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Sorghum and Millet Improvement Program (SMIP) Midterm Review

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The Southern African Development Community (SADC)/International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) Sorghum and Millet Improvement Program (SMIP) Phase IV represents several significant changes from previous phases. It focuses on Botswana, Mozambique, Tanzania, and Zimbabwe, and it is organized around a commercial focus on expanding market demand for target crops. Phase IV also emphasizes a much broader range of public and private sector partners than earlier phases.

The SMIP Midterm Review (MTR) was conducted from 18 June to 2 July 2001. The review team had meetings with ICRISAT staff, consulted project documents, and met a range of stakeholders in Zimbabwe. Members of the team also traveled to Botswana, Mozambique, and Tanzania to consult stakeholders.

The Project

SMIP is organized around four themes or Intermediate Results (IRs).

The majority of the review addresses the accomplishments and challenges of these four themes.

IR 1.1 Farmers have access to a wider range of improved varieties resulting in higher rates of adoption

SMIP builds on the release of over 40 varieties of sorghum and millet by national programs during earlier phases of the project. The current phase seeks to improve the adoption of these varieties by paying particular attention to the development of appropriate seed systems and stimulating commercial demand for the crops that should increase the demand for seed. Additional activities include improved conservation and dissemination of germ-plasm resources, development of varieties for industrial use, and technical support to breeder seed production.

The review team made several recommendations:

- Instead of attempting to develop commercial seed

capacity with organizations such as churches and primary schools, contracts could be made for the production of seed packs that can be demonstrated and sold both through these organizations, and by commercial outlets.

- Learn from past success: for example, consider the successful schemes promoted by the project under which nongovernmental organizations (NGOs) organize farmers as contract growers for seed companies.
- Continue the project's efforts in seed policy reform and coordinate these efforts with those of other organizations (e.g., other CGIAR centers) that have similar goals.
- Ensure that the targets and justification for any varieties released are well specified.
- Pursue the goal of instituting a regional variety release and testing system in conjunction with other centers and the Southern African Centre for Cooperation in Agricultural Research (SACCAR).

IR 1.2 Farmers in targeted areas use a wider range of crop management options, leading to increased productivity

The project includes a significant component on crop management research. The goal is to test and demonstrate best-bet crop management options at selected locations in Tanzania and Zimbabwe through participatory methods and farmer field schools (FFS). The project believes that the adoption of improved crop management will be more likely if farmers have access to markets for their grain, and hence the project attempts to establish these linkages. The following recommendations were made:

- Document and analyse the performance of the new technologies so that results can be shared with other organizations working on crop management.
- Test the hypothesis that increased commercial demand encourages the use of the crop management technologies promoted by the project.
- Document and analyse the experiences with FFS as a method of technology diffusion.
- Explore more collaboration with other organizations that are testing and promoting crop management technology in the region.

IR 1.3 Broader public and private partnerships promoting regional technology development, exchange and application
Phase IV attempts to involve a much wider range of stakeholders, including public sector research and extension, farmers' organizations, policymakers, NGOs, and a wide range of private firms. The project is establish-

ing a regional Sorghum and Millet Improvement Network (SMINET) to serve the needs of these stakeholders. It is also establishing other forms of information exchange, such as regional databases and research projects, and demonstrations for technology exchange. The review team recommended:

- Document specific linkages between organizations from different sectors that SMIP has helped to establish
- Recognize the importance of distinguishing between those activities that can benefit from a network and those that can be pursued on a pilot project basis.
- Give attention to the importance of beginning to identify the dimensions and limitations of a future network, as many of the activities envisioned may be more appropriately managed by more flexible, short-term modalities.
- Consider coalitions with other similar entities for developing consistency and critical mass in such areas as seed policy reform or crop management research.

IR 2.1 Market systems linking grain producers and industrial consumers

A major new thrust is the exploration of commercial markets for sorghum and pearl millet. This is based on the proposition that better markets for these crops will lead to increased adoption of technology. The project has pursued a number of activities to encourage wider use of these crops, particularly in the milling industry, and to improve grain-marketing procedures. A food technology pilot laboratory at Matopos was constructed during a previous project phase, and a decision must be taken on its disposition. The review team recommended:

- A set of specific short-term consultancies to explore a broader range of potential industrial uses for sorghum (e.g., for starch or glucose).
- A consultancy to examine the potential of regional and international markets for the target crops.
- Establishment of business innovation grants to encourage private-sector research and testing of sorghum-based products.
- A partnership with one or more NGOs to help establish better market access for sorghum.
- Divestiture of the pilot plant facility.

Project Management and Partnerships

The project is being competently managed and coordinated. It has the advantage of building on 15 years

of previous work. There have been concerns about the current strategy of limiting activities to four countries, but additional activities have helped ensure some technology exchange with other countries in the region. Although SMIP is designed to be centrally initiated and managed, there should be additional opportunities to attract initiative and investment from potential partners. This is particularly important if the project is to encourage sustainable partnerships and active networking in the future. More thought should also be given to the best means of representing various sectors in project management. Finally, although individual project components attempt to address the commercialization focus, more effort is needed to use this as a unifying theme across the project.

Links to USAID Strategy

The development and evolution of the project has taken place at a time of significant change at both the United States Agency for International Development (USAID) and ICRISAT. USAID was considering the nature of support for sorghum and millet research, its interests in regionalization, and an increased emphasis on market-led agricultural development. At the same time ICRISAT was undergoing a number of administrative changes, and decisions were being made about the Institute's future role in southern Africa. The resulting project thus juxtaposes new and historical mandates. The commercialization strategy sits somewhat uneasily with crops that have traditionally been considered principal sources of food security. The final project document reflects some ambivalence about the shift in focus, and although the vision statement reflects the priority of market-led strategies, the majority of the principal indicators and benchmarks are not particularly commercially focused. This makes an MTR somewhat problematic as the project is being asked to respond to evolving donor priorities.

Conclusions

- The staff of SMIP has responded to the challenges and reorientation of the new project with great energy and imagination. The MTR confirms that the project is largely on course with respect to its target indicators and benchmarks. SMIP staff has established solid foundations to provide valuable experience and new partnerships that will help define the course of sorghum and millet research in the region. The MTR provided a number of recommendations that the SMIP team may wish to consider during the remainder of the project. The recommendations are basically divided into four areas:

- Exploration of further commercial opportunities in both grain and seed marketing
- Pursuit of selected policy objectives
- Synthesis of experience in plant breeding and agronomy so that this type of work can be done more efficiently in the future
- A careful analysis of various experiences in trying to form new partnerships.

It is the identification of the most efficient means of encouraging such partnerships that holds the key to determining future strategies for sorghum and millet research in the region.

Quality Analysis of Tanzanian Photoperiod-sensitive Sorghums and Potential for their Improvement through the Lead NARS Approach

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Rationale

Past breeding objectives, strategies, and achievements of the Sorghum and Millet Improvement Program (SMIP) correctly targeted the needs of farmers in drought-prone, less-endowed environments. More than 45 accessions of sorghum and pearl millet germplasm that are early maturing have been developed and released for small-scale farmers. An internal review during 2000 noted an obvious gap in technology for the wet semi-arid tropics (SAT) whose production system includes late-maturing photoperiod-sensitive sorghum. Such postharvest concerns such as storability, quality, processing, and utilization requirements had not been adequately addressed. Based on these deficiencies and outputs from the October 2000 workshop for breeders, farmers, and industry, a need to develop and disseminate technology suitable for increasing productivity in these areas was identified. The purpose is to ensure that effective products are available to farmers in all SAT locations to enable them to steadily grow their way out of poverty and food insecurity. To use regional resources efficiently, a Lead national agricultural research systems (NARS) concept was adopted, whereby a breeder from Zambia would lead

the photoperiod work and the developed materials would be tested in Tanzania and Mozambique.

The current traditional late-maturing photoperiod-sensitive varieties have provided farmers with sustainable production. These varieties are mainly white-seeded with a pearly white endosperm. The photoperiod-sensitive landraces are specifically adapted for yield, quality, and their defensive capacity against biotic and abiotic stresses. In particular, they have been shown to be less susceptible to damage by birds and storage pests than other cultivars. They are also unaffected by grain molds because they mature at the end of the rainy season. Their cooking quality is excellent, and in southern Tanzania and central and northern Mozambique, their food products are comparable and similar to those made from rice (*Oryza sativa* L). Because of these qualities, the photoperiod-sensitive materials have roles in both food security and in the output market. Yet, their potential is not well documented and is therefore not well known because there has been minimal research work in crop improvement and management of this material.

Approach

In a variety adoption and seed survey conducted in Tanzania, 14 local sorghum landraces were collected and their food quality assessed for comparison with standard improved and released sorghum varieties. The local photoperiod-sensitive landraces were analyzed for: visual hardness score, kernel weight, floaters, size fractions (large, medium, and small), dehulling loss, milling yield, water absorption, agtron readings (colour of flour), and tannin contents. Dehulling loss, milling yield, and agtron readings have important bearing on suitability for milling and acceptability of the final product. Vitreous pearly white endosperm types, for example, have high commercial milling yields and are highly sought by industry. High agtron readings translate into whiter products and are preferred in the market.

Results

All 14 landraces had unique grain-quality traits. Their hardness indices (characterized by visual hardness score), floaters, and water absorption index, complemented by the quantitative dehulling loss, were compared to those of such released improved varieties as Macia and Pato. The landrace mean values particularly for visual hardness, floaters, water absorption, and dehulling loss were far better and more acceptable than those of released short-season sorghums. The agtron readings (dry) of landraces were also better than those of the released cultivars (Table 1).