SMINET News - Vol. 3, No. 1 (July 2001)

Farmers in Targeted Area Using a Wider Range of Crop Management Options Leading to Increased Productivity in Zimbabwe

GM Heinrich (SADC/ICRISAT Sorghum and Millet Improvement Program, PO Box 776, Bulawayo, Zimbabwe) g.heinrich@cgiar.org

Introduction

One of the major research themes or Intermediate Results (IRs) in Phase IV of the Sorghum and Millet Improvement Program (SMIP) is to increase the productivity of sorghum- and pearl millet-based systems—IR1.2. Highlights of work conducted under this research theme in Zimbabwe to date are described. It should be noted that this work is interlinked with that of other SMIP themes on seed systems and improving output markets.

The objectives of IR1.2 are to increase the productivity and incomes of smallholder farmers, and to protect the environment through the adoption of integrated soil water and nutrient management (ISWNM) technologies. Soil nutrient status is extremely important in crop production because it has a direct effect on the productive potential of the environment. Soil nutrients in communal areas in Zimbabwe are declining due to net nutrient outflows (Mapfumo and Giller 2001). (Zimbabwe is one of SMIP's Phase IV target countries.) These areas are also semi-arid, and often their crop productivity is limited by lack of moisture. This makes improved soil water management important. Poor soil water management can also cause erosion that contributes to major nutrient losses and environmental degradation. Research has shown that better management of these two key resources holds tremendous potential for increasing productivity and incomes at the farm level in the semi-arid areas of southern Africa.

Progress of Activities

SMIP's activities on soil water management target *both* the identification and adaptation of improved management options, and the pilot testing of approaches aimed to facilitate adoption of better management systems by smallholder farmers. In tests for approaches for management options, links with input supply and output marketing efforts are crucial. Research in this area is being conducted in both Tanzania and Zimbabwe and the key partners are the national research and extension systems. In Zimbabwe, other partners include the University of Zimbabwe Department of Soil Science; the FAO; the Rockefeller Foundation (which contributes financial support); Tropical Soils Biology and Fertility (TSBF) Program; and NGOs: Intermediate Technology Development Group (ITDG), CARE, and the Citizens Network; and farmers. Private sector companies like the Zimbabwe Fertilizer Company are also becoming involved.

In both Tanzania and Zimbabwe, work on increasing productivity began with in-depth literature reviews on past research on soil fertility and soil water management, the examination of technology options currently considered to be effective, levels of adoption of recommended practices, and farmers' current production systems. Baseline surveys were implemented on farmers' current practices and production constraints in target research areas. Information generated in the ICRISAT crop growth simulation program helped to guide the choice of input levels mat were examined. Discussions were also held with research, extension, and NGO personnel and farmers on identifying technology options that appeared to be practical and effective and were of interest to farmers.

Identification of promising technologies in Zimbabwe. Interaction with target communities was initiated in the 1998/99 cropping season, and a systematic on-farm, farmer participatory research (FPR) process was launched during the 1999/2000 cropping season. The purpose of farmer participatory research is to test and adapt a range of soil fertility and soil water management options identified earlier in the program. Options that prove successful were to be fed into a subsequent pilot program aimed to facilitate broad adoption in target areas. Two representative target districts, Tsholotsho and Gwanda South, were selected in 1998/99 and a third, Zvishavane, was added in 2000/01.

To institute the FPR program in communities, initial village level meetings were held to introduce and discuss the program with the communities at which interested farmers volunteered to participate in the program. Further meetings were held with groups of volunteer farmers to discuss and choose the technology options and methods for conducting trials. The majority of the volunteers were women.

A series of dials were implemented. These included two trial types: Researcher Managed trials (RM) and Farmer Managed trials (FM). The RM trials were designed

to address topics of particular interest to research, and to provide good quantitative data on specific questions. Researchers supervised all field operations and data collection activities, and provided the necessary inputs. In the FM trials, farmers individually selected the technology options they wished to evaluate. However, for the different options tested, farmers had to agree on trial design and systems for applying experimental variables. Farmers individually decided on the levels at which they would apply all non-experimental variables, and conducted all field operations including the maintenance of records of the operations. Researchers assisted farmers to collect harvest data. The main cereal crops in the trials were sorghum and pearl millet and the main legume crops were groundnuts, cowpeas, and bambara groundnuts.

Field days were held prior to harvesting at trial sites identified as exemplifying the most important lessons emerging from the trials program (from both the RM and FM trials). Attendance at field days was generally about 100 to 150 farmers.

After harvesting, farmers jointly evaluated all technology options that were under experimentation—scoring and ranking the various treatments using their own evaluation criteria.

Technology options evaluated during the 1999/2000 season include the following:

- Modified tied ridging in combination with fertility improvement treatments (modified tied ridging involves using a plough to make furrows between crop rows, and "tying" the furrows with soil after every 1 or 2 meters to trap rain water in the field. The operation was implemented in place of the first weeding.)
- The use of farmyard manure (FYM) and combinations of minimal amounts of FYM and inorganic nitrogen
- Management systems to improve the quality of FYM
- The use of legume rotations to improve soil fertility
- Seed priming (seed is soaked overnight in water, before planting. The purpose is to improve the rate of emergence. Stand establishment is a common problem in the semi-arid areas).

Rainfall in the 1999/2000 season was about 100% above normal in the two target research areas in Zimbabwe. This was also the first year of the trials program. Results should therefore be interpreted with caution. None-the-less, several results are of interest. Highlights include the following:

- No yield benefits could be attributed to water conservation measures for the year because rainfall was abundant. Although modified tied ridging did not show yield benefits, farmers found it easy and practical to use. Researchers observed that the system appeared to slow down water movement/runoff in the field and to help in reducing erosion. The system looks promising in drier years.
- An "exchange visit" to see on-farm research being conducted in other semi-arid areas of the country stimulated participating farmers' interest in a water conservation system known as "dead-level contours and infiltration pits". About five farmers spontaneously started testing these systems in their own fields.
- Grain yield response to FYM was limited in this first year of application. However, improved management of FYM (in this case, heaping and covering the manure in July, prior to application at planting) significantly improved the grain yield response. This appeared to be related to an increase in the amount of available nitrate in the FYM, as a result of the treatment.
- There was a significant difference in grain yield response to different FYM types. Goat manure gave significantly higher yields than cattle manure, at the 7% level of probability, across manure management systems. In these trials, goat manure also had higher initial levels of N.
- On average, there was a significant response to the application of limited amounts of mineral nitrogen (9 and 18 kg ha^{-1} N applied as ammonium nitrate). This was not unexpected in a year of good rainfall.
- In end of year assessments, farmers concluded that goat manure is more "powerful" than cattle manure. In one location, farmers concluded that if a farmer has no cash at the start of the season he should apply FYM. But where cash is available, a farmer would get more immediate benefits from applying small amounts of inorganic N. Resources permitting, the best option would be to apply both FYM and N.
- Farmers consistently indicated that seed priming did increase the rate of emergence in both cereal and legume crops (cowpeas and bambara - it was not tried on groundnuts). While the yield benefit was not evident in this wet year, however, farmers felt that seed priming was a low-cost and practical option that can be useful in improving stand establishment in drier years.

The FPR program initiated in 1999/2000 was continued in 2000/01. The purpose was to obtain a more thorough evaluation of the options, and compare responses across years. In addition, the second year of testing included evaluation of residual effects of different manure management treatments and different levels of manure applications and of effects of rotation treatments.

The 2000/01 season was quite different from the preceding season. In Gwanda South, there was almost no rain in November and December. In January, rainfall was rather limited and from February onwards became quite regular. As a consequence, crops were planted late—in January instead of November/December.

In Tsholotsho, rainfall at the start of the season was reasonably good, and most of the trials were planted in December. However, there was a severe drought in January. Much of the maize died. In the experiments, most of the crops survived, but yield potential was reduced. Analysis of results of the second year, and a combined analysis across years, will be completed in August 2001.

In October 2000, a "Farmer Field Schools" (FFS) program was initiated, with support from extension personnel and other partner institutions (financial support has been provided by the Rockefeller Foundation). FFS groups (with 15 to 30 farmers each, the majority of whom are women) were formed in Tsholotsho (3 groups), Gwanda South (2 groups), and Zvishavane (2 groups). The groups meet weekly with a "facilitator" to discuss issues on principles of integrated soil fertility and water management and the related technology options to test. Each group's members decide on topics to examine, and jointly implements trials on a designated site.

The objective of the FFS program is to help farmers understand the basic principles of integrated soil water and nutrient management. The program also includes other relevant technology options. Participating farmers are encouraged to experiment on the management of resources which they already have, based on an understanding of certain underlying principles. A greater understanding of the principles of integrated soil water and nutrient management is expected to enhance farmers' ability to make rational management decisions in response to changes in their biophysical and socio-economic environment, and to make them less dependent on receiving specific technical recommendations from external sources. In the same target areas, SMIP is also initiating collaborative programs with NGOs and private sector companies to simultaneously improve farmers' access to input and output markets.

To date, implementation of the FFS program has gone well, and it is particularly popular with farmers. However, the current system is also fairly expensive (per farmer reached), particularly with regard to the training of FFS facilitators (extension officers). At a recent workshop, partners in the program discussed methods for reducing costs, increasing the number of FFSs and beneficiaries, and improving the sustainability of the FFS approach. Some innovative ideas developed will be tested in the coming season.

Seed Policy in Mozambique

DD Rohrbach (SADC/ICRISAT Sorghum and Millet Improvement (Program, PO Box 776, Bulawayo, Zimbabwe) d.rohrbach @cgiar.org

Sorghum and Millet Improvement Program (SMIP) recently completed a review of seed policies in Mozambique in collaboration with the national Ministerio da Agricultura e Desenvolvimento Rural and Michigan State University. This study estimates Mozambique is annually losing up to US $77 million in productivity gains from the failure of the national seed system to disseminate new varieties of grain and grain legume crops currently identified on the national registration list. This includes an annual loss of US$14 million resulting from the failure to disseminate improved varieties of sorghum and pearl millet. Substantially larger sums are being lost if one considers the complementary costs of continuing food insecurity and poverty.

The study offers a number of recommendations for strengthening the national seed system. For example, several recommendations are provided for the simplification of procedures for variety registration and release. Formal release procedures are suggested for varieties developed within Mozambique. However, the country would benefit by allowing the simple registration of varieties released in neighboring counties.

The analysis recommends the allocation of a specific budget to maintain breeder seed stocks of all released varieties. Cost recovery is recommended through sales of foundation seed to seed companies and development projects.

Mozambique is advised to encourage the entry of additional seed companies into the market. Companies producing seed locally can be favored in tenders for seed destined for emergency and development programs. However, free distribution of seed should be limited. If concessionary seed distribution through relief and development programs is necessary, strategies should be employed to promote the development of seed markets. Options include the use of small pack sales, and voucher programs linking seed delivery with the expansion of retail trading networks.

The study notes that emergency seed requirements are commonly over-estimated in Mozambique. Better procedures are needed to more accurately estimate these requirements. The analysis identifies areas of the country most prone to drought and flooding, and estimates approximate seed requirements in these areas. This analysis will be pursued in more detail when ICRISAT hires a seed system development specialist for Mozambique under a new project targeting the development of strategies for improving the efficiency of emergency seed supply.