

# Changing Agricultural Research in a Changing World

A Strategy and Results  
Framework for the  
Reformed CGIAR

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# Key points

- Agriculture in the developing world faces unprecedented challenges. Rising and volatile food prices, coupled with increasing pressure on natural resources, have emerged as severe threats to the world's poor and hungry. Climate change and variability will exacerbate these threats in the coming decades.

- At the same time, rapid advances in science and technology, combined with a better understanding of small-scale producers' needs, offer unprecedented opportunities.

- The context of the CGIAR's research is changing. National agricultural research organizations in some developing countries have become significant international players. The private sector is playing a greater role.

- To overcome the challenges and exploit the opportunities, the Consultative Group on International Agricultural Research (CGIAR) has undertaken a reform process.

- The new CGIAR Strategy and Results Framework defines four system-level outcomes – reduction in poverty, increased global food security, improvement of nutrition and better management of natural resources – that will shape the CGIAR's research in the coming years, and will in turn be measurably improved by that research.

- CGIAR Research Programs will be the main organizational mechanism for planning and conducting research and will be built on three core principles: impact on the four system-level outcomes; integration across CGIAR core competencies; and appropriate partnerships at the different stages of R&D. CGIAR research will reflect the important role of women in agriculture.

- The proposed portfolio includes 15 CGIAR Research Programs that will require a system-wide budget of US\$790 million for the first year (2011), with an annual increase of around US\$100 million for the next three years.



# Agriculture in the 21st century: challenged as never before

**The CGIAR will redouble its efforts to orient research and to change farming practices and systems in a way that better recognizes the essential role women play in improving productivity and livelihoods. Photo CGIAR**

The recent food and financial crises suggest a grim future for food and nutrition security in developing countries. In 2007–2008, the prices of nearly every agricultural commodity rose sharply. Staples such as rice, on which around half the world's population depends, more than doubled in price in the space of a few months. Although prices receded in late 2008, they stabilized above pre-spike levels and in 2010–2011 began to climb again. As recent experience has shown, high, volatile food prices can inflict extensive misery, spark civil unrest and destabilize governments – often for long periods. Unless immediate action is taken by planners, policymakers and researchers, increased volatility and risk, along with their attendant problems, will remain lasting features of the world food system.

Poor people spend 50–70 percent of their income on food. Because wages for unskilled labor tend to lag behind food inflation, the

poor have little capacity to adapt as prices rise. Moreover, even before the recent food crisis, the poorest of the poor were being left behind. Programs are needed to address production and productivity through policy and institutional innovations, improved markets and value chains, and better technology for small-scale producers.

The natural resources on which agriculture depends are already under very severe stress. Global economic and population growth have combined to increase the demand for water, arable land and forest products, including fuelwood and timber. Urbanization intensifies these problems, as it drives up the effective demand for food while consuming agricultural land and increasing the competition for water. Deforestation and land use change are already undermining the provision of environmental goods and services, reducing the resilience of ecosystems and incurring the loss of potentially



useful biodiversity. Loss of genetic diversity threatens to undermine future efforts to improve crops, trees, livestock and fish. Climate variability and change will further threaten agriculture by increasing the risk of droughts and floods, affecting temperatures and crop growing seasons, altering the distribution of pests and diseases, and triggering rises in sea level as well as changes in the ability of the oceans to support life. Many of the world's fisheries are near collapse.

It is no exaggeration to say that large segments of the global population are now threatened by the depletion or degradation of natural resources. In sub-Saharan Africa, food insecurity persists and is even worsening in some countries, where it is strongly linked with unproductive rainfed agriculture, declining soil fertility, lack of investment and poorly integrated markets. Despite several decades of increasing productivity in South Asia, yields have now reached a plateau or begun declining, accompanied by serious soil degradation problems and increasing shortages of water. The same is true of parts of Latin America, where degradation associated with deforestation is also a serious problem. The dry areas of North

Africa and South, West and Central Asia confront serious water scarcity, which is likely to be exacerbated by climate change. In almost all regions, competition for access to productive resources has been recognized as an increasing source of conflict, actual or potential.

To combat these problems, better adaptation of crops and livestock to drought, heat and other stresses is needed, but this alone will not suffice. Broader changes in land management also need to be promoted: new policies and institutions must be put in place that recognize the importance of forests and agro-forests in maintaining biodiversity, minimizing soil erosion and soil fertility decline, and protecting water quality and supply; new techniques for cultivating cropland in ways that conserve soil and water resources must be more widely disseminated; and production systems will need further diversification to enhance food security and create alternative livelihoods, especially in the drylands. In addition, to secure impact, research must consider all stages 'from farm to fork', encompassing food systems as a whole rather than just agricultural systems.



**Water scarcity or inability to access water hinder millions of farmers throughout the developing world. Agriculture that uses water efficiently will help solve these problems. Photo IRRI**

# A new era of opportunity for agricultural research

**A**dvances in bioscience and ecology, coupled with progress in the development and application of information and communication technologies (ICTs), are transforming both the processes and products of agricultural research. And the influence of these changes goes beyond the lab and the field, affecting innovation systems as well as agricultural technology development. The last decade has seen huge gains in our knowledge of how plants and animals grow and synthesize useful products, and in our ability to use this information. Genome sequences of major crop species are now available or close to completion, while functional genomics is providing critical information on the role of genes and their products. Genetic markers are enabling scientists to detect previously hidden genetic variability, and genetic engineering is expanding the ways in which microorganisms, plants and animals can be used for human and environmental benefit.

By priming the efficiency and effectiveness of the research process, these advances are enabling researchers to improve plant breeding methods, construct safer and more effective pest control strategies, and develop plants with improved agronomic traits and nutritional characteristics. They provide the basis for breaking through present yield barriers, allowing the delivery of important social, economic and environmental benefits. While progress in applying these advances to the productivity of livestock and fish is slower than it is for plants, impressive gains in knowledge have been made here too.

Just as biology is shifting the perceptions as to what is possible, so ICTs are scaling up those possibilities by dramatically boosting the capacity to access and use new knowledge. More and more rural people are connecting to the internet, using it to gain market information, understand the threats posed by weather, pests



**By harnessing advances in bioscience and ecology, the CGIAR's research will help farmers produce more from less. Photo Neil Palmer, CIAT**

and diseases, and enhance their access to and use of technology. Ever-greater quantities of data can be manipulated on ever-increasing scales. Researchers are just one of many groups benefiting from ICTs, which are redefining the strategies for communicating – and thus innovating – worldwide.

On the ecological front, such approaches as integrated pest management and conservation agriculture are increasingly being adopted by farmers, as much for economic as for environmental reasons. Moving beyond an individual farm perspective to the landscape level is allowing researchers and farmers to further their understanding of how living organisms and their surroundings interact with each other. This is in turn fostering a more productive, environmentally benign agriculture that conserves or even enhances biodiversity.

These and other advances open up previously denied territories, increasing the efficiency and efficacy of research and empowering rural populations to use the results of research. They are not enough by themselves, however; they must be harnessed by relevant institutions and promoted through a conducive policy environment if the opportunities they provide are to be fully exploited.

Two further factors enhance the opportunities for agricultural research over the next decade. The first is the so-called rehabilitation of agriculture – the growing realization of its importance not only for future food supplies but also for sustainable development. This is a welcome change, following two decades of neglect. The second is the change in the nature of aid in recent years: it has increased in amount, is available from more sources, and is better coordinated and aligned with pro-poor development objectives. At the same time, donors demand more accountability and impact than ever before.

## A CHANGING INSTITUTIONAL LANDSCAPE

While research capacities are still weak in much of the developing world, in some of the larger countries, especially Brazil, China and India, national research systems are becoming significant international players. At the same time, regional and subregional organizations have emerged as a source of support for national efforts. Private-sector research is playing a growing role, and although its reach in low-income countries is still very restricted, its potential is considerable. In addition, a number of universities and research institutions in developed countries have expanded their work in areas relevant to developing countries. These changes, which have long been in the making, compel the CGIAR to reach out to these new partners, devolving responsibility to them so as concentrate more intensively on the things it does best.

**A broader view: adopting a landscape perspective is improving our understanding of how ecosystems work. Photo CGIAR**



# How did we get to where we are now?

The CGIAR was founded in 1971 by a coalition of donors, including the Ford and Rockefeller Foundations, who were already supporting a network of researchers at several international and national agricultural research organizations. Early success – particularly the development of high-yielding varieties of rice and wheat – spurred what became known as the Green Revolution. At that time, the main focus was plant breeding, the aim being to meet the imperative to increase food production if mass starvation was to be avoided.

The success of the initial research effort, together with growing awareness of the complexity of the R&D challenge, spawned new centers devoted to other commodities, specific ecoregions, specific resources, food policy, and research organization and management. The centers continued to focus on food security, but there was also increasing emphasis on poverty and on natural resources issues, especially sustainability. Partnerships expanded beyond national breeding programs to involve a broadening range of other kinds of organization, including advanced research institutions in developed countries, non-government organizations (NGOs), policy bodies, universities and private-sector companies.

Demands for evidence of the impact of research investments led to a further expansion of the mandate during the 1990s. Many centers took on impact assessment in addition to research on natural resource management and the livelihood strategies of poor households. Novel approaches to poverty alleviation and the sustainable use of natural resources emerged as key themes. However, aid for agricultural

research declined during this period, forcing the centers to address broadening portfolios with fewer resources. Special project funding began to replace, rather than merely supplement, ever-shrinking levels of core funding.

Although the CGIAR continued to perform world-leading research during this period, the decline in funding triggered a loss of cohesion. Fragmentation diluted the impact of research, while the continuing duplication of activities across certain centers led to competition for resources and attracted mounting criticism from donors. The centers struggled to capitalize on the growing role of the private sector, the potential for stronger national agricultural research organizations to shoulder more responsibility, and the increasingly vocal demands of NGOs and civil society organizations.

These pressures led the CGIAR to experiment with a more systemic approach to research and a heightened emphasis on development outcomes. The system first launched system-wide and ecoregional programs, designed to create synergy among centre activities and to free research from the limitations of a commodity focus. These innovations were followed by the Challenge Program initiative, which aimed to address complex issues of global and regional significance by further integrating capacities across centers and diversifying partnerships. These new approaches produced improvements in some areas, but were often seen as parallel structures that competed with the centers rather than enhancing overall system efficiency.

Recognizing that, without fundamental change, it risked contraction or even obsolescence, the CGIAR system undertook a comprehensive review of its structure and activities in 2008. This identified the proliferation of CGIAR entities and programs, the dispersal of research focus and the complexity of decision making as severe impediments to effectiveness. A far-reaching reform process was set in motion, leading to complete reorganization and a new set of programs, described in the Strategy and Results Framework (SRF).

**No longer top-heavy: the new CGIAR has a lighter structure and its research is more firmly anchored in poor farmers' needs. Photo ICRISAT**



## A LEANER, MORE EFFICIENT CGIAR

The new CGIAR is more efficient, more accountable and more open to effective collaboration with other organizations.

In replacing the Alliance of CGIAR Centers, the Consortium binds together the work of the 15 centers and provides a single contact point for donors. The Consortium Board leads the refinement of the SRF as it evolves to meet changing needs, and works with CGIAR Fund donors, research partners, farmers and other stakeholders through ongoing consultation and the biennial Global Conference on Agricultural Research for Development. The Consortium is governed by a 10-member board, which oversees the performance of CGIAR Research Programs (CRPs) and centers according to funding and performance agreements.

The CGIAR Fund, a new multi-donor funding mechanism, will finance the research guided by the SRF. The Fund Council, a representative body of the fund donors and other stakeholders, allocates resources to the CRPs and centers, and manages relationships with donors. It is also responsible for setting criteria, standards and processes for funding CRPs. The council comprises eight representatives from developed countries, eight from developing countries and regional organizations, and six from multilateral and global organizations and foundations. It meets twice a year to make decisions on behalf of all fund donors, who may participate in meetings as observers.

Fund donors include any country or organization (e.g. foundations, multinational agencies and NGOs) that provides funding to support CGIAR programs and activities and the functioning of CGIAR bodies and centers. The minimum contribution required to be eligible for representation on the Fund Council is US\$500,000. The World Bank serves as trustee for the fund. The Funders Forum, a biennial gathering of all donors, will set the CGIAR's strategic direction.

The Fund Council also appoints the Independent Science and Partnership Council (ISPC), a panel of leading scientific experts, who provide independent advice and expertise to CGIAR donors. The ISPC serves as an intellectual bridge between the Fund and the Consortium, ensuring that CGIAR research is in line with the SRF.



# How has the CGIAR's research changed?

The starting point, in identifying the CGIAR's research agenda, is the system's vision, redefined as:

***To reduce poverty and hunger, improve human health and nutrition, and enhance ecosystem resilience through high-quality international agricultural research, partnership and leadership.***

In pursuing this vision, the new CGIAR will work towards four strategic **system-level outcomes**:

- *Reduced rural poverty.* It has long been known that growth in agriculture, achieved through improved productivity and better developed markets, reduces poverty, especially in the initial stages of development.
- *Improved food security.* Millions of poor people in both urban and rural communities struggle to afford food, especially during global price spikes. Solving this problem requires an increase in global and regional supplies of key staples that will buffer price rises and volatility.
- *Improved nutrition and health.* Poor people, particularly women and children, often suffer from a lack of micronutrients in their diets. The resulting malnutrition affects their health and development. This can be tackled by diversifying production systems and developing improved crop varieties.
- *Sustainably managed natural resources.* This outcome is essential for both food production and the provision of ecosystem services to the poor, particularly in light of climate change.

The CGIAR already has a wealth of knowledge and experience in key areas that can contribute to these outcomes. These 'core competencies' are a further factor guiding the formulation of the system's future research agenda. Special strengths include research to increase the production of crop and animal commodities important to the poor, research on natural resource management, including the conservation and improved use of water, soils and forests, and social science and policy research that benefits the poor by increasing their access to agricultural resources, food and markets.



**Combating climate change and variability: the development of 'climate-ready' crop varieties will be a major focus of the new CGIAR's research. Photo IRRI**

Likewise, to enhance its impact on the system-level outcomes, the CGIAR will need to build its capacity in a number of areas that have not been well developed in the past. These include the design of improved production systems that integrate the outputs of commodity, natural resource management and policy research, the study of the impact of climate change on agriculture, and the development of agricultural technologies that improve nutrition and health, particularly among women and children.

The new CGIAR will organize its research in multi-center initiatives known as CGIAR Research Programs or CRPs. To be eligible for funding, the CRPs must meet three criteria or core principles: they must demonstrate a strategic approach to achieving impact on one or more of the four system-level outcomes; they must integrate research across CGIAR core competencies and centers; and they must engage with stakeholders and develop effective partnerships throughout the R&D process. Challenge Programs and system-wide initiatives not completed by 2011 will be absorbed by the new CRPs.

The CGIAR Consortium Board is responsible for approving the CRP portfolio and submitting it to the CGIAR Fund Council. The Board's roles are to ensure that: individual CRPs are aligned with the SRF and meet the above criteria; the CRPs complement each other, avoid overlaps and exploit participating centers' core competencies; and milestones and outputs, which will be specified in a performance contract signed by the centers and the Board, are delivered within the agreed time and budget.

The Consortium Board's decision to adopt CRPs as the primary instrument for CGIAR research signals three fundamental changes in the way the system's research is planned, approved and implemented:

- First, the CGIAR will function as a single institution, with its centers collaborating in pursuit of shared goals and objectives. In other words, for the first time since foundation, the centers now have a common strategy to guide their research.
- The second change is the adoption of an agricultural-research-for-development approach throughout the system's research. This means that all research priorities and activities will be guided by their potential contributions to the four system-wide outcomes. Previously, individual centers were responsible for impact – arising essentially from the research outputs developed in response to each center's mandate. Under the new model, the CGIAR system as a whole will be responsible for impact.
- Finally, by structuring their research activities into CRPs, the centers and their partners will integrate their work into large and ambitious programs driven by their potential impact on development. The fragmentation and loss of focus that characterized some of the centers' research from the 1990s onwards will become a thing of the past.

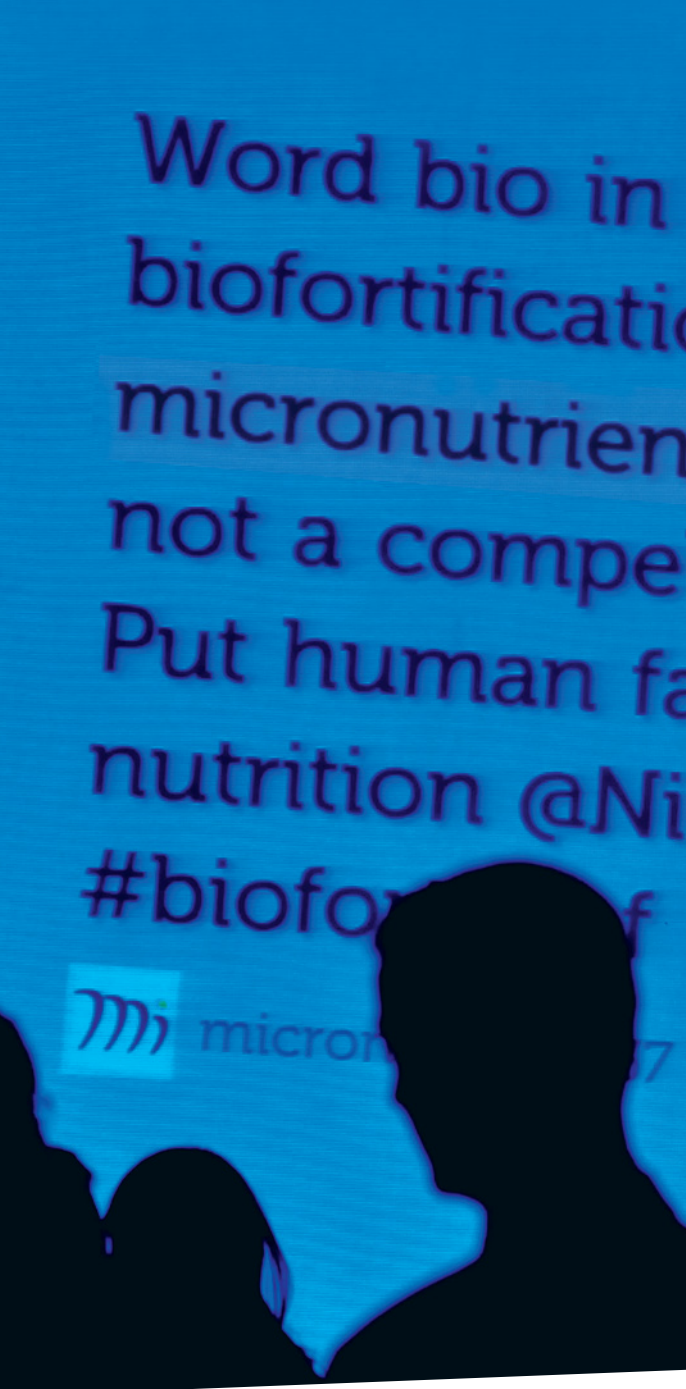
CRPs organized around development objectives start from the development outcome and work backwards up the impact pathway to identify their starting points. This contrasts with the old approach, in which research outputs were produced in response to particular mandates and speculative impact pathways that might (or might not) contribute to development outcomes were then identified.

# What are the new CGIAR research programs?

The table below lists the 15 CRPs proposed by the CGIAR centers in collaboration with their partners. The proposals are at various stages of completion, with some yet to be considered for approval. If approved, all remaining CRPs are likely to begin by early 2012.

## PROPOSED CGIAR RESEARCH PROGRAMS

Title	Lead Center
Integrated agricultural production systems for the poor and vulnerable in dry areas	International Center for Agricultural Research in the Dry Areas (ICARDA)
Integrated systems for the humid tropics	International Institute of Tropical Agriculture (IITA)
Harnessing the development potential of aquatic agricultural systems for the poor and vulnerable	WorldFish Center
Policies, institutions and markets to strengthen food security and incomes for the rural poor	International Food Policy Research Institute (IFPRI)
Wheat – Global alliance for improving food security and the livelihoods of the resource-poor in the developing world	International Maize and Wheat Improvement Center (CIMMYT)
Maize – Global alliance for improving food security and the livelihoods of the resource-poor in the developing world	CIMMYT
GRiSP – a global rice science partnership	International Rice Research Institute (IRRI)
Roots, tubers and bananas for food security and income	International Potato Center (CIP)
Grain Legumes – enhanced food and feed security, nutritional balance, economic growth and soil health for smallholder farmers	International Crops Research Institute for the Semi-Arid Tropics (ICRISAT)
Dryland cereals: food security, better health and economic growth for the world's most vulnerable poor.	ICRISAT
More meat, milk and fish by and for the poor	International Livestock Research Institute (ILRI)
Agriculture for improved nutrition and health	IFPRI
Water, land and ecosystems	International Water Management Institute (IWMI)
Forests, trees and agroforestry	Center for International Forestry Research (CIFOR)
Climate change, agriculture and food security	International Center for Tropical Agriculture (CIAT)



**New partnerships will ensure research outputs are translated into development outcomes. Photo Neil Palmer, CIAT**

## Ensuring the CGIAR gets it right

The impact of research conducted by the new CGIAR will be assessed through a comprehensive monitoring and evaluation framework. All those involved in CGIAR research, from funders to the centers and their scientists, are accountable to the people who use that research. Together with external partners, they share the responsibility for ensuring that research outputs are adopted and, ultimately, achieve development outcomes.

The new framework aims to streamline the review process, clarify core responsibilities and reduce duplication. It is structured to provide evidence and analysis of the relevance, scientific value, efficiency and effectiveness of CRPs and centers.

### MAKING THE MOST OUT OF PARTNERSHIPS

The new CGIAR will foster partnerships that are more effective than ever before, with a wider range of organizations than ever before. Moreover, partners will be engaged not only in research but also at subsequent stages of the R&D process, to ensure that program results generate the impact intended. To do this, CGIAR centers will need to reach beyond traditional research partnerships and involve new partners, from the research design stage all the way through to impact in the real world.

From the outset, each CRP will define clear partnership roles and capacity strengthening strategies for each stage of the program, from initial research through to dissemination and scaling up. At the research end of the R&D spectrum, external scientific partners will include strong national agricultural organizations, along with advanced research institutions that will bring expertise not available within the CGIAR. Generating and testing research outcomes may involve these partners, as well as other national research institutions and regional R&D agencies. When research outputs are ready to be scaled up, NGOs, civil society organizations and development agencies will come on board. There will be opportunities to partner with private-sector organizations throughout the process.

# What do these changes mean for the CGIAR's donors?

**W**ith a more coherent program shaped by the SRF, the CGIAR will be better positioned to meet current and future research and development challenges. Rising to these challenges will require a sizeable increase in funding, and the SRF shows how additional resources would be channeled to maximize the returns to investment.

Investment in agricultural research must increase substantially if this research is to have the desired impact on poverty and hunger. To achieve a food-secure world by 2025, an annual increase in agricultural productivity of 0.5 percent across all regions until that year is required. According to estimates made by the International Food Policy Research Institute, this equates to a massive expansion of investment – from US\$5.1 billion per year today to US\$16.4 billion per year by 2025. This increase includes investment in national as well as international public-sector research.

Investment in international public goods research is currently about 10 percent of total public R&D spending (slightly over US\$500 million in 2009). Making the conservative assumption that this will at least be held constant, and extrapolating it to 2025, a CGIAR budget of around US\$1.6 billion (10 percent of US\$16.4 billion) by 2025 is required if the system is to make an appropriate contribution to food security and poverty reduction by that year.

The budget request implied by the existing portfolio of 15 CRPs is around US\$790 million for the first year (2011), with an annual increase of around US\$100 million for the first three years. Similar annual increases to the year 2025 would produce a figure comparable to, though slightly higher than, the estimated minimum required.

**Just as water is essential for productive agriculture, so funding is essential for productive agricultural research. Turning off the tap would spell disaster. Photo Neil Palmer, CIAT**



# What do these changes mean for the CGIAR's beneficiaries?

**M**ore than a decade ago the UN Millennium Development Goals (MDGs) confirmed the global community's commitment to improving the living conditions of the poor and hungry. Since then there have been repeated commitments to eradicating global poverty and hunger, most recently in response to the food crisis of 2007–2008. In 2008, the UN assembled a High-Level Task Force on the Global Food Crisis, which developed a Comprehensive Framework for Action that represents the consensus view of the UN system on how to respond to the food crisis. Promotion of smallholder food production plays an important role in this framework.

The Group of Eight (G8) along with other countries issued a statement in July 2009 to the effect that “there is an urgent need for decisive action to free humankind from hunger and poverty ... We therefore agree to act with the scale and urgency needed to achieve sustainable global food security. To this end, we will partner with vulnerable countries and regions to help them develop and implement their own food security strategies, and together substantially increase sustained commitments of financial and technical assistance to invest in those strategies.” This statement, which specifically supports reform of the CGIAR, was later affirmed by the Group of Twenty (G20) and signed by 36 nations and UN agencies.

Can the CGIAR's beneficiaries expect these fine words to make a real difference? If poverty and hunger are indeed to be eradicated, substantial investments must be made in agricultural research and innovation as well as in agricultural development. The SRF reflects the opportunities that agriculture presents

for pro-poor economic development and the contribution that a well-functioning food and ecological system can make to human wellbeing and security. Improved agriculture and natural resource management have crucial roles to play in achieving not only the most obvious MDG of halving hunger and poverty (MDG1), but also most of the others, including achieving greater environmental sustainability (MDG7), improving access to water (MDG7c), overcoming land degradation (MDG7a), promoting gender equality (MDG3), reducing child mortality (MDG4), and improving maternal health (MDG5).

Women, who are responsible for around half of all agricultural production, must receive particular attention if the MDGs, as well as the CGIAR's development challenges, are to be met. The CGIAR will redouble its efforts to orient research and to change farming practices and systems in a way that better recognizes the essential role women play in improving productivity and livelihoods. CGIAR research must also seek to influence governance systems so that these include women in decision-making.

Ultimately, poor and hungry people are the reason for the CGIAR's very existence. There is a moral imperative to do everything possible to ensure that agricultural research in the 21st century meets their needs. The CGIAR's reforms give its research the best possible chance of success.

<sup>1</sup> United Nations, High-Level Task Force on the Global Food Security Crisis, Comprehensive Framework for Action, New York, 2008.

<sup>2</sup> Group of Eight, L'Aquila Joint Statement on Global Food Security, 10 July 2009.

## ACRONYMS

<b>CGIAR</b>	Consultative Group on International Agricultural Research
<b>CRP</b>	CGIAR Research Program
<b>ICTs</b>	information and communication technologies
<b>ISPC</b>	Independent Science and Partnerships Council
<b>MDG</b>	Millennium Development Goal
<b>NGO</b>	non-government organization
<b>R&amp;D</b>	research and development
<b>SRF</b>	Strategy and Results Framework
<b>UN</b>	United Nations

Writing, design and layout:  
Green Ink ([www.greenink.co.uk](http://www.greenink.co.uk)),  
in association with Jeff Walker



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