing countries from 1960 through the late 1990s.

The study found that growth from varietal improvement has been realized in all crops, but at very different rates by region. By the end of the 1990s, all crops except beans were achieving high growth rates in productivity through varietal improvement. The average annual growth in productivity from crop germplasm improvement (CGI) research across all crops and regions between 1960 and 1998 was 0.72 percent, with the highest rates in Asia (0.88 percent). In Sub-Saharan Africa the annual productivity growth averaged 0.28 percent. The CGIAR contribution as a share of this total CGI annual growth was estimated to be between 40 percent and 45 percent, depending on the assumptions used about substitution effects and on the crop and the region.

The findings support the proposition that CGIAR investments in crop germplasm improvement have had positive impacts for all the study crops. These impacts have been substantial, partly because of higher leverage through IARC-NARS joint production, which underscores the importance of CGIAR-NARS partnerships. The placing of crop germplasm improvement at the core of CGIAR Center programs appears to have been well justified.

### NERICAs

Another recent example of the type of research that makes the CGIAR such a good investment is found in the new improved rice varieties.

Developed by the Africa Rice Center (WARDA) for specific adaptation to harsh growing conditions of upland rice ecologies of Africa, the New Rices for Africa (NERICAs) are spreading fast.

NERICAs provide multiple benefits, including higher yields (between 25 percent and 250 percent) and increased tolerance to droughts, pests and weeds. Developed less than 10 years ago, NERICAs are now planted on an estimated 23,000 hectares in West Africa alone and their use is spreading across central and eastern Africa. In a region where annual rice imports top \$1 billion, planting of higher-yielding NERICAs have helped Guinea save an estimated \$13 million in rice import bills. Research on NERICAs involved national agricultural research programs in 20 African countries and advanced research institutions in China, Japan, the United Kingdom and the United States. Dr. Monty Jones's pioneering research leading to the development of NERICAs has been internationally recognized.

### The Way Ahead

Accumulating evidence suggests that investments in the CGIAR are a sound strategy, but the process

of impact assessment continues. The Science Council is initiating impact assessment activities in natural resources management, policy and social science research, and a major assessment is underway to better understand the impacts of CGIAR training activities.

In all of its work, the CGIAR complements NARS activities and relies heavily on its NARS partners as well as those from the developed world to achieve impact. The CGIAR *modus operandi* is based on partnerships and recognizes the importance of long-term, close relationships with scientists in client countries where downstream research, adaptation and knowledge transfer activities take place. Indeed, the CGIAR finds that, as NARS advance, many of the research areas in which it has been involved can successfully be taken over by the NARS partners and their cadres of researchers. This opens opportunities for the CGIAR to move into new areas where different partnerships can be forged and significant new impacts generated.

Hans Gregersen  
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# boosting zero tillage in south asia with private-sector support



**“The rapid expansion of zero tillage was made possible by the adoption of specialized implements called ‘seed drills’... developed jointly by the Rice-Wheat Consortium, private companies, and public sector research organizations.”**

Public-private partnerships are necessary to bring the benefits of science to poor farmers. In an excellent example of public-private synergies, CGIAR researchers and partners joined hands with the business community to promote zero-till agriculture in South Asia's bread basket.

Through the efforts of the Rice-Wheat Consortium (RWC) for the Indo-Gangetic Plains and its many partners from the public and private sectors, farmers in South Asia have begun using practices that save water, fuel and other inputs and that allow them to diversify their cropping systems. The most prominent of these practices—zero tillage to sow wheat after rice—was used on nearly 1.3 million ha during the 2003-04 wheat season, a dramatic increase from only a few years ago, according to RWC estimates.

The rapid expansion of zero tillage was made possible by the adoption of specialized implements called “seed drills” for sowing directly into unplowed soil and crop stubble. This is where the private sector stepped in. The seed drills were developed jointly by the RWC, private companies, and public sector research organizations, both national and international. Over 20,000 seed drills have been manufactured and sold by more than 80 companies. Originally designed for wheat, the implements are increasingly used for a range of crops, including chickpea, lentil, maize, pigeonpea, rice and sorghum.

This tillage revolution is different from the Green Revolution in several ways. One major difference is that it depends greatly on resources and time invested by the private sector.

Such advances would not have occurred without the willingness of companies to invest time and resources in machinery development, to adapt

designs based on farmer and researcher feedback, to facilitate timely delivery of implements for farmer experimentation, to provide servicing and repair, and to rapidly increase production to meet demand while maintaining quality and competitive prices.

As with many good things, fruitful public-private sector partnerships take time to build. In the mid-1980s, CIMMYT introduced and promoted testing of inverted-T planters from New Zealand. As part of expanded research and development efforts in the early 1990s, several manufacturers in India and Pakistan supplied prototype seed drills for farmer experimentation. Testing and development continued throughout the decade, supported among other ways by study tours. In 2000, for example, the RWC organized a visit by 23 scientists, farmers and manufacturers from Bangladesh, China, India, Mexico, Nepal and Pakistan to areas where zero tillage had been widely adopted. A later visit to Australia by South Asian manufacturers allowed them to see how manufacturers there addressed the problem of sowing directly into large amounts of crop residues. The capacity and confidence of South Asia's companies have grown to encompass development of multicrop seed drills, implements for sowing in raised soil beds, animal-drawn zero tillage implements, and a range of other conservation agriculture equipment.

The project is an excellent example of a public-private partnership for the common good.

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