



INTERNATIONAL MAIZE AND WHEAT
IMPROVEMENT CENTER



The Risk Management Project

Improving options for resource poor farmers in drought prone areas of southern Africa



Agricultural Production Systems Research Unit



Focus

Low soil fertility and unreliable rainfall significantly reduce the productivity of smallholder maize cropping in Zimbabwe and Malawi, threatening household food security and increasing land degradation. In a resource-poor community, a vicious spiral of diminishing returns and poverty often results.

The goal of the CIMMYT-AusAID-ACIAR Risk Management Project is to increase the productivity and sustainability of smallholder maize-based farming systems in southern Africa by speeding the adoption of productivity-enhancing, resource-conserving practices in rainfed, drought-prone areas. As part of this, it is helping farmers, extension workers, researchers, and policymakers to understand the performance of different crop and resource management strategies under scenarios of climatic risk. The Project ultimately aims to expand farmers' soil fertility and resource management options, with special attention to those that can help maintain production under even the harshest conditions.

Merging Models and Participatory Research

Direct experimentation alone, whether on research stations or in farmers' fields, is too time-consuming and expensive to achieve the above. Smallholder farming systems in southern Africa are complex; they feature intricate crop and soil management practices adapted to local resource constraints and livelihood strategies. So the Risk Management Project works from a *systems* perspective, using *simulation models* and *farmer participatory research*.

Simulation models allow swift assessment of a wide range of options, including maize-legume rotations and intercrops, planting dates, fertilizer management, and farm-level resource allocation. They also help researchers deal with complex biophysical interactions, soil and climatic variability, and the long-term consequences for the resource base of different management strategies. The Project uses the *Agricultural Production Systems Simulator (APSIM)* by APSRU, because it can handle interactions among climate, soil fertility, and crop and residue management, and has been widely evaluated under low-input farming systems in India, Kenya, and now through this project in Malawi and Zimbabwe.

Farmer participatory research complements simulation modeling. Project staff and farmers have developed categories for land (e.g., lowlands, lowland margins, home gardens, toplands) and farmers (e.g., no livestock, a few livestock, ample livestock). These types, which are replicated in numerous villages across wide areas of southern Africa, are used to interpret results from farmer experimentation on the performance and attractiveness of crop management options. One result will be a decision tree—a set of conditional statements—on how crop management practices (including new technologies) can best be used in given farming systems. These decision rules will facilitate the scaling up of research results across a wide area.

Examples of Results

Farmer experimentation under the project suggests that inorganic fertilizer on the toplands works best if farmyard manure has been applied within the past two years. For most farmers, however, manure application to toplands is of low priority. Only farmers with ample livestock have enough manure to cover a few topland areas as well as other parts of the farm. Inorganic fertilizer use on topland fields, then, is influenced by farmer category (livestock ownership patterns) and topland soil characteristics.

On home garden land, in contrast, inorganic fertilizers appear to work best when concentrated on those patches of land that have *not* recently benefited from other sources of nutrients (such as leaf litter, household refuse, manure, compost, or rotations or intercrops with legumes).

New Participatory Issues Raised

Farmer experimentation raises questions while answering others. Some of these new questions may be addressed through simulation modeling. Drawing on the above examples, models can assess interactions over time between organic and inorganic fertilizers on topland fields; or compare fertilizer use strategies on home gardens (e.g., application to the whole home garden vs. concentration on distinct patches).

Resource flow maps developed as part of participatory exercises provide a means of communication between farmers, researchers, and extension workers, as well as helping link participatory research and simulation modeling. Farmers develop these maps for each field where they conduct experiments. The maps show how different nutrients are used on different parts of the farm, allow measurement of inputs and outputs, facilitate the development of modeling scenarios, and provide an interface whereby model results can be communicated to farmers. This combined approach has facilitated both the definition of problems and the assessment of solutions.

Project Priorities

Priority areas for Project efforts include:

- Inorganic fertilizer management (timing, placement, amount).
- Legume and manure management in maize-based systems.
- Grain legumes as an alternative food source.
- Use of drought tolerant maize varieties.
- Scaling up successful practices through partnerships with organizations working at other sites throughout the region.

Linking with Global Partners

The Risk Management Project links farmers directly with agricultural researchers and extension agents from public institutions and universities in Malawi and Zimbabwe. Participants also collaborate with several international institutions (ICRISAT), non-governmental organizations (CARE), the Rockefeller Foundation-funded Soil Fertility Network for Malawi and Zimbabwe, the *Southern* African Drought and Low Soil Fertility Project funded by the Swiss Agency for Development and Cooperation and ACIAR. Given the similarities regionwide of drought and soil fertility concerns, participants expect to capitalize on the above partnerships and establish new ones to increase crop production and alleviate poverty throughout southern Africa.

Acronyms

ACIAR	Australian Centre for International Agricultural Research
APSRU	Agricultural Production Systems Research Unit
APSIM	Agricultural Production Systems Simulator
AusAid	Australian Agency for International Development
CIMMYT	International Maize and Wheat Improvement Center
ICRISAT	International Crops Research Institute for the Semi-Arid Tropics



Even in home gardens, which tend to receive more attention and organic matter, the granitic soils and dry climate of communal lands in Zimbabwe greatly reduce crop yields.

Farmers and project staff work as partners to identify problems and devise and test solutions.



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