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# INTERNATIONAL AGRICULTURAL RESEARCH FOR FOOD SECURITY, POVERTY REDUCTION, AND THE ENVIRONMENT

## *What to Expect from Scaling Up CGIAR Investments and “Best Bet” Programs*

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**T**he recent food crisis, combined with the energy crisis and emerging climate change issues, threatens the livelihoods of millions of poor people as well as the economic, ecological, and political situation in many developing countries. On top of these crises, the decades of shrinking global investment in agricultural research are leading to slower growth in agricultural productivity. Progress in achieving development goals—such as cutting hunger and poverty in half by 2015—has been delayed significantly. In fact, the number of hungry people actually increased by at least 75 million from 2004 to 2007 and probably by even more in 2008. Investment potential in developing-country agriculture is improving, but realizing this potential requires policy action.



Addressing these challenges will require the world to develop a more productive and sustainable food and agricultural system. More and more experts and policymakers agree that investment in agriculture and in related, research-based innovations must be accelerated. The Consultative Group on International Agricultural Research (CGIAR) is particularly well positioned to contribute to the global effort to foster sustainable food production, increase access to food, and reduce poverty and hunger in rural and urban areas. Its 15 international research centers generate publicly available research on everything from dryland and tropical agriculture, to livestock, to agroforestry, to water management and fisheries. They have decades of experience in agricultural research and participate in a worldwide network of partnerships. The CGIAR is now redesigning its structure and organization to address these global challenges, but it also requires increased funding.

## MEASURING THE BENEFITS OF AGRICULTURAL RESEARCH

On behalf of the CGIAR, the International Food Policy Research Institute (IFPRI) considered the impact of doubling spending on agricultural research and development (R&D). Researchers found that increasing investments in public agricultural research from about US\$4.6 billion to US\$9.3 billion (including an increase in CGIAR investment from US\$0.5 to US\$1.0 billion) would significantly raise agricultural output and reduce poverty.

The exact numbers would depend on how investments were allocated. Targeting new resources toward maximizing total agricultural output, which would reduce global food price increases, would mean allocating more to East and Southeast Asia. This approach would raise agricultural output growth from 0.5 to 1.5 percentage points a year. Such an increase in agricultural growth is highly significant and would reduce the number of people living on less than US\$1 a day by 204 million by 2020. If, on the other hand, expanded investments were targeted toward maximizing poverty reduction, relatively more would need to be spent on Sub-Saharan Africa and South Asia. Overall agricultural growth would increase from 0.5 to 1.1 percentage points a year and lift about 282 million people out of poverty by 2020.

Greater agricultural research investments would also help avert future food crises by significantly reducing food prices. Researchers modeled the effects of high investments in agricultural R&D on food prices and found that such investments could reduce the price of maize by 67 percent in 2025, wheat by 56 percent, and rice by 45 percent, while also reducing farmers' unit costs of production.

## “BEST BETS” FOR CGIAR INVESTMENTS

How can agricultural research investments achieve these goals? Scientists and research leaders have produced an illustrative list of “best bets” for CGIAR investments in coming decades that would produce the greatest share of sustainable poverty reduction. This list is neither comprehensive nor complete but indicative. It shows key examples of promising investments and their likely impact, grouped according to the CGIAR's three strategic objectives, and they build upon the CGIAR's past contributions and successes in combating hunger and poverty through agricultural research.

### **FOOD FOR PEOPLE:** *Create and accelerate sustainable increases in productivity and production of healthy food by and for the poor*

Increasing agricultural productivity, not only to raise farmers' incomes but to ensure affordable food for growing urban populations, is one of the main tasks of the CGIAR and its partners. Achieving this goal is becoming more difficult in many areas where the land and water resource base is under pressure and where climatic fluctuations and pests or diseases threaten production. “Best bets” for CGIAR investments in this area focus on increasing the productivity of crop and livestock systems, reducing biotic and abiotic stress, and improving the nutritional quality of food.

- **Revitalizing yield growth in the intensive cereal systems of Asia**—In the 1990s the growth of cereal yields in Asia stalled, setting the stage for the higher food prices. Investments in improving and promoting agronomic practices such as improved seed handling, land leveling, water-saving technologies, reduced tillage, and postharvest processing can raise yields by 1 to 2 metric tons per hectare and significantly reduce postharvest losses. **Total investment: US\$150 million. People reached: more than 3 billion.**
- **Ensuring productive and resilient small-scale fisheries**—Small-scale fisheries provide two-thirds of the global fish catch and more than 95 percent of employment in fisheries. Sustaining and enhancing small-scale fisheries calls for investments in improving governance, processing and marketing procedures and technologies, quality control, and fishers' knowledge of business development. **Total investment: US\$73.5 million. People reached: 32 million.**
- **Controlling wheat rust**—An estimated 90–95 percent of global wheat area is susceptible to a new stem-rust (or its variants) that has emerged in the past decade. Combating the infestation requires monitoring its spread for early warning and potential chemical interventions, screening released varieties and germplasm for resistance, distributing sources of resistance worldwide,

and breeding to incorporate diverse resistance genes into high-yielding adapted cultivars and new germplasm to reduce potential losses. **Total investment: US\$37.5 million. People reached: 2.88 billion.**

- **Developing and disseminating a vaccine for prevention of East Coast Fever in cattle**—In many African countries, East Coast Fever is the most economically devastating cattle disease, leading to losses that exceed US\$200 million annually. A successful vaccine could increase milk yields and meat production while also generating environmental benefits by eliminating chemicals used in combating the disease. **Total investment: US\$10.5 million. People reached: 20 million, with additional indirect effects on many more.**
- **Developing and disseminating drought-tolerant maize in Africa**—In many parts of Africa, recurrent droughts limit maize production. Although drought-tolerant maize cultivars have been shown to raise yields dramatically, more research and vigorous promotion are essential to further improve yields and ensure widespread adoption of drought-tolerant cultivars. Many countries also require the establishment of effective seed systems. **Total investment: US\$100 million in 20 countries. People reached: 320 million, with additional indirect effects on many more.**
- **Scaling up biofortification**—An estimated 2 billion people in the developing world suffer from mineral and vitamin deficiencies, which lower disease resistance, increase mortality, compromise cognitive development, stunt growth, and lower work productivity. The HarvestPlus Challenge Program seeks to develop and distribute varieties of food staples that are high in iron, zinc, and provitamin A. **Total investment: US\$125 million. People reached: up to 672 million.**

**ENVIRONMENT FOR PEOPLE:** *Conserve, enhance, and sustainably use natural resources and biodiversity to improve the livelihoods of the poor and respond to climate change*

Natural resource management practices can reduce agricultural production costs and the use of inputs such as fertilizers and irrigation. With rising fertilizer and energy prices, these savings are especially important for the poor. Research on neglected and underutilized species can broaden the food base. “Best bets” for CGIAR investments in this area are focused on mitigating climate change, increasing the resilience of agro-ecosystems (including climate change adaptation), and increasing the efficiency of water use, which is particularly important for North Africa and West and Central Asia, for instance.

- **Increasing carbon sequestration and the livelihoods of forest people**—Negotiations toward

a post-2012 climate governance regime have brought reduced emissions from deforestation and degradation to the center of the international agenda. Research is required, however, to produce standardized, widely accepted, credible, and scientifically sound methodologies to measure and monitor reduced emissions from deforestation and other land-use change. **Total investment: US\$45 million. People reached: 48 million people in poor, forest-dependent communities.**

- **Conducting climate change and adaptation research**—Research on climate change and adaptation is needed at global, regional, and national scales, examining agricultural production as well as forest systems. More information is required, for example, on potential climate change effects by region to identify the sectors most at risk and to develop gender-equitable agricultural adaptation and mitigation strategies. **Total investment: US\$127.5 million. People reached: 1.18 billion.**
- **Combining organic and inorganic nutrients for increased crop productivity**—Combining organic nutrients with small doses of mineral fertilizer gives the highest yields and financial returns on maize and other cereal crops across a range of African sites. More work is needed, however, to identify the best-bet combinations for different ecological conditions and to ensure that smallholders and women farmers can obtain fertilizer. **Total investment: US\$55 million. People reached: 400 million.**
- **Promoting sustainable groundwater use in agriculture**—Groundwater resources offer high productivity gains and some protection against climatic fluctuations. Hydrogeologic and economic analysis is needed to allow decisionmakers to sustainably develop groundwater in Sub-Saharan Africa and to mitigate the impacts of overuse in South, East, and West Asia and North Africa. **Total investment: US\$24 million. People reached: 261 million.**

**INNOVATION FOR PEOPLE:** *Mobilize science and technology to stimulate institutional innovation and enabling policies for pro-poor agricultural growth and gender equity*

Accelerating innovation and translating agricultural production into food, nutrition, and livelihood security for the poor require the right institutions and policies. “Best bets” in this area focus on genetic resource management, strengthening markets, ensuring women’s participation in agriculture, and understanding the links between agriculture and health.

- **Enhancing germplasm exchange**—Because of restrictive rules and technologies that prevent the reproduction of seeds, farmers’ ability to use plant

genetic resources for food and agriculture to improve agricultural production and enhance food security has been limited. Through the CGIAR Systemwide Genetic Resources Programme, CGIAR crop centers collaborate in implementing an international treaty that creates a common pool of plant genetic resources for food and agriculture, which is made freely available to all parties to the treaty for research and breeding. **Total investment: US\$15 million. People reached: global impact, with a focus in developing countries.**

- **Improving market information and value chains**—Value chains involve a complex network of assemblers, brokers, wholesalers, processors, retailers, and exporters, all working within an environment of imperfect information. New information and communication technologies can help reduce the costs of linking buyers and sellers within the value chain, and improved market information systems can reduce agricultural marketing margins and price volatility and increase farm prices and marketed volumes. **Total cost: US\$10.5 million. People reached: 45 million.**
- **Ensuring women's full participation in agricultural innovation**—Women play a critical role in agriculture, and the food and income under their control are vital in meeting the basic needs of their families, but various barriers have prevented women from fully participating in highly productive agriculture. The CGIAR is working to ensure that women have secure access to land and other assets they need for agriculture, that agricultural research addresses women's needs, that women are included in extension and innovation systems, and that they have access to postharvest processing and markets. **Total cost: US\$30 million. People reached: 200 million.**

- **Reducing the adverse effects of agriculture on health and improving the health benefits of agriculture for the poor**—The CGIAR plays a leadership role in clarifying links between agriculture and health. Research in this area seeks to mitigate the negative effects of ill health on agricultural activities while maximizing opportunities for agriculture to benefit health and for better health to benefit agriculture. Research priorities include HIV/AIDS and agriculture; avian influenza, livelihoods, and food security; agriculture, nutrition, diet, and health; and food safety and growing food-supply chains. **Total cost: US\$75 million. People reached: global.**

## UNLEASHING THE POTENTIAL

The CGIAR has identified a strong set of research programs that could benefit billions of people, but progress is constrained by a lack of funds. The CGIAR's "best bets" are only partially funded, and the centers' heavy reliance on project-related funding reduces the efficiency of implementation because of a lack of continuity and staffing. With doubled funding, the centers could fully implement these and other "best bets" as well as the needed core activities of germplasm storage, maintenance breeding, and other essential support programs. They could also take advantage of expanding frontiers in agricultural science and policy, such as biotechnology, information systems, and nanotechnology. The investments required are large by the standards of agricultural research but small compared with other general development investments. They are enormous, however, in terms of the number of people reached and the returns to investment—improved well-being for billions of people.

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**CGIAR Centers:** Africa Rice Center (WARDA), Bioversity International, CIAT (Centro Internacional de Agricultura Tropical), CIFOR (Center for International Forestry Research), CIMMYT (Centro Internacional de Mejoramiento de Maiz y Trigo), CIP (Centro Internacional de la Papa), ICARDA (International Center for Agricultural Research in the Dry Areas), ICRISAT (International Crops Research Institute for the Semi-Arid Tropics), IFPRI (International Food Policy Research Institute), IITA (International Institute of Tropical Agriculture), ILRI (International Livestock Research Institute), IRRI (International Rice Research Institute), IWMI (International Water Management Institute), World Agroforestry Centre (ICRAF), and WorldFish Center.

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