FARMER PARTICIPATORY RESEARCH (FPR) IN UGANDA

Location: Iganga District, Uganda

The Ikulwe project in Uganda's Iganga District demonstrates the efficacy of Farmer Participatory Research (FPR) as an innovative, collaborative development model to address poor crop productivity due to insect pests, crop pathogens, and low soil quality. FPR combines farmers' needs and experiences with the technical knowledge of scientific researchers to improve crop production and resource conservation capacity.[1]

CHALLENGE

Uganda has fertile soils and two rainy seasons per year, from March to May and from October to December. Uganda's population is predominantly rural and agriculture is the main productive activity. Staple food crops are bananas, corn, cassava, potatoes, millet, and pulses, with some animal products—meat, milk, and fish. Cash crops include coffee, tea, cotton, tobacco, sugar cane, cut flowers, and vanilla. Pests and diseases, low soil fertility, soil erosion, and unreliable rainfall all adversely affect crop production.

RESPONSE[2]

Between 1992 and 1997, Uganda's National Agricultural Research Organization (NARO), in collaboration with the International Center for Tropical Agriculture (CIAT), introduced a range of participatory crop breeding and ecologically based soil fertility management strategies. Defined by participating farmers from five villages, the Ikulwe project's objectives were to address the pressing issue of crop productivity limited by insect pests, crop pathogens and low soil quality.

Ikulwe is predominantly an area of tall grassland, with perennial and annual crops produced in mixed farming systems. The area is representative of traditional banana-and-coffee-based systems of Eastern and Central Uganda. Farmers estimated the following land allocations for different crops: bananas 20 percent; cassava, maize, and fruit, 10 percent each; coffee, beans, vegetables and grazing 7 percent each; sweet potatoes 6 percent, others 16 percent. During characterization and diagnosis meetings, crop pests and diseases were identified as the greatest challenge encountered by farmers, followed by low soil fertility and soil erosion. Farmers also identified low crop yields and unreliable rainfall as additional challenges.

A participatory research approach for system improvement was initiated in 1992 and carried out over 11 research seasons until 1997. The collaboration began with on-farm research for variety verification and adaptation of soil management practices; information was gathered through informal surveys, a participatory rural appraisal approach, and meetings to develop a research plan. Farmers fully participated in all steps of research planning, including problem identification and solving, soil fertility design and implementation, pest management, and crop-selection trial management.

It was easy to identify the major causes of low soil fertility, such as: continuous cropping, overgrazing, monocropping, vegetative cover removal, soil compaction, soil erosion, lack of farmyard manure etc., but it was more difficult to identify the primary causes of crop pests and diseases. By working in small groups, farmers identified appropriate solutions for low soil fertility and developed responses to pest attacks, using available resources.

Research efforts were prioritized to address several key production issues, including developing new low-input management strategies to combat the Africa cassava mosaic virus, the groundnut rosette virus, multiple bean (legumes) diseases, and the banana weevil. Additional research efforts were focused on addressing soil erosion and fertility.

The basic principles of experimentation were explained to farmers: objectives, treatments, plot size, site selection, replications, trial management, and recording observations. They designed trials for agroforestry, green manure, mulching, and variety trials for bean and cassava, as well as groundnut spacing trials. For the bean variety trials, farmers opted to test 12 new varieties. For the more complex trials involving alternative management practices—green manure and agroforestry—farmers chose to compare local practices with two to four different treatments.

Participating farmers chose which trials they wanted to conduct: groundnut-spacing trials and cassava variety trials were the most popular (chosen by 50 percent of farmers). Other trials included *Crotolaria* used as green manure, bean varieties, agroforestry, banana weevil management, and mulching. Various trials were conducted during the 11 research seasons.

RESULTS

Crop Variety

- Five cassava varieties were evaluated for resistance to the mosaic virus. Farmers have successfully adopted and multiplied two improved varieties.
- Twenty-nine bean varieties were evaluated for blight resistance. Varieties were screened for farmer preference and performance under low-input conditions. Most farmers adopted the eight most resistant varieties, taking into consideration seed appearance, marketability, and drought tolerance. Selected varieties were subsequently multiplied and supplied to other farmers.
- Two varieties of upland rice and several varieties of sweet potato and soybean were evaluated, with farmers adopting specific varieties. Some farmers went further, multiplying rice seed and selling it to others.

Erosion Control and Fodder

- Vetiver grass was tested for soil erosion control. After observing how runoff and soil accumulated in front of the grass barriers and in the crown of the plants (part of plant at ground level, where stem and roots merge), farmers planted it in living barriers across their fields. Some farmers expressed a preference for a grass that is more palatable to livestock.

Soil Fertility Management with Green Manures

- *Crotolaria, Mucuna, Lablab and Canavalia* (Jack Bean) were evaluated for use as either green manure with food crops (maize, bean, sweet potato) or as improved fallow crops for soil fertility improvement.
- Intercropping with *Crotalaria* and *Canavalia* was particularly efficient. *Crotalaria* also helped improve fallow compared to weedy fallow. Maize and bean yields were increased by 41 percent and 43 percent, respectively, following a one-season *Crotolaria* fallow as compared to two seasons of weedy fallow.
- Although agronomically superior in improving productivity of subsequent crops, *Crotalaria* was relatively laborious to produce and was the least adopted. *Mucuna* was the species farmers preferred when noxious weeds were problematic and *Lablab* was the most preferred species for fodder.
- Following a one-season *Mucuna* or *Lablab* fallow period, maize grain yield was 60 percent and 50 percent higher, respectively, as compared to maize following maize.

Lantana camara and *Cassia hirsute*, two abundant species in Eastern and Central Uganda, decompose quickly and release nitrogen, phosphorus, and potassium rapidly. On-farm work evaluated maize and bean response to these soil amendments in combination with inorganic fertilizers. The use of *Lantana camara* allowed reducing major reduction in the use of inorganic fertilizers with no decrease in yields.

Bean Inoculation with *Rhizobium* Bacteria

- Nitrogen fixing trials were conducted for two seasons with *Phaseolus* beans and for one season with soybeans. 'Inoculation' was practiced, which is the process of introducing *Rhizobia* bacteria into the soil to act as a natural fertilizer fixing nitrogen. Bean yields responded to inoculation with *Rhizobia* only when phosphorus was applied. Although phosphorus fixes nitrogen on its own, inoculation practiced in addition to phosphorus application resulted in increased fixation and appeared to be the most economical option, increasing yield by 29 percent.

- Compared to a control, soybean yield was dramatically improved (44 percent) with inoculation, but there was less response to phosphorus fertilizer.

Crop Disease and Pest Prevention and Management

- Though it proved expensive for farmers, hot-water disinfection treatment for banana corms was a successful component of integrated pest management for banana weevil and nematodes.
- Crop damage by root rats was among the priority problems identified by farmers. Researchers advised them to experiment with *Tephrosia*, a local crop that was traditionally used for treating wounds and as an insecticide against storage pests, ticks, and termites. Farmers planted it in borders around their fields and reported root rat reduction within six to twelve months.

Other Achievements

- Participating farmers also visited research institutes and NGO training facilities. They reported to the larger group on the technologies they observed, including pit storage of sweet potato, firewood efficient stoves, agroforestry, management of tree nurseries, liquid manure, and composting. Farmers tested ox-drawn weeders to eliminate undesirable weeds from fields and solar dryers and suggested modifications. They also contributed to technology dissemination by hosting numerous farmer and student groups.
- Formed in 1996, the Farmer Research Committee consists of three men and three women who are among the pioneer FPR farmers. Responsibilities include supervising and guiding participatory research, encouraging farmers' participation, identifying needs and opportunities, coordinating with researchers, and convening meetings. Within five years, the FPR increased its coverage from five to ten villages. New members attend the semi-annual planning and evaluation meetings and are mainly involved in testing and adopting technologies with proven efficacy.
- FPR is now recognized as an effective methodology for technology development and transfer by NARO. Indigenous technical knowledge is valued, and farmers' problem-solving abilities have been improved through access to information, acquisition of additional research skills, and improved relationships with neighboring farmers.

Farmers in trial plots. © Buginyanya ZARDI

Following a one-season *Mucuna* or *Lablab* fallow period, maize grain yield was 60 percent and 50 percent higher, respectively, as compared to maize following maize.

Managing seedlings. © Buginyanya ZARDI

- The project also had social benefits with farmers becoming more active learners, serving as peer educators, practicing problem solving, and becoming more self-reliant in improving crop production. The project fostered trust while defining effective research methods that hold significant promise for larger scale use in sub-Saharan Africa.

The Ikulwe example and other FPR cases provide decentralized, socially equitable, and ecologically sustainable options for enhancing food security in sub-Saharan Africa through improving crop varieties, soil fertility, and pest management. Numerous social and resource challenges must however be acknowledged to ensure project success. Researchers must consider the accessibility of new planting material and work with farmers to develop strategies for balancing short-term food needs with longer-term soil fertility objectives. Additional social lessons elucidated that full transparency regarding any payments made to community-based facilitators is critical to avoiding conflict; that the project scope must be clear; and that the research team must visit and follow-up with farmers regularly. Lack of follow-up with project participants and low levels of involvement by extension staff and local leaders hampered the technology dissemination process. In addition there is "a need to carry out socioeconomic studies on some of the developed technologies" to further improve adoption rates.

The Ikulwe example provides decentralized, socially equitable, and ecologically sustainable options for enhancing food security in sub-Saharan Africa through improving crop varieties, soil fertility, and pest management.

Mulch trial plot. © Buginyanya ZARDI

FOR MORE INFORMATION
www.oaklandinstitute.org

ENDNOTES

1 Fortmann, Louise. *Participatory research in conservation and rural livelihoods: Doing science together*. New York, Wiley-Blackwell, 2008.

2 All project data cited in this case study are from the following: Kayuki, K.C. and C.S. Wortmann. "Farmer Participatory Research in Ikulwe - Iganga District Uganda." in *Participatory Research for Improved Agroecosystem Management: Proceedings of a Synthesis Workshop*. (ed) Farley, Cary. Centro Internacionale de Agricultura Tropical (CIAT), African Workshop Series, no. 38, 1998, 124.

FRONT PAGE PHOTO:
Attending to fruit trees. © Buginyanya ZARDI