Partnerships for Progress: The SADC/ICRISAT Sorghum and Millet Improvement Program

A. INTRODUCTION

Large parts of the Southern African Development Community (SADC) are semi-arid, with erratic rainfall and nutrient-poor soils. While maize is the major cereal crop in the region as a whole, sorghum and pearl millet are crucial in the driest environments, where rural farm households have the poorest resources and the lowest incomes. Sorghum and pearl millet, being drought-tolerant, have a strong adaptive advantage and lower risk of failure than other cereals in such environments. Agricultural development and food security initiatives for the drier areas of the region, therefore, must focus on sorghum and pearl millet production systems.

The SADC/ICRISAT Sorghum and Millet Improvement Program (SMIP) was launched in 1983, in response to a recommendation made by the SADC Heads of State. The program is currently in its fourth phase (1998-2003). A partnership-based approach involving multiple stakeholders, commitment by participating governments, and strong donor support have enabled SMIP to make significant contributions to agricultural development in southern Africa.

Title: SADC/ICRISAT Sorghum and Millet Improvement Program
Objectives: To improve food security and incomes among small holder farmers in semi-arid areas of the SADC region. This will be achieved in partnership with national research programs and other stakeholders, by developing and disseminating new technologies to improve productivity in sorghum and millet-based systems
Activities: Infrastructure and human resource development to build research capacity. Research and technology exchange, targeted primarily at small holder farmers in drought-prone areas. Networking to leverage the strengths of various partners and accelerate technology diffusion. Policy research to provide a basis for informed decisions by national programs, ministries of agriculture, donors, and other stakeholders. Impact assessment to quantify benefits generated by SMIP and its partners, and guide the development of the program over time.
Area: Genetic resources conservation and enhancement, natural resources management, socio-economics and policy research, building research and technology exchange capacity in national programs.
Region: The program targets semi-arid areas (drought-prone, therefore poverty and food insecurity endemic) of the SADC region. Eleven countries in sub-Saharan Africa have been involved – Angola, Botswana, Lesotho, Malawi, Mozambique, Namibia, South Africa, Swaziland, Tanzania, Zambia, and Zimbabwe.

B. STAKEHOLDERS

Beneficiaries
The primary beneficiaries, and the main focus of SMIP research, are small holder farmers in the drought-prone, semi-arid areas of southern Africa. These areas cover approximately one-third (6.8 million sq km) of SADC, and support one-fourth (35 million) of the population. Small holder farmers in these regions operate at the margins of subsistence, contending with a host of difficulties – erratic rainfall, nutrient-poor soils, pests and diseases, cash and labor shortages, and lack of access to input and output markets.
The second group of beneficiaries are the SADC national research programs. Here the focus has been on better access to knowledge, germplasm and other technology; improved research infrastructure; and human resource development through short- and long-term training.

Research partners
Regional oversight is through SACCAR. Partners include ICRISAT, national research and extension programs, universities, international research institutes, NGOs, farmers’ organizations, policy makers, and the private sector. The program is implemented through collaborative research work plans in each country, which are developed jointly by all participants on an annual basis.

Donors and budget
SMIP was launched with funding from USAID, which continues to be the main donor. CIDA provided additional funds from 1986 to 1995, and BMZ/GTZ from 1988 to date. Budgets for Phases I to III were approximately US$ 20, 20, and 7 million respectively. The budget for Phase IV is approximately US$ 4.8 million for the 5-year period 1998 to 2003. However, project implementation costs in Phase IV are considerably higher than this. The shortfall is met through contributions from partners -- staff salaries and allowances, transport, use of facilities, and co-funding of operational costs. Partners included national programs, NGOs (World Vision, Oxfam, and many others), donors (e.g., GTZ/BMZ and DANIDA support for seed initiatives), and the private sector (Seed Co, Induna Foods). ICRISAT contributes an additional US$ 300,000 per year from its core funds. Partner contributions accounted for about 30% of SMIP’s operational expenditures in 1999, clearly demonstrating that SMIP’s partners are fully committed to the program, and willing to use their own resources to implement collaborative work plans.

C. PROJECT RESULTS AND IMPACT

SMIP and its partners have contributed substantially to agricultural R&D across the SADC region – stronger national research programs, higher productivity, a better understanding of environmental and socio-economic factors in agriculture, and improvements in food security and farm incomes.

Main Results
Development of infrastructure and human resources. SMIP helped upgrade equipment and facilities at national research stations in Botswana, Malawi, Namibia, Tanzania, Zambia, and Zimbabwe. Human resource development involved collaboration between INTSORMIL and SMIP, to support 96 national scientists from 9 countries for advanced degrees: 34 PhD, 53 MSc, 9 BSc. To date, 536 scientists and technicians have received in-service training at ICRISAT stations in India and Zimbabwe. Many more have benefited from workshops, study tours, and in-country courses organized or sponsored by SMIP. These efforts have helped develop strong scientific capacity in the region -- a necessary enabling condition for real partnerships.

Collection and preservation of germplasm. Working with national programs and the SADC Plant Genetic Resources Centre, SMIP has helped conduct germplasm collection missions for sorghum and pearl millet in eight countries. A “seed bank” was established at Matopos, which now contains 13,500 accessions indigenous to southern Africa, and another 75,000 lines of genetic stock, breeding lines, and populations developed jointly by NARS/ICRISAT teams in the region. These efforts have helped preserve and document indigenous genetic diversity, and create a more diverse genepool from which national breeding programs can select and incorporate specific traits.

Variety development and release. SMIP has distributed over 130,000 sorghum and pearl millet genotypes to SADC national programs, assisting them in the development of a range of new varieties suitable for their own environments. Over the past 15 years, 46 improved varieties (27 sorghum, 19 pearl millet) have been released by 8 SADC countries -- Botswana, Malawi, Mozambique, Namibia, Swaziland, Tanzania, Zambia, and Zimbabwe. In comparison, only 24 varieties had been released before SMIP was launched. The improved NARS/SMIP varieties give 20% higher yields than traditional varieties, with the potential for further gains if improved crop management methods are used. Equally important, they mature earlier (up to one month earlier than traditional varieties), reducing the risk of drought-induced crop failure and significantly improving food security in semi-arid areas.

Seed production and distribution. Non-availability of seed is a major constraint to the adoption of new varieties. SMIP has led a series of initiatives to address this problem. These include provision of breeder and foundation seed and seed parents, assistance with purity maintenance, and technical support to develop sustainable national-level seed production systems. SMIP also works with NGOs in Tanzania, Mozambique, and Zimbabwe to promote community-based seed production. SMIP has conducted a major study on the variety release process, and seed production and distribution, in six countries. Recommendations from the study are helping national policy makers strengthen seed systems and accelerate the development and dissemination of new varieties.

Dissemination of Results

At the regional level, research results are disseminated through networks, training programs, workshops, publications, and library services (access to global agricultural databases, bibliographic services, etc), and through regular interaction among a wide range of stakeholders.

In each country, dissemination remains the responsibility of the national program. However, SMIP responds to national priorities, and provides training, technical support, genetic material, and linkages to ICRISAT’s global research programs, and facilitates the development of in-country linkages (e.g., support for national stakeholder meetings) through the multi-partner work planning process.
Impact of the Project

Infrastructure and human resources. In 1983 there were only 35 scientists working on sorghum and pearl millet in the region, and infrastructure and funding were limited. With another 87 scientists having received post-graduate training, SADC today has a large pool of highly trained research staff. Infrastructure and facilities have significantly improved, and these crops are receiving greater attention from policy makers. Improvements in national research capacity have ensured that collaborative projects are well implemented, and that the flow of new technologies – developed within the region – will continue to provide the foundation for agricultural development. An additional impact is that today, all participating national programs have established links with local partners and routinely work with extension, NGOs, farmers, and the private sector, to develop and deliver improved technologies.

Variety adoption. Significant adoption of new varieties is occurring in a number of countries. For example, NARS/SMIP varieties are grown on 38% of the sorghum area in Zambia and 30% Zimbabwe. The pearl millet varieties occupy 49%, 30%, and 27% of millet area in Namibia, Botswana, and Zimbabwe respectively. Surveys in 1997 indicated that about 15% of the sorghum and pearl millet area in the entire SADC region was sown to new varieties. Except in South Africa, virtually all this adoption was achieved with direct (variety development) and indirect (training and collaborative research) SMIP support.

Spillover benefits. The regional nature of SMIP facilitates the rapid dissemination of technology across countries. For example, the sorghum variety Macia, originally developed and released in Mozambique, has also been released in Botswana, Zimbabwe, Namibia, and Tanzania. The pearl millet variety Okashana 1, after proving highly successful in Namibia, was released in Malawi and Botswana. Such spillovers have greatly reduced both time and costs involved in variety development and release, stimulated the expansion of regional seed sales, and significantly improved returns on donor investment in agricultural research.

Impact assessment studies. The economic value of these benefits has been documented by NARS/SMIP studies in different countries. In Namibia, investments by SMIP and the Namibian pearl millet breeding program in developing and disseminating Okashana 1 have yielded an Internal Rate of Return (IRR) of 50%, and provided benefits with a net present value of US$ 11 million in 1998. In Zambia, investments in sorghum breeding have yielded an IRR of 10% at current adoption rates (38% of cropped area). But adoption is expected to increase. An adoption rate of 50% would yield an IRR of 15.4% and benefits with a net present value of US$ 6.4 million. In Zimbabwe, investments by SMIP and the national program in two varieties, sorghum SV 2 and pearl millet PMV 2, have yielded an IRR of 27%, at current adoption levels, rising to 34% at a more realistic adoption of 50%. The stream of net benefits from these two varieties ranges from US$ 7.8 million to US$ 28.9 million depending on future adoption rates. These figures represent simply the value of increased productivity. There are also substantial additional benefits (food security, nutrition, reduction in dislocation caused by drought) to smallholder farmers in some of southern Africa’s most drought-prone regions.

D. PARTNERSHIPS

Respective Roles of Different Stakeholders, Coordination Mechanisms for Project Design, Implementation, Management, and Result Dissemination

The range of stakeholders in SMIP, and the nature of their participation, has evolved over the years, in response to changes in research focus and priorities. During Phases I and II, the emphasis was on developing technology, infrastructure, and human resources, through collaboration between SMIP and the
national research program in each country. As these goals were achieved, the emphasis in Phase III shifted towards technology exchange, with a greater role for extension, NGOs, and other stakeholders. The objective was to widen the range of partnerships in order to stimulate technology adoption. This approach is central to Phase IV, to the extent that quantifiable parameters to measure the success of the partnership-building process are built into the project monitoring system.

From the start of Phase III, oversight of SMIP has been provided by a Regional Steering Committee, whose composition is approved by SACCAR. The current Steering Committee includes representatives from NARS (5 members), universities (1), extension (1), NGOs (2), farmers’ organizations (1), seed industry (1), milling industry (1), stockfeed industry (1), SACCAR (1), and the SMIP Project Manager (1). This gives partners considerable ownership of the SMIP program.

The following information on the roles of stakeholders in the program reflects the current implementation of SMIP Phase IV.

**Project design:** Phase IV was designed by ICRISAT, SACCAR, and donors, with input from the Steering Committee, and based on knowledge of existing constraints in the region and the interests of NARS. A draft of the proposal was widely circulated to stakeholders in the region, and then presented and discussed at a large stakeholders conference. Participants included representatives from SACCAR, research and extension, policy makers, universities, NGOs, farmers’ organizations, the private sector (seed, milling, and stockfeed industries), donors, ICRISAT, and other advanced research institutions both regional and international. About 150 people attended, including all Steering Committee members. Outputs from working groups at the conference were incorporated into the proposal, which was then reviewed by SADC and submitted to SACCAR and the donors for approval.

**Project implementation:** The heart of project implementation lies in the work planning process. This is typically done through NARS at the national level, with all local stakeholders participating in the joint development of specific annual work plans. For each activity, work plan documents are developed that indicate the rationale, activities, expected outputs, and individuals responsible for each activity. They also contain a budget, and indicate all sources of funds. Each work plan is then reviewed by a sub-committee of the Steering Committee for technical quality and focus, amendment if necessary, and approved. Program funds are disbursed based on approved work plans and work plan coordinators are responsible for local implementation. Annual technical and financial reports must be submitted by each work plan coordinator before additional related work plans can be considered. This system guarantees input from all key stakeholders, as well as technical and financial accountability among implementers. It has been in place since 1994, and works well.

**Project management:** ICRISAT is the implementing agency for the program, and facilitates day-to-day operation as well as financial management. The Steering Committee provides oversight and guidance, and approves all work plans and budgets. The Project Manager reports annually to the Steering Committee and to donors on both technical and financial matters. The Chair of the Steering Committee is elected annually by members and reports to SACCAR on implementation of the program.

**Results dissemination:** Results are disseminated in multiple ways. Approved work plans and progress reports are published annually. Additional technical and financial reports are prepared annually for SACCAR and donors. Work plan outputs and workshop proceedings are regularly published, and
collaborators also publish jointly in refereed scientific journals. National and regional workshops are another important channel for sharing information and knowledge.

SMIP Phase IV targets real change at the farm level, so information dissemination at the local level is critical. At the national level, delivery of information to farmers and other stakeholders is the responsibility of the NARS. SMIP facilitates the process through support to nationally designed work plans. Approaches include on-farm research and demonstrations, training, workshops, publications, and field days.

In Phase IV, a regional sorghum and millet network (SMINET) has been established, and a regional Network Coordinator appointed. SMINET is currently part of SMIP Phase IV, but regional stakeholders will ensure long-term sustainability, so that the network continues to function after SMIP closes down. The purpose of SMINET is to share information and encourage collaborative research at the regional level. The network will facilitate collaborative research among countries, make available a regional database, and is already distributing relevant information and publications among participants.

**Added Value of Partnerships**

The pearl millet variety Okashana 1 is an example of how partnerships can create and sustain change. Okashana is an early-maturing, high-yielding variety developed by multiple institutions working together. The parent material originated in Togo. It was identified, selected and improved by ICRISAT-India, and then further developed by SMIP scientists in Zimbabwe, working with their counterparts in Zimbabwe and Namibia. An NGO-led initiative in Namibia involved small holder farmers in participatory variety selection that identified Okashana as being suitable for local conditions and preferences.

Okashana is now grown on almost 50% of the pearl millet area in Namibia. National research and extension staff worked with farmers to promote the new variety and ensure the availability of seed. The NARS developed a farmer-based seed production system with technical support from SMIP, funding from donor agencies, and additional assistance from national policy makers and development agencies. This system has now grown into a financially self-sustaining farmers’ cooperative that produces over 200 tons of certified pearl millet seed each year.

Turning good research into real benefits for farmers would not have been possible without effective partnerships. In this case, partners included national and international research institutions, extension staff, policy makers, an NGO, farmers, donors, and finally the private sector.

**E. CONCLUSIONS**

The SMIP experience provides several important lessons:

- Research can generate technologies that are very useful to farmers and other stakeholders. However, translating successful research into tangible benefits requires strong partnerships among appropriate stakeholders.
- Developing partnerships requires time and resources. However, this effort is vital if the benefits of research are ever to become available to the targeted beneficiaries.
- For partnerships to be effective, all partners must participate in both project planning and implementation, and must be accountable to the larger group, in terms of fulfilling their commitments.
Regional collaboration among researchers can lead to substantial pay-off by reducing the cost and the time required for technology development and adoption.

SMIP’s main goal is to improve household food security and incomes for small holder farmers in the semi-arid areas of SADC. New sorghum and pearl millet varieties directly address the issue of food security. But for the future, SMIP Phase IV is also focusing on crop productivity and farm incomes. Priority areas include soil fertility and soil water management, and identifying and exploiting opportunities for commercialization. Most important, the various stakeholders will continue to lead the project and determine research priorities for the future. This will ensure that SMIP remains focused on the priorities of the region and those of its primary clientele, the small holder farmer.

**Sustainability:** The issue of sustaining the progress made in SMIP is being addressed in several ways. First, by establishing a regional network. Over the period of Phase IV, it is planned that national programs and other regional stakeholders will shoulder a progressively higher share of the costs of operating the network; a good start has already been made. Secondly, ICRISAT has made a long-term commitment to its partners in the region, by establishing a “Regional Hub” in Zimbabwe. Thirdly, Phase IV is designed in such a way that over the life of this (final) phase, the costs of activities will be borne more and more by partners, and less from project funds. The first-year target for financial contributions from partners for SMIP was exceeded by a considerable margin, and the outlook for the future is encouraging.

The recent evolution of the program is in line with SACCAR’s Long-Term Strategy and Five-Year Plan, which aim to re-orient and strengthen existing networks. The objectives are two-fold. First, to improve the design and transfer of new technologies by involving end-users of research products more closely in all phases. Second, to transfer management of the networks from international executing agencies to institutions from the region; this will ensure ownership and sustainability. International agencies will concentrate on partnership building and technical backstopping.

Finally, once partnerships have been established, they tend to be self-sustaining, particularly if they are successful and productive. Because of this, there is good reason to believe that the broad range of effective partnerships that have been established through SMIP will continue to benefit the region long after the program has closed.