

A photograph of a terraced field with a stream and a corn plant in the foreground. The terraces are filled with green crops, and a stream flows through the center. A corn plant is visible on the left side of the frame.

CIMMYT

NATURAL RESOURCES GROUP

Helping today's resource-poor maize
and wheat farmers secure tomorrow's harvests

WHAT does the Natural Resources Group (NRG) do?

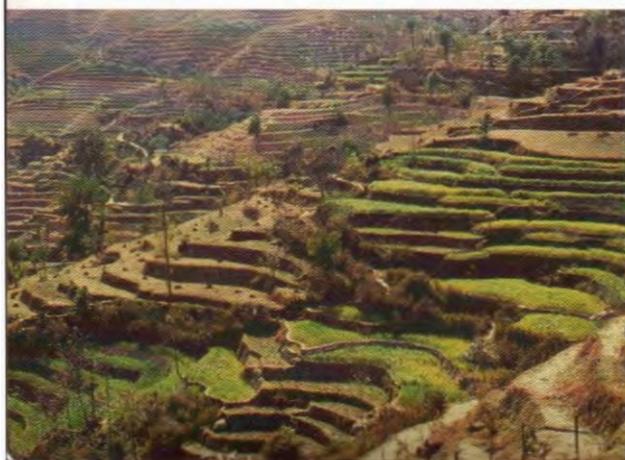
The NRG works to boost harvests while reducing the costs of farming—for people and the environment—with a focus on soil, water, and farming systems diversity. To accomplish this, NRG staff identify, test, and promote environmentally-safer ways to increase the productivity of maize

and wheat cropping systems. These include practices that slow or reverse environmental degradation, and studies and methods to assess the long-term consequences of technical change in agriculture. The NRG supports and complements efforts of CIMMYT's Maize, Wheat, and Economics Programs.

WHY is this work important?

Each year the world's population grows by 100 million persons. Most will inhabit developing countries, where farming is the chief occupation, and population growth and poverty are pushing agriculture to the limit. One result is the degradation of natural resources. In parts of South Asia, each square centimeter of arable land supports two crops per year; yields have leveled off or declined, and serious water shortages loom. Impoverished

farmers in sub-Saharan Africa are worse than "dirt" poor: with little cash and facing harsh conditions, they 'mine' already-depleted soils. In Latin America, economic restructuring and the opening of global markets have left small-scale, subsistence farmers increasingly destitute. *The NRG is charged with helping resource-poor farmers improve their food security and livelihoods, while conserving the soil and water base needed for future harvests.*



Highlights of NRG

ACTIVITIES and OUTPUTS

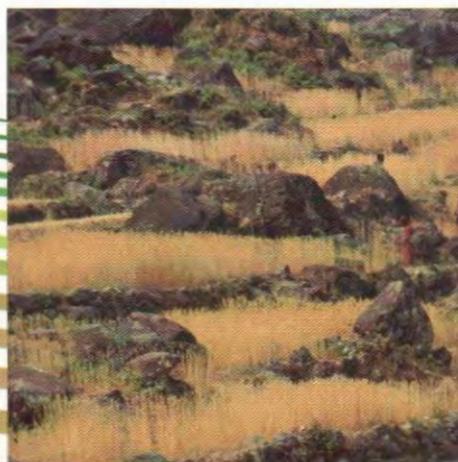
Conservation agriculture

The food security and livelihoods of small-scale, subsistence farmers are closely tied to the amount and quality of soil and water at their disposal. Conservation agriculture—maintaining the soil surface that is covered with the residues of previous crops through zero or minimal tillage, crop rotations, and green manure cover crops—can relieve threats to those resources and offers many other benefits. These include reduced labor and fuel costs, increased system productivity and water-use efficiency, improved soil structure and fertility, and better control of weeds and pests. The NRG is leading or contributing to varied efforts to develop, test, and promote conservation agriculture.



The Rice-Wheat Consortium (RWC) for the Indo-Gangetic Plains

Intensive rice-wheat cropping systems provide food and livelihoods for nearly 250 million persons in Pakistan, northern India, southern Nepal, and Bangladesh. The RWC—an alliance of experts led by the national agricultural research systems of those countries



and including several international centers and advanced research institutes—fosters sustainable productivity in rice-wheat farming systems. The NRG assists in RWC coordination and promotes participatory approaches and extensive partnerships to help rice-wheat farmers test and adopt diverse resource-conserving practices, among them the use of zero tillage for sowing wheat. Now employed on 500,000 hectares of wheat in the region—and expanding rapidly—the practice, compared to traditional systems, saves 75% or more fuel (at least 60 liters per hectare), requires 50% less herbicide, 25% less water, and results in better yields.

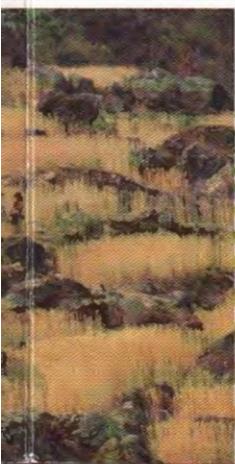
Southern Africa: Managing risk in drought-prone maize systems

Under this project, small-scale maize farmers in Malawi and Zimbabwe work with the NRG, the CIMMYT Maize Program, and national partners to identify better soil fertility management practices. The practices must produce strong benefits in poor seasons without posing large risks in bad seasons. Farmers and researchers

together identify new management options and where they might work. Using crop simulation models, in a single afternoon participants can simulate 50 crop seasons and observe how frequently various options cause unacceptable losses. These results, combined with farmers' field tests, help farmers decide which practices are most attractive. The NRG has brought together stakeholders and created tools for farmers and modelers to communicate effectively. The group has also led in model adaptation and provided training for national partners on the use of the models.

Zero tillage in Kazakhstan

The NRG works with research institutes in northern Kazakhstan and CIMMYT's Wheat Program to develop a conservation agriculture system for this semi-arid region, where wheat is continuously grown, occasionally interspersed with a fallow year. Locally manufactured seeding equipment has been modified for zero tillage, and evaluation is underway on green manure cover crops for use in the fallow years. Initial results show that yields can be maintained with zero tillage while reducing production costs.



Accessible information technology

The NRG includes a small team of experts on geographic information systems (GIS) and modeling, who offer the best of this technology to partners in the developing world. Among their outputs are powerful, CD-based GIS tools for non-specialists, including *Maize Research Atlases* for Africa, Asia, and Latin America, and *Maize Country Almanacs*. The team has distributed copies and provided training in the use of these tools to researchers worldwide. The range of *Almanac* users includes agricultural researchers from the public sector, international research centers active in eastern and southern Africa, private seed companies, and a religious organization helping Malawian villagers to access water. As of 2002, there are *Almanacs* for 19 countries, including 15 in Africa. The *Atlases* and *Almanacs* were developed in partnership with Texas A&M University and Mud Springs Geographers, Inc., with funding from USAID. Finally, NRG researchers have worked closely with CIMMYT's Maize and Wheat Programs to refine classification of environments for which breeders target new varieties.

Training in sustainable agriculture

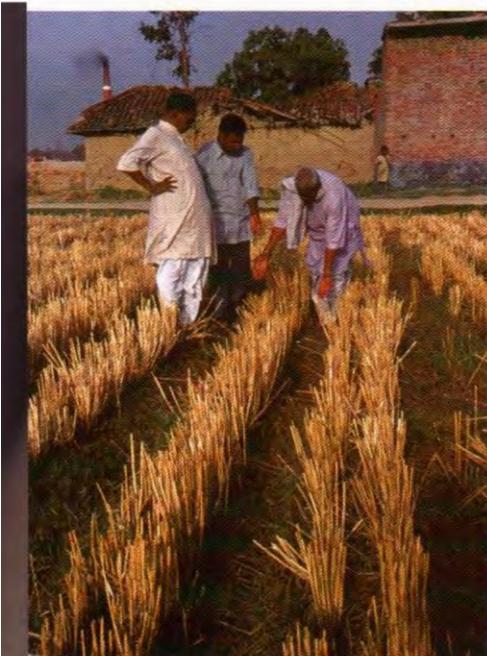
The NRG's training course on sustainable agricultural systems, based on case studies of the complex issues surrounding soil degradation in different parts of the developing world, is conducted on request.

Analysis of soils and plant tissue

The NRG supervises a small laboratory at CIMMYT that conducts soil, plant tissue, and water analysis as a service to center staff and national partners. Currently the laboratory is upgrading its capacity to evaluate changes in the physical and biological characteristics of soils, which are associated with conservation agriculture.

Sustainable agricultural systems in Central Mexico

Through a project begun in 2001 with support from the French research agency CIRAD, NRG staff work with public and private Mexican institutions and farmer associations to develop suitable conservation agriculture systems for Mexico's *El Bajío* region. Farmers in this irrigated heartland face falling profits, low payoffs from fertilizer use, and groundwater depletion that could signal the end of irrigated agriculture in the region. Work builds on lessons learned from South America and South Asia, and more than a decade of previous research by CIMMYT on conservation tillage in Mexico.



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