



## Consultative Group on International Agricultural Research

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### **Intensified Research Effort Yields Climate-Resilient Agriculture To Blunt Impact of Global Warming, Prevent Widespread Hunger**

#### ***Heat-tolerant Wheat, Flood-proof Rice, Satellites for Carbon Trading Among New Technologies***

WASHINGTON, D.C. (4 December 2006) — In reporting new forecasts of the devastating impact of climate change on food production in some of the globe's poorest regions, the world's largest alliance of international agricultural research centers today announced it is embarking on a new effort to intensify and streamline research to reduce developing countries' vulnerability to climate change caused by global warming.

The Consultative Group on International Agricultural Research (CGIAR) ([www.cgiar.org](http://www.cgiar.org)), in consultation with the global environmental change science community, is refining a comprehensive climate change agenda that is already generating climate-resilient innovations, including crops bred to withstand heat, salt, submergence or waterlogging, and drought, and more efficient farming techniques to help poor farmers better use increasingly scarce water and fragile soil. Researchers are also focusing on boosting agriculture's role in reducing climate-altering greenhouse gases. (See attached descriptions of new crops and approaches.)

"The impacts of climate change on agriculture will add significantly to the development challenges of reducing poverty and ensuring sufficient food production for a growing population," said Dr. Robert S. Zeigler, Director General of the International Rice Research Institute (IRRI), a CGIAR-supported research center. "The livelihoods of billions of people in developing countries, particularly those in the tropics, will be severely challenged as crop yields decline due to shorter growing seasons."

"Anticipating and planning for climate change is imperative if farmers in poor countries are to avert forecast declines in yields of the world's most important food crops," said Dr. Louis V. Verchot, a climate change scientist with the World Agroforestry Centre (ICRAF), a CGIAR-supported research center. "Yet, adaptation is not a substitute for reducing new and removing existing greenhouse gases from the atmosphere—our only long-term option."

Adding urgency to the researchers' action plan is a new study that forecasts a 51 percent decrease by 2050 in the amount of India's most favorable wheat-growing land. According to a study from one of the research centers, *Can Wheat Beat the Heat?*, sustained periods of hotter, drier weather will dramatically shrink India's breadbasket and diminish yields, placing at least 200 million people at greater risk of hunger.

As a result of rising temperatures, the climatic conditions best suited to wheat growing will shift away from the tropics—where most of the world’s poorest countries are situated—toward the poles and to higher elevations. According to the study, North American wheat growers will be able to farm new lands as far as 65 degrees north, 10 degrees beyond their current planting limit. In North America, wheat growing would extend from its current limit – extending from Ketchikan, Alaska in the West to Cape Harrison, Labrador in the East – to less than two degrees beneath the Arctic Circle. In Eurasia, much of Siberia would become farmland. While poor tropical countries’ capacity for food production will diminish, developed countries—most of which are located far from the equator—will, in many cases, experience an increase in productive capacity as land that was previously frost-bound opens to cultivation.

“Developing countries, which are already home to most of the world’s poor and malnourished people and have contributed relatively little to the causes of global warming, are going to bear the brunt of climate change and suffer most from its negative consequences,” said Dr. Verchot of the World Agroforestry Centre.

Meanwhile, a second study finds that projected increases in temperature and changes in rainfall patterns will decrease growing periods by more than 20 percent in many parts of sub-Saharan Africa. According to the findings in CGIAR’s research report *Mapping Climate Vulnerability and Poverty in Africa*, Africans living in the continent’s poorest countries are at greatest risk from environments that will become even less hospitable to agriculture. Most vulnerable of all are farming families in East and Central Africa, including Rwanda, Burundi, Eritrea, and Ethiopia as well as Chad and Niger.

The authors’ findings were based on analysis that examined such factors as land degradation, renewable water supply, infant mortality, crop suitability, disease prevalence, governance, and public health.

“Poor countries are overwhelmingly dependent on natural resources, and, given their limited financial or institutional ability to adapt to profound change, they are severely at risk,” said Dr. Zeigler, speaking on behalf of the 15 research centers supported by the CGIAR. “Helping poor farmers adapt to climate change will require a concerted international effort to improve crops, techniques of cultivation, and soil and water management.”

“The task ahead may well prove bigger and more complex than what we faced at the outset of the Green Revolution,” Dr. Zeigler added. “To feed a growing population, food production must be doubled over the next 25 years, but now poor countries must do so in harsh environments that climate change has rendered far less suitable to agriculture.”

Main approaches in the new climate change agenda outlined by the research centers include the following:

***Developing climate-ready crops***

Researchers are developing more reliable varieties of food crops capable of withstanding increased temperatures, drought, and flooding. Heat-resistant cereals currently under development will provide greater yield reliability, especially in the tropics and subtropics, where many crops are grown at or near their thermal optimum, and where a 1 degree Celsius increase in temperatures during the growing season can result in a decline in yields of up to 10 percent. Under these conditions, photosynthesis slows or even ceases altogether, pollination is prevented, and dehydration sets in.

With increased rainfall and flooding forecast in many parts of Asia, new breeds of rice benefiting from a trait that allows the plant to survive prolonged periods of submergence are already helping farmers on millions of hectares in India and Bangladesh. Researchers are also looking to boost rice yields from a shrinking land base by reconfiguring the plant's photosynthetic engine so that it more efficiently converts solar power and atmospheric carbon into grain.

For drought-prone regions like Southern Africa, researchers using an innovative molecular approach to breeding have made progress in developing maize that withstands prolonged dry periods and infertile soils. This and other drought-related work, including research that allows crops to be “programmed” so they mature at the time of year when conditions are most likely to be favorable for grain development, regardless of when they are planted, is beginning to have an impact in farmers' fields.

Plant breeders will continue to develop new varieties that can better tolerate the impacts of climate change, but there are limits to the ability of new varieties to counteract the effects of heat, drought, and submergence.

“Adaptation does not guarantee that farming will be able to continue in an area, or if it does, that farmer income will remain unchanged,” said Dr. Zeigler. “Some adaptation will involve shifting production from one location to another.”

#### ***More efficient use of resources***

Improving farmers' ability to use water more efficiently and to better manage their fragile soil is essential if they are to adapt to the shocks of climate change. In many farming systems, as much as 70 percent of the rain falling on a crop is lost to evaporation and runoff and cannot be used by the plants. Several CGIAR-supported centers are refining and introducing new and better methods for rainwater harvesting and storage, shifting to less thirsty crops and perfecting drip irrigation to deliver precise amounts of water when and where it is most needed. Conservation farming techniques refined by CGIAR researchers, such as low- or zero-tilling in which farmers refrain from plowing their fields, help to increase the water-holding capacity of soils and infiltration so more water is available for the crop, moderate soil temperatures, and have the added benefit of preventing carbon from escaping from the soil into the atmosphere.

#### ***Managing greenhouse gases***

The CGIAR-supported centers are working with farmers to develop and test innovative practices capable of contributing to the net reduction of atmospheric carbon on three fronts: stanching the loss of carbon from agricultural systems; returning carbon from the atmosphere to plants and soils; and better managing forests and soils. Trees, which absorb—or sequester—carbon as they grow, thereby reducing atmospheric carbon dioxide, and the developing-country farmers who plant them, are at the center of one of the most important research efforts. CGIAR scientists are working to increase poor farmers' participation in carbon sequestration projects by introducing satellite technologies that verify the carbon they are removing from the atmosphere, thus allowing them to receive proper compensation. According to estimates from the Intergovernmental Panel on Climate Change, agroforestry has the potential to trap an additional 170 megatons of carbon each year.

Agricultural systems also release greenhouse gases—accounting for an estimated 20 percent of man-made emissions—by clearing trees for fields and pastures, transforming soil into cultivated land, and burning crop residues. To reduce the incidence of devastating slash-and-burn agriculture in the humid tropics, scientists from a number of the international

centers are working with farmers to develop alternative livelihoods from the very forests they once cleared. In Mexico, CGIAR scientists have introduced infrared sensors to farmers to help them reduce the application of nitrogen fertilizer, which, when applied to crops, produces emissions of nitrous oxide—a greenhouse gas with 310 times the warming power of carbon dioxide. Another group of CGIAR researchers in Colombia has isolated a naturally occurring chemical in African grass that inhibits the production of nitrous oxide.

***Better forecasts, policy options***

To help farmers make better planting decisions, a consortium of CGIAR-supported centers is working with national and international meteorological services and leading climate-modeling researchers to provide local and regional information that combines forecasting knowledge with expertise in farming systems. In the local, national, and international policy arenas, CGIAR researchers are generating innovative options to foster adaptation to climate change. In addition, new research at CGIAR-supported centers focuses on understanding the impacts of climate on natural resources, such as water, fisheries, and forests, and on planning for improved management of these resources to meet the needs of growing populations as the climate changes.

The CGIAR is a strategic agricultural research alliance dedicated to generating and applying the best available knowledge to stimulate agricultural growth, raise farmers' incomes, and protect the environment. It supports 15 research centers worldwide conducting groundbreaking work to nourish the future. For more information, please visit [www.cgiar.org](http://www.cgiar.org).

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