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S/M CRSP
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Managerial Review

Sorghum and Millet Collaborative Research
Support Program (CRSP-S/M)

March 16-25, 1987

Project Number: 931-1254.11
Grant Number: AID/DSAN-1254-G-SS-5065-00 with
the University of Nebraska as Management Entity (ME)

The Grant Agreement

The agreement for the CRSP-S/M was entered into by the U.S. Agency for International Development, grantor, and the Board of Regents of the University of Nebraska, grantee, the effective date being June 30, 1984, continuing the Program initiated in 1979. This grant was extended for three years to June 30, 1987. The Collaborative Research Support Grant carries the No. AID/DSAN/XII-G-1049, and Project No. 931-1254.11. The original grant and extensions contain specific terms and in considerable detail, the technical, fiscal and legal/regulatory requirements of the Grant.

In the course of developing a CRSP for sorghum and millet, A.I.D. entered into an agreement with the University of Missouri, the planning entity, for the preparation of a preliminary plan which would subsequently form the basis for the grant with the University of Nebraska. Once the agreement was formalized and signed, it superseded the Missouri Plan.

Team Composition

A. Team Members
   Dr. Anson Bertrand
   Consultant

   Dr. Harve Carlson
   Consultant

   Dr. Robert Jackson
   Consultant and Team Leader

   Mr. William Fred Johnson
   BIFAD

B. Team Coordinator

   Dr. Harvey Hortik
   Chief, Agriculture Production Division
   S&T/AGR/AP

Responses to Scope of Work

The Team conducted reviews at the University of Nebraska and Purdue University. While at Nebraska, the Team met with University officials, the Management Entity, the Technical Committee and the principal investigators and students of the University. At Purdue the Team met with officials of the University, principal investigators and students associated with the S/M-CRSP.

The formats for the reviews were left largely to the respective universities. (See appendix 1 for details.) They were advised that the purpose of the review was primarily managerial. However, it was generally recognized that management cannot be separated from the technical aspects. Both universities involved elected to provide an abbreviated presentation of their research projects, their training programs, and their work in the host countries. The research workers and administrators were given an opportunity to relate their thoughts on the management aspects of INTSORMIL at all levels.

Monitoring by A.I.D. and the Management Entity (ME) of the CRSP projects in the U.S. and host countries has been adequate. During the last two years, i.e., 7 and 8, the ME and A.I.D. have developed a sound and effective program of monitoring. The projects and programs they are principally concerned with, however, require additional time and staff of the ME to reduce present loads and do a more adequate and thorough job. Several groups, such as the TC, BOD, EZC, EEP, ME, missions and A.I.D. are involved in various aspects of this function. These groups as seen through the eyes of an administrator, have performed very well as stated in the CRSP Guidelines. The PIs that the team talked to pointed out that the number of reviews is excessive. Some of these reviews are mandated by A.I.D., but others are conducted as non-mandated reviews at the whims of A.I.D. In many cases, these reviews, particularly the latter results in loss of time from research and in some cases, written comments which require an expenditure of effort. The time spent by the team interviewing the P.I.'s was through the role they played as members of the TC or EZC so the coverage was minimal. A.I.D. might reexamine the duplication of effort for the reviews in light of the budget reduction. It appears that the review conducted by the Hogan team was redundant. In addition audits were conducted by the IG.

The ME and BOD should seriously look at the possibilities of outside funds to reduce the impact of the budget reduction. The Team discussed this with several members of the TC, EZC and BOD. With full authority, the ME should work directly with Missions, foundations, World Bank and other prospective donors. The top administrative personnel of the CRSP associated universities should inform knowledgeable and influential people of the progress and potential of the CRSP.

The global plan, "Fighting Hunger with Research -- A Team Effort" developed during the 6th year, is a good document. It establishes clear objectives, lays out a rational organizational plan, identifies constraints to sorghum and millet production in countries where these crops are important, assigns specific responsibilities and allocates resources.

The Sorghum/Millet CRSP is complex and difficult, but not impossible to manage. The ME is responsible for operating the CRSP Headquarters and assisting the Board, EEP, EZC and TC to carry out their duties. In addition

the ME must oversee training and work with prime site coordinators to ensure that field work moves forward smoothly. The establishment of prime sites with coordinators and EZC was an effort to decentralize management responsibility. The amount of detail that must be handled by the ME is very great. The greatest limitation to effective management is the limited amount of time that the Director and Associate Director devote to their full time positions. The Director currently dedicates 50% of his time to the CRSP Management. It is understood that the Associate Director spends 25 to 35% of his time on the SADCC training program. This team sees the need for both persons to spend full time on management activities. An important responsibility of the management team is to develop linkages with other funded activities in relevant research, both bi-lateral and multi-lateral. The P.I.'s also play an important role in this respect by identifying opportunities.

The ME has been able to move most of the projects into active collaborative research (see 1986 Annual Report). Documentation is adequate and timely, but budget support is minimal and often inadequate to fully realize all research opportunities.

A major responsibility of the ME is to provide liaison between host countries, PI's, Missions, IARCs, cooperating U.S. personnel and institutions, and AID/W. Timely accurate and complete communications are difficult when two or more entities are involved. When numerous entities are concerned as in the case of this CRSP, it is nearly impossible to operate for very long without something going wrong and there have been a few such incidences with the S/M CRSP. However, these have been fewer than with some other CRSPs. The ME knows what should be done for satisfactory liaison. It usually discharges the responsibilities with skill. Limited personnel and heavy workloads at the ME can account for most of the difficulties encountered. The EEP, during its site visits did not report any serious deficiencies. Likewise, the missions responses to queries preceeding this review did not reveal any serious difficulties. Requests for travel clearance, travel procurement, budgets and reports of training and research progress are timely and usually complete.

Memoranda of Understanding (MOU) have been negotiated between the host countries and the ME. In the beginning years, several of these were negotiated without completely considering the legal aspects of transferring funds, equipment and customs clearance procedures. The ones drawn up early in the history of the CRSP were not done with full representation of the ME, but by a Principal Investigator. Several of the MOUs did not have annual work plans. Currently there are 27 signed MOUs. The annual work plans, which are a part of the MOUs, should be updated and some of the MOUs should be revised to reflect the current conditions and status of the collaborative research work.

Training, while a by-product of the primary research activities, is very important and indeed essential for the continued success of the research. Training of LDC persons to the M.S. and Ph.D levels increases the research capability and improves the quality of the collaborating research institutions, thus providing greater assurance of continual interest and participation in research. Also, training has improved the capacity of research in the United States. This was evident in the Team visits to participating U.S. universities.

The numbers, types, and geographic distribution of the students trained are shown in Tables 1 and 2 in Appendix 4. From 1979 through 1986, 346 candidates were trained. There were, 224 Ph.D.s, 116 M.S's and 6 Post Doctorates trained.

In addition, short-term training has been provided for 22 technicians. Also there have been 15 major workshops held in different countries attended by 964 U.S. scientists and scientists from developing and developed countries. The workshops exchanged information by presenting scientific papers and sharing experiences (See Table 4, Appendix 4 for details).

The disciplines covered in training reflected the areas of research. Socio-economic training was not reported for the period 1979-1984. However, such training was being provided in 1985-1986. If projects have to be phased out, the U.S. institutions will still have a commitment to complete the degree training that was started under the project. This limits the CRSP's ability to reallocate funds from any phased-out project. Also, a process needs to be developed to maintain a rational balance in training to cover the needed disciplines after projects are phased out.

Despite the need and importance of continued training, reductions in budgets will affect training adversely. There is a need to explore with A.I.D./Washington and with Missions alternate ways to finance training, such as is being done under the SADACC research projects in which the CRSP is providing training under a sub-contract with ICRISAT.

A.I.D. has a vested interest in protecting the training activities under the CRSP for a number of reasons. First of all, advanced degree training accelerates the institutional development process in A.I.D.-assisted countries. Secondly, training as provided by the CRSP is unique and less costly than that provided through A.I.D.'s regular participant training program. The CRSP provides no scholarships for advanced degree training. Rather, candidates are employed as research assistants in the CRSP for research on problems that are relevant to the native country of the candidate. The candidate has a ready opportunity to study in the discipline related to his/her studies and to research problems of his/her country.

Such candidates have a decided advantage over those who seek advanced degrees through regular participant training programs. Much of the frustrations, improper placement, and disappointments of candidates that often plague A.I.D.'s regular program are avoided in the CRSP.

The bottom line is that the CRSP is able to provide such training at less than one half the cost of A.I.D.'s regular program. The annual cost for Ph.D. and M.S. candidates under the research-training program of the CRSP is approximately $11,000 per person per year in contrast to the approximate $25,000 paid by A.I.D. under the regular training program. This difference in training costs should be a positive factor for encouraging separate support from A.I.D. for training of host country personnel under the CRSP. To prevent reductions in the program, the ME should explore other funding possibilities with A.I.D., as well as looking to other possible sources for assistance.

The S/M-CRSP projects have strengthened host country capabilities. In those countries, such as Honduras, Botswana, Mali, Niger and Sudan, active research programs are being carried out either by CRSP scientists stationed in the countries, by short term consultancies or by training host country nationals. Improved varieties or hybrids have been developed, released and seed made available to farmers.

CRSP scientists have conducted research aimed at reducing or removing agricultural constraints to increased production. Some of these include better water management in tied-ridges in Mali and Niger, water technologies in Botswana, and insect and disease control in several countries.

Strong linkages have been established between the personnel at U.S. institutions and their overseas collaborators in related fields of experience. Students who have been trained at the CRSP institutions have a definite tie and relationship to the university which provided their academic training. In addition, the provision of limited equipment by the CRSP to overseas sites has been very beneficial toward improving the quality of research conducted in the host countries. This has also helped to firm the relationships between the U.S. and overseas institutions.

Host countries and the United States have benefitted in a number of other ways from the collaborative relationship under the CRSP. Replies to A.I.D. cables of inquiry to missions showed that host governments where the CRSP is now working want the CRSP to continue. Most of the host governments have increased their interest in and are now more willing to help finance local costs for the research program of the CRSP.

Acceptance of CRSP scientists came slowly at first, but now there is a firmly established relationship between host country and U.S. scientists. This spirit of collaboration was demonstrated at a meeting of principal investigators in Kansas City in January 1987. LDC and U.S. scientists met and discussed scientific accomplishments and problems in a cordial atmosphere. Qualified candidates for training, some 300 of them, have been entrusted to CRSP universities by host governments with excellent payoffs.

The surest way of bringing about institutional development and policy change is through the candidates trained to the Ph.D. and M.S. degree levels under the CRSP. As these candidates have returned to their institutions, they have assumed positions of leadership and influence. The relationships with U.S. scientists who have been full time researchers in the country have changed from operations to advisory roles and from long-term to short-term. assignments.

On the U.S. side, the influence of developing countries has brought about changes in universities' curricula. The experience has given the U.S. scientist a broader outlook and perspective in conducting research. New germplasm, different cultivatation practices, exotic ecologies and environments have added resources and new ideas to the U.S. scientists' research programs. Also, the students from these different cultures have enriched the teaching and research programs of the U.S. institutions.

The most lasting of relationships among scientists of different countries have resulted from programs such as this.

Also, the U.S. scientists have gained acceptance at the international agricultural research centers where they were received with skepticism at the beginning of the program. Much of the competitiveness that existed on both sides has been replaced by cooperation, reflecting recognition of the complementarity of the programs of centers and U.S. universities.

On policies, the developing countries face some of the same issues in agriculture that are faced today in the U.S. These are beyond the realm of the CRSP, but do impact on the CRSP's work when new technology developed by the CRSP is not adopted by farmers because they cannot sell their products at a price that provides incentive to produce.

There have been a number of successes in the CRSP, which have benefitted both the donor and host countries. These successes could not have been achieved without active on-site participation in the research by U.S. scientists working in close collaboration with host country scientists.

For example, the Hageen Dura-1 sorghum hybrid was developed by on-site work with ICRISAT, Sudanese scientists, and U.S. scientists from the CRSP. When the first hybrid seeds were selected for reproduction, the U.S. and host country scientists had to monitor the fields to assure that proper culture and harvest practices were carried out.

In Honduras, a similar success story can be attributed to on-site works of dedicated U.S. and local counterparts. They worked with farmers in rugged uplands to establish field trials. After some 5 years of such work, poor farmers are cultivating the improved hybrid sorghum on some 50,000 hectares of land, opening new opportunities to these deprived people.

This program was preceded by base-line socio-economic studies of farms and villages. This activity determined the approach to be used by the CRSP and established the need for improved cooking quality of sorghum to make tortillas. Breeders worked in this direction and have provided an acceptable grain to poor farmers.

This type of success story can be cited in several countries. For example in Mali and Niger, scientists from Purdue University made on-farm analyses of water conservation practices, and used tied-ridges, and improved tillage practices. These farming systems demonstrated that incomes and profits could be increased through these techniques.

Project activities in this CRSP have been directed toward realistic objectives and progress is being made toward attainment of goals established in planning documents and workplans.

The goal of the CRSP is to improve agriculture in developing countries and the U.S. through active collaborative research that contributes to the alleviation of hunger and malnutrition in developing countries by improving the availability and utilization of sorghum and millet.

The overall purposes of this CRSP are: (1) to organize and mobilize financial and human resources necessary for mounting a major, multi-institutional U.S.-host country collaborative effort which in turn provides the knowledge base necessary to achieve significant advances in alleviating the principal

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constraints to improved production, marketing and utilization of sorghum and pearl millet; (2) to improve the capabilities of host country institutions to generate, adapt, and apply improved knowledge to local conditions, and (3) to facilitate training programs for host country personnel and provide on-site technical assistance.

It is the intent of the CRSP to increase production of grain sorghum/pearl millet in those countries where these grains are the principal food crops by: (1) developing and testing new and improved technologies; and (2) teaching local scientists to solve problems related to sorghum/millet production and use. Directions have shifted and changes have been made for sound reasons. During the first six (6) years of this CRSP, the goals stated above were pursued by developing collaborative efforts along disciplinary lines related to sorghum/millet production and utilization. These were incorporated in world-wide programs on plant breeding, entomology, pathology, agronomy, physiology, food quality and nutrition and socio-economic concerns. Projects were not specifically oriented toward solving regional problems affecting sorghum/millet. With development and adoption of the global plan in 1985, this CRSP was organized along in ecogeographic zones. Although the discipline concerns have not been abandoned, the collaborative activities became more targeted toward removal of constraints to sorghum/millet production and utilization within specific regions. Goals of specific projects and activities became more focused and more relevant to host country needs.

Under the global plan, individual project goals are made more specific, and workplans are directed toward meeting specific targets which contribute to the goals in the ecogeographic zone (geographic region) and to the overall CRSP.

The shift in direction from a disciplinary approach to an ecogeographic problem solving approach has resulted in most projects becoming more regionally focused and targeted on real problems facing farmers in the region. Each project makes technical adjustments as the research progresses. The reasons for such shifts in emphasis are generally sound and well founded and have resulted in accelerated movement toward local production improvement without sacrificing contributions to institution building and training.

An analysis of progress reports indicates satisfactory advances toward reaching goals (see 1986 Annual Report). Where progress is slower than desired, budget constraints are usually responsible.

Budget reductions have slowed progress toward the goals at almost all locations and have diminished the level of collaboration and have reduced training opportunities. Further reductions in budget will likely necessitate drastically reducing expenditures at some research locations. It is recommended that CRSP management consider reducing the number of prime sites and, if further program reduction is necessary, some lower priority, secondary locations could be eliminated. Emphasis should be placed on maintaining a vigorous program at a minimum of four prime sites, thus maintaining opportunity for effective work toward the goals of increased food production, institution building, and training. It is recommended that the global plan and work plans be modified as required.

A.I.D. monitors the S/M-CRSP, yet has little input into making any major changes or shifts in the projects. This is largely true because the CRSP is

funded as a grant. With the recent budget reductions, the A.I.D. project officer should take an active role in the decision making processes concerning program modifications and associated budgetary expenditures. A.I.D./W should look at the grant document when it is extended for years 9, 10, and 11. A continuous exchange of information should be maintained between the AID/W and the CRSP to inform of predicted budget levels, on the one hand, and CRSP program responses on the other. A.I.D. has an overview of all CRSPs while the university is looking at only one CRSP and its projects. Both groups would benefit. With good communications, some savings and better use of funds may result.

It is impossible to calculate a cost benefit ratio for the Sorghum/Millet CRSP because many of the accomplishments cannot be monetized and it is too early to realize the full benefit of these contributions to food production, nutrition, resource conservation, and socio-economic development. However, it is a certainty that there have been real accomplishments that will have lasting effects. A few of the accomplishments of this CRSP are enumerated below:

1. An international network of sorghum/millet research scientists has been established.

2. U.S. university, host country and IARC scientists have jointly identified research and training needs.

3. Approximately 300 host country students have received advanced degree training.

4. Sorghum protein research has shown that two different chemicals in the seed prevent bird damage and lower digestability. With this knowledge, digestability and bird resistance can be enhanced simultaneously.

5. Sorghum root hairs exude a water insoluble oil, "sorgoleone" which has been shown to enhance germination of the seeds of the parasitic plant striga which reduces sorghum yields drastically in Africa. Identification of this chemical will accelerate development of a herbicide for striga.

6. Hageen Dura-1, a sorghum hybrid developed with CRSP assistance in the Sudan, yields 152% of the yield of the best local varieties under rainfed conditions.

7. Several sorghum lines produced by INTSORMIL projects are showing outstanding drought tolerance. Others have been bred that are highly tolerant to aluminum toxicity and can be grown in acid soils where no crops could be grown previously.

8. A sorghum variety that carries excellent tolerance to striga has been identified.

9. Yield increases of up to 26% in pearl millet have been obtained from INTSORMIL breeding work.

10. The economics of sorghum based farming systems has been analyzed, permitting recommendation of specific technologies.

11. A sorghum research network for Latin America has eminated from INTSORMIL work in Honduras.

12. Food quality research under INTSORMIL has identified the quality attributes of sorghum for use in the major food products in which sorghum is used.

13. A model has been developed which will permit a developing country to evaluate the potentials of sorghum/millet in given agro-climatic-zones.

14. The benefits of growing sorghum with a grain legume in rotation to fix nitrogen has been demonstrated.

This CRSP has had a beneficial impact on U.S. agriculture. Involvement of U.S. scientists in research in developing countries has broadened the horizons of these scientists. It has provided a broader spectrum of germplasm with which to work and has exposed them to new and different insect, disease and weed problems. The research results enumerated above relative to grain quality, bird resistance, palatability, weed resistance, drought tolerance and high yields will be of direct benefit to U.S. producers. Also work on sorghum - grain legume rotations will be valuable to U.S. producers who are striving to reduce fertilizer costs.

In the Sorghum/Millet CRSP, a worldwide research program is being effectively and efficiently managed. The ME is staffed by two senior university faculty members, assisted by one secretary and administrative assistant. In fact, the Program Director, Associate Director and the administrative assistant are working part time (the equivalent of two full time employees). While the current operation is meeting basic requirements of management, a full-time Director and Associate Director would be more able to plan future programs for the CRSP and to search for additional sources of funds.

One can appropriate ask, "How can four people, operating at the equivalent of 2.75 full-time persons manage a worldwide program, involving 41 scientists at six institutions, operating in 7 countries on 4 continents?" The answer lies in the management structure which provides assistance from representative scientists and administrators from participating universities which permit decentralization. The Board, TC and the EZC in this structure serve without pay. Their only cost to A.I.D. and the ME is their travel and per diem.

The ME is responsible to A.I.D. for the program and is accountable to A.I.D. for the use of Federal funds. The ME cannot delegate its responsibilities. However, it can and does draw on volunteer organizations for advice and assistance. All of these organizations keep abreast of the operations of the CRSP so that they can provide advice. The Board advises on policy and overall budgets. The TC, composed of some of the Principal Investigators, coordinates research programs and develops associated budgets. The EZC, composed of

senior PIs, serves as country coordinators and oversee the prime site operations. A prime country, representative of a large ecological zone, serves as the site for the principal research in that zone. Linkages are established with secondary sites. The EZC serves as the clearing house on programs of prime sites. The EZC also coordinates the preparation of budgets with the TC.

The EEP, composed of leading scientists outside of universities involved in the CRSP, objectively evaluate research performance and progress.

This system works because the participating institutions cooperate fully. The system works also because it cuts across institutions. Although there are six universities involved in the CRSP, they do not manage the CRSP. The structure described manages the CRSP with the consent of participating university scientific and administrative personnel.

The current administrative structure of the CRSP is operating at below a minimum level. There is no place to cut. Any further reduction must come from research. A.I.D. is receiving much more from the universities in this CRSP than is accounted for in the match, or is otherwise readily apparent. Futhermore, the overhead of universities does not exceed 45%, which is considerably below A.I.D. contract rates and the grant rates of private universities. The CRSP universities match A.I.D. funds at 30 to 35% instead of the required 25% contribution of nonfederal resources. In addition, other benefits to A.I.D. include the use of university laboratories and expensive scientific equipment. Most of this match comes from the cost of the time that the 41 scientists spend working on the CRSP. The salaries of most scientists are fully paid by the universities. In general, the scientists report officially that they spend 10 to 15% of their time on CRSPs. In actual practice, those contacted say that they spend 30 to 45% of their time on CRSPs.

The S/M-CRSP should not take on added responsibilities through outside grants/contracts just to expand the activity per se. Only where there are ongoing projects or projects which meet the goal and objectives of the CRSP should any outside funding be sought. During the present budget reductions, it is advisable to seek other sources of funds. For example, there are Mission projects either being implemented or ready for implementation which could be very well served by the CRSP. Some of these projects have funds for training, consultants, equipment and supplies. The CRSP personnel should be able to work on arrangements with the Mission and contractor to take advantage of these opportunities. It behooves AID/W and the Missions to be fully aware of the services that the CRSP can provide to projects, particularly at the design stage. If plans are made at that time to incorporate pertinent activities of the CRSP into the project, a better planned one can be the outcome.

If outside funds do become available, S&T/AGR's role should be to make sure that the research and training carried out with these funds clearly fit into the CRSP Guidelines, goals and objectives.

Missions in Sudan, Mali, Botswana, Honduras and Niger have benefitted the CRSP by providing direct support (funds) and logistical support including transportation and housing. This has been of great value to the sorghum/millet project in that country and has lessened the financial burden on all entities concerned.

There is good possibility for more Mission, host country, and IARC buy-ins if the ME staff can devote time to make visits to these agencies/institutions. The person who takes on this responsibility should be fully acquainted with the CRSP, speak with authority for the CRSP, and be very knowledgeable of activities in Missions, the host countries and IARCs. It would be a waste of time and money for someone who does not meet these qualifications to engage in discussions with these entities.

The relationship between the S/M-CRSP and the IARCs has been very positive. The two IARCs most closely associated with the CRSP are ICRISAT and its two centers in Africa, and CIAT. The latter was very positive in its cable reply regarding its relationship to the CRSP. The work on screening methodology to identify germplasm tolerant to tropical acid soils was developed at CIAT by the CRSP. From this screening, tolerant lines have been distributed to national programs in many countries of Latin America, Africa and Asia. Training activities of the CRSP have included thesis research of five Ph.D. students in Colombia. An international workshop, Sorghum for Acid Soils, was jointly sponsored by INTSORMIL, ICRISAT and CIAT in Colombia. Sixty persons attended.

The CRSP has taken the lead in sorghum networking activities with national programs in Latin America, and is filling a gap not covered by ICRISAT, especially in the area of acid soils research. ICRISAT reported that its cooperation with the CRSP has been excellent in the field of training and exchange of scientific information. It was also reported that continued cooperation is essential as grain quality is affected by breeding for resistance to fungal diseases and insects. Joint annual workshops have been suggested. Both of the ICRISAT programs carried out in Africa are also relying on assistance from the CRSP.

The relationship between the CRSP and the IARCs is good, should be continued, and has steadily improved. The IARCs have responded very favorably to their cooperation with the CRSP. While there is cooperation and collaboration on research, there appears to be no duplication of effort.

Attainment of all project goals and objectives, of the CRSP in the time horizon programmed in light of budgetary reductions is not possible. Although research is the primary emphasis of the program, institutional development and training have been significant outputs. Diminished budgets have and will continue to reduce the amount and rate of production of results. Budget

limitations have made it virtually impossible for the CRSP to launch programs on the Asian Subcontinent and have prevented the launching of new initiatives in several countries in Africa, Central America and South America. Activities and results are limited, resulting in slower progress toward project research goals, less effective institution building, and less, training than was originally projected. The overall effect of budget reductions will be a decrease in the amount and extent of results, thus slowing the pace of attaining overall project goals.

In some cases, budget reductions have not materially affected specific local projects because local managers have choosen to give priority to the most promising lines of endeavor. They simply will not undertake the higher risk research even though it may be very important to overall goals. Local managers are loath to allocate resources to collaborative and training efforts at the expense of on-going research. Budget reductions definitely slow attainment of project goals and in some cases prevent the undertaking of important activities.

Specific interdisciplinary research areas where cooperative efforts by two or more CRSPs would be possible and could increase the efficiency and effectiveness of the CRSPs found in those countries where there are constraints to production of other crops such as peanuts, beans and cowpeas, and sorghum and millet. These possibilities should be addressed. In most countries where these crops are grown by the traditional farmers, they are grown as mixed crops. It is very common to observe cowpeas or peanuts interplanted with sorghum. It is the exception to find any of these crops grown in pure stands. Therefore, research should be aimed at production of these crops as they are grown by the traditional farmers.

As the level of production increases through the adoption of improved varieties, the use of improved cultural practices and the increased application of agricultural chemicals, more research is needed in soil and plant relationships. Presently, much of the research conducted on fertilizers is by trial and error. There is little or no scientific information on soil analysis to determine what elements are deficient or toxic, nor on the amount of these elements available in the soil.

These are specific examples of where the the Bean/Cowpea CRSP, the Peanut CRSP and the Trop Soils CRSP could work together. The S/M-CRSP is working with Trop Soils in Mali and similar working arrangements could be developed elsewhere.

Recommendations are presented in four categories of issues; staff and management, program, funding, and training.

Staff and Management

Although staffing and management have generally been good, there are issues that need addressing:

a. The ME is inadequately staffed. Both the CRSP Director and Associate Director need to spend full time on management responsibilities. Much of the training activity of SADCC might ultimately be delegated to administrative assistants.

b. The S/M CRSP has personnel posted overseas at three locations. With due consideration to the various trade-offs and timeliness, consideration should be given to reducing permanent expatriate personnel overseas, thereby lowering costs, as trained local scientists take over their functions.

c. The ME should continue to be diligent in supervising and controlling expenditures for equipment and travel.

d. The ME has given high priority to its liaison function. This activity should continue to receive high priority with increased attention to interaction with other CRSPs and IARCs.

e. The S/M CRSP has been subjected to an excessive number of reviews during the past two years. Non-mandated reviews should be held to a minimum.

Funding

In view of recent budget reductions, the considerable progress made by the CRSP and the high probability of significant contributions in the future, maximum efforts should be made to ensure adequate funding for continuation of a vigorous CRSP. Specific actions suggested are:

a. Appropriate means should be promptly used to inform knowledgable and influential people about the CRSP to seek additional financial support.

b. This CRSP receives limited funds from Missions and host countries. These sources of possible funding should be pursued with vigor to increase and broaden the base funding for the CRSP.

c. Efforts should be made to broaden the base of support for the CRSP by seeking support from sources outside of A.I.D. and host countries, with caution to protect the autonomy of the CRSP and its concept. While the CRSP might be constrained to make direct approaches per se, there are examples in other CRSPs where indirect funding complementary to the CRSP have resulted from other donors taking on some of the CRSP activities (e.g., Canada on peanuts in Thailand and the Small Ruminant CRSP in Peru).

Recommendations

d. A.I.D. should reinstate and comply with the two-year forward funding plan spelled out in the CRSP Guidelines.

Training

Training, in its various forms, constitutes a very important part of the CRSP activities and represents one of the most valuable contributions to development of a CRSP:

a. Training should be effected primarily as a by product of research activity.

b. Efforts should be made to enhance and even accelerate training. Source of additional funding should be explored in AID/Washington, Missions, and elsewhere.

Program

Given budget constraints and the need for improved production of sorghum and millet, it is essential that program issues be under constant scrutiny. Specific issues are:

a. The Global Plan and workplans should be modified to reflect reduced financial resources.

b. The current balance of domestic and host country spending should remain about half and half.

c. Efforts should be made to give more emphasis to millet.

d. Annual program workplans should be updated and some of the MOUs should be revised to reflect the current conditions and status of the collaborative research work.

e. The CRSP is making satisfactory progress toward its objectives. These objectives remain valid and are needed. This CRSP should be authorized and funded adequately to permit it to effectively operate under the Global Plan and pursue its objectives for years 9, 10 and 11. The team strongly recommends that this be done.

Appendix 1

PROJECT EVALUATION SCOPE OF WORK

PROJECT TITLE	:	CRSP-Sorghum/Millet
PROJECT NUMBER	:	931-1254
NAME OF GRANTEE	:	University of Nebraska
GRANT NUMBER	:	AID/DSAN/XII-G-0149
LEAD SCIENTIST/CONTACT	:	Dr. Glen Vollmar CRSP/SM Program Director
REVIEW DATES 3/15-18/87		A. University of Nebraska, B. Purdue University, 3/19-20/87
TYPE OF REVIEW		Administrative Management Review
TEAM COMPOSITION		A. Team Members:

1. Dr. Anson Bertrand
   Consultant

2. Dr. Harve Carlson
   Consultant

3. Mr. Robert Jackson
   Consultant and Team Leader

4. Mr. Fred Johnson
   BIFAD

B. Team Coordinator

Dr. Harvey J. Hortik
Chief, Agriculture Production Division
S&T/AGR/AP

A. PURPOSE AND RATIONALE FOR THE A.I.D. ADMINISTRATIVE MANAGEMENT REVIEW

The CRSP Guidelines recommended that A.I.D. team evaluations of CRSPs be performed every third year of their program and when possible to be coordinated with the normal activities of the External Evaluation Panel (EEP). This procedure was suggested as a way to conserve the time of host country collaborators, allow for observations on the modus operandi of the EEP and provide a convenient method for interactions between the A.I.D. grant, subgrant and institutional representatives (U.S. and host country collaborators). The EEP for the Sorghum Millet CRSP completed its special evaluation for the Triennial Review in January 1987.

B. TEAM COMPOSITION

1. Dr. Anson Bertrand, Consultant, is the former A.I.D. Agency Director for the Directorate for Food and Agriculture. He is a soil scientist by training and currently a private consultant. He has extensive experience with the U.S.D.A. and A.I.D. in research administration, project design and evaluation.

2. Dr. H. J. Carlson, Consultant. He has 28 years of U.S. Government services as a research administrator. He retired from the National Science Foundation in 1972. From 1972-1977 he was self employed as a research and grants consultant for U.S. universities. Since 1977 he has done short-term consulting for A.I.D. on research administration, most recently on projects at the University of Missouri, Idaho, Nebraska and Michigan State.

3. Dr. Robert Jackson, Consultant and Team Leader. He is a former A.I.D. Project Manager and S&T/AGR/AP Division Chief. He has been working as an international agriculture consultant since his retirement in January 1986 and has over 30 years of international research and management experience as an agronomist and production specialist with A.I.D.

3. Mr. W. Fred Johnson, BIFAD, is an agricultural economist with a long career in development assistance, working with A.I.D. in Washington and with several country missions, and formerly with FAO..

C. DATES AND PLACES OF EVALUATION

1. PARTICIPATING INSTITUTIONS

University of Nebraska - March 15-18, 1987
Purdue University - March 19-20, 1987

D. COST ANALYSIS FOR EVALUATION

Name	Travel	Per Diem	Salary Consultant fee	Source of funds
H. Hortik (A.I.D. project officer)	785	450	-	S&T/AGR operating expense
Dr. Anson Bertrand (Soil Scientist) Consultant	835	1200	3500	S&T/AGR Project #936-4109 (purchase order program funds)
Dr. H. Carlson (Research Administrator) Consultant	1185	1200	3500	S&T/AGR Project #936-4109 (purchase order program funds)
Mr. W. Fred Johnson (Agricultural Economist)	785	450	-	BIFAD operating expense
Dr. R. Jackson (Agronomist, Consultant)	835	1200	3500	S&T/AGR Project #936-4109 purchase order rogram funds)

Total cost to S&T/AGR:

Operating Expense: 1,235
Program Funds: 16,955

E. BACKGROUND

The Sorghum/Millet CRSP (S/M CRSP) was initiated under the Title XII Support Act and the Grant Agreement was accepted and signed by the University of Nebraska in July 1979 for a five-year period at a cost of $14.5 million. A one-year extension was granted from July 1984-85 and a 2-year extension for July 85-87. For this period, $11.992 million have been committed by A.I.D. under terms which require a minimum cost sharing contribution. It was also anticipated that overseas collaborators would contribute substantial resources for the S/M CRSP research activities.

The long-range goal of the S/M CRSP is to make a substantive contribution to the eradication of hunger and malnutrition in identified developing countries where sorghum and millet are major sources of calories and protein. Forty one research projects were selected to initiate activities and the University of Nebraska was designated as the Management Entity. Five U.S. institutions are responsible for providing leadership to the projects and are actually subgrantees of the S/M CRSP. At present, there are seven LDCs and three IARCs collaborating in the research projects. Each host country has an established

agricultural institution, staffed by scientists, trained personnel and students with whom the S/M CRSP scientists are able to collaborate. These institutions provide the extension links for the practical adoption of sorghum and millet research findings developed under the project. The sites are representative of the various ecozones and production systems encountered in the tropics and subtropics.

F. PROBLEMS AND ISSUES TO BE ADDRESSED BY THE TEAM

The following specific items should be considered by the team:

1. The S/M CRSP has just begun its eighth year while some project activities have been in a functional mode for a longer period, i.e. from the former individual university contracts. Has monitoring by A.I.D. and the ME of the CRSP projects in the U.S. and host countries been adequate? Several groups, such as the TC, BOD, EEP, ME, Missions and A.I.D. are involved in various aspects of this function. Have these groups performed as outlined in the CRSP Guidelines? Are there marginal or redundant activities that should be deleted from the CRSP?

2. Is the S/M CRSP too complex for efficient management? Has the ME been able to move the projects into active collaborative research with appropriate documentation and budgetary support? Has it provided the necessary liaison between host countries, PIs, Missions and A.I.D. for travel procurement, training, reports and budgets? Has a meaningful global plan been developed?

3. Memoranda of Understanding (MOU) have been negotiated between the host country and the ME. Are these MOUs and the annual work plans complete, concise and comprehensive enough to cover the situations for each agreement?

4. What has been the progress in training of students and/or technicians both overseas and in the U.S.? Which, if any, areas of speciality need more focus? With the recent budget reductions, should the training focus and quantity be reduced further?

5. Have the S/M CRSP projects strengthened host country capabilities? Are strong linkages being established between U.S. institutions and their overseas collaborators in related fields of experience?

6. Has the S/M CRSP had an impact in host country and U.S. institutional research activity priorities and government policies?

7. Have host country and U.S. institutional collaborators become involved at the project worksites?

8. Have the projects been directed towards their objectives and are they reaching their goals as established in their work plans and progress reports? Have directions shifted and have changes been made? Were their reasons valid for these changes? With reduced budgets, what modifications to project goals and work plans should be considered? Should specific amendments be introduced for FY 87 and FY 88?

9. A.I.D. monitors the S/M CRSP, yet has little input into making any major changes or shifts in the projects. This is largely true because the CRSP is funded as a grant. With the recent budget reductions, should the A.I.D. Project Officer play a more active role in the decision making process including project design and budgetary expenditures?

10. How cost effective has the S/M CRSP been? Can a cost benefit ratio be calculated? What success stories are there to support the cost effectiveness? What impact has the S/M CRSP had on U.S. agriculture?

11. Is the present structure the most cost effective and efficient management structure? Can administrative funds be reduced?

12. Should the S/M CRSP take on added responsibility through outside grants/contracts? If so, what is S&T/AGR's role in monitoring the S/M CRSP with this additional funding?

13. What mission projects has the S/M CRSP supported? What are the missions' comments on in-country collaborative research projects through the S/M CRSP? What are the chances for more Mission, Host Country and IARC buy-ins?

14. What is the relationship between the S/M CRSP and the IARCs? Is there too much co-mingling or should there be more?

15. What is the chance of attaining project goals and objectives in the time horizon programmed in light of budgetary reductions?

16. Are there specific interdisciplinary research areas where cooperative efforts by two or more CRSPs could increase the efficiency and effectiveness of the CRSPs? If so, give specific examples.

G. The A.I.D. team has reports and briefing materials for use prior to and during its reviews. Some of this available information is as follows:

1. Grant document
2. Project descriptions
3. Budgets for each participating institution and each project
4. External Evaluation Panel reports
5. Sample trip reports
6. 1985 Annual Report and 5-year Report, "Fighting Hunger with Research."
7. S&T/PPC Collaborative Research Support Program Review (Hogan Report)

H. The Review Team's final written report which addresses the specific items in section F should be completed by April 3, 1987 and submitted to the Chief of the Agriculture Production Division in the Office of Agriculture.

Appendix 2

Schedule for AID/W Sorghum/Millet CRSP Management Review Team

University of Nebraska

March 16, Morning	Introductory session with the Management Entity; Drs. Glen Vollmar, Program Director and John Yohe, Associate Program Director
	Dr. Irvin Omtvedt, INTSORMIL Member, Board of Directors
	Dr. Roy Arnold, Vice Chancellor
March 16, Afternoon	Meeting with all U. of N PIs:
	Ralph Clark Max Clegg Jerry Maranville Steve Mason David Andrews Janet Buck Jerry Eastin Charles Sullivan
March 17, Morning	Technical Committee:
	Lynn Gourley Henry Pitre Jerry Maranville John Sanders Larry Butler Darrell Rosenow
	CRSP Graduate Students
March 17, Afternoon	Tour of PI research offices, laboratories and green houses
March 18, Morning	Drs. Vollmar and Yohe Dr. Roy Arnold
March 18, Afternoon	Travel to Purdue University

March 19, Morning	Dr. Woods Thomas Member, Board of Directors
	Meeting with Purdue PIs:
	Gebisa Ejeta Allen Kirleis Harry Smith
	Budget Management
March 19, Afternoon	Agronomy PIs and Students:
	Gebisa Hourley Monyo Tyler Kapram
	Biochemistry PIs and Students:
	Butler Netzley Putman Mole Tsai Daley Houber
	Tour of Biochemistry Laboratory
March 20, Morning	Ag Economics PIs and Students:
	Sanders Adesina Habask
	Food Science PIs and Students:
	Kirleis Shull Arum
	Wrap-up Session PIs and Ag Staff
March 20, Afternoon	Travel to AID/W
March 23-25	AID/W Writing Evaluation Report

Appendix 3

Mission and IARC Responses to Outgoing Cables Requesting Their Comments on S/M CRSP Activities

Triennial Review of S/M CRSP - Senegal

1. Mission supports CRSP start up via MOU with both of Senegal's ITA and ISRA (Agronomic). Good collaborative professional spirit between CRSP & Senegal scientists. Three day millet seminar produced a sound work plan.

2. CRSP management and research support has incurred few problems. French language slowed implementation but no problem.

3. Good collaboration has opened for regional workshops and publication in professional journals. ITA and ISRA scientists will gain from expanded opportunities and leadership responsibilities.

4. Mission inputs directly to CRSP will be minimal. Genetic selection and improved cereal marketing adds value of program.

Chad

Mission tested 294 lines of sorghum and millet at the Gassi seed farm. After two plantings the results under rainfed conditions were very satisfactory. The Ministry of Agriculture is interested in starting a seed multiplication program for the millet variety. They will need training for the staff and operating funds. There is also interest in continuing and expanding research programs with INTSORMIL. Mission interested but cannot fund future CRSP operations due to financial constraints.

CIAT

Screening methods to identify sorghum germplasm tolerant to acid soils were developed. 1700 sorghum lines from the world collection and an equal number of elite and ICRISAT lines have been screened. Millet was found to be more tolerant to acid soils. Pearl millet germplasm is being distributed to acid soil areas of Latin America.

Training activities of INTSORMIL included 5 Ph.D students in Colombia and one Colombia Ph.D and two M.S. in the U.S. INTSORMIL, CIAT and ICRISAT sponsored an international workshop on Sorghum for Acid Soils in Colombia.

Four aluminum tolerant maintainers and male sterile lines have been released as germplasm. INTSORMIL/CRSP has taken the lead in sorghum networking activities with national programs in Latin America and is filling a gap not covered by ICRISAT, especially in the area of acid soils research. This research benefits the U.S. farmers in acid soil areas in the Southeastern U.S. and the U.S. based multinational seed companies.

Other CRSP involvement in Latin America is limitless. More training of developing country students, better adapted varieties and hybrids, the promotion of benefits of pearl millet for unfertile soils are some of the major opportunities of the CRSP in the future in this region as well as the provision of germplasm support to acid soil areas in Africa where sorghum is grown.

Honduras

1. S/M CRSP (INTSORMIL) aspects of research support have gone well and have contributed in 5 areas.
   a. Breeding - two local varieties and one hybrid. Increased breeders seed available in country.
   b. Training - 11 graduate students - sorghum related research.
   c. Natural Resources Management - Technology packages have been environmentally beneficial, reducing burning off of fields, and soil or water conservation.
   d. Base Line Information - CRSP has generated extensive information on production practices, yields, costs, pest & disease problems.
   e. International development. CRSP has strengthened the Ministry of Natural Resources Research & Extension programs. It has also assisted the Pan American Agricultural School in research and extension.

2. Problems with the CRSP management - at first, yes - lack of support, both administrative and funding. Change of government ('85-'86) resolved problems. U.S. AID Honduras, Ministry of Natural Resources and Agricultural School have an excellent relationship.

3. Opportunities for future involvement with CRSP. Include training of Honduran researchers, greater emphasis for on-farm research, technology transfer between countries and expanded support for research and extension efforts of the Ministry and Agricultural Schools.

4. The Mission is willing to continue support as long as local currency resources are available and the government is in agreement with their use for CRSP related activities.

ICRISAT

Cooperation of ICRISAT with INTSORMIL is excellent in the field of exchange of scientific information and training. Scientists from the laboratory spent sabbaticals at INTSORMIL supported facilities. INTSORMIL and ICRISAT scientists have arranged annual workshop to avoid duplication of research projects.

SADCC-ICRISAT-S&M

SM improvement program has interacted well with INTSORMIL in the following areas: (a) acid soil with aluminum toxicity in Zambia, (b) assisting INTSORMIL pathologists arrange a 1988 International meeting on SM diseases, (c) assisted Texas A&M on problems associated with sorghum in Zambia, (d) striga research beginning and, (e) arranging for 22 students to be trained in the U.S.

Sudan

This country has 15 million acres of sorghum and millet. There are many trained scientists who are looking at drought tolerance, control of weeds, striga, S/M diseases, insect pests, economics and food research. The Mission feels that INTSORMIL support should be increased.

Kenya

INTSORMIL support was timely during period when increased attention by the government of Kenya was given to sorghum following the drought. Main problem was due to the uncertainty of scope and duration. The arrangements were ad hoc without a formal agreement with Kenya. On the positive side, this project is now established and has credibility with the government which will serve well for future work.

Botswana

Germplasm exchange, funding of irrigation system, agronomic practices of rotation of legume and sorghum, statistical design and analysis and on tillage studies related to seedling and rainfall establishment are underway. INTSORMIL shared in the technology improvement project. Mission not informed about aspects of INTSORMIL/ICRISAT regional training program. Suggest INTSORMIL advance funds to assist departing students. Problem at first with no local scientist collaborating. Now changed with return of scientists and students. Mission will continue to support INTSORMIL in-country scientists.

ICRISAT Sahelian Center

Adaptation of pearl millet poses a major constraint in transfer of elite strains to West Africa due to unpredictable rainfall, parasites, and Striga. As a result of this and other natural pressures, the contributions of INTSORMIL towards improving the genetic base of the programs in West Africa is very limited.

In training, INTSORMIL has done a good job. They have organized workshops on crop improvement. The CRSP could help the Center by getting involved in research on drought resistance, cooking quality, screening techniques for Striga, potential use of wild species of Pennisetum and training programs in the U.S.

Burkina Faso

The CRSP should collaborate with national West Africa research programs complementing the research network.

ICRISAT/Mali

External evaluation on INTSORMIL has rated the Mali the best project for the following reasons: integration and multidisciplinary activities of ICRISAT national programs, TROPSOIL, CIBA GEIGBY Foundation and INTSORMIL in Mali.

Mali

INTSORMIL-supported research has gone well, i.e., training, sorghum physiology, availability of equipment, screening of varieties for food quality or drought resistance, food laboratory and coordination of projects on sorghum/millet improvement. Several problems exist i.e., financial management changes should be January/December or have reserve funds, management entity and scientist linkages should include all countries having geographical proximity, visits cleared with mission one month prior to leaving the U.S. and debriefing before leaving. Language - adequate French skills and publication through U.S. university system.

USAID/Mali would like to see the CRSP continued and expanded to other ecological zones of the country. Little possibility of mission picking up CRSP projects.

TABLE 1

SUMMARY OF TRAINING BY CONTINENT

1979 - 1987

	Ph.D./M.S. Post Doc	Non-Degree
AFRICA	119	3
NEAR EAST	24	2
ASIA	41	2
LATIN AMERICA	94	14
U.S.	58	-
OTHER (U.K. Europe, Australia, Canada)	13	1
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TOTAL	349	22

(Ph.D = 216, M.S. = 126, Post Docs 7 - Total 349)

TABLE 2

SUMMARY TRAINING BY CONTINENT & DISCIPLINE

1979-1984, 1985-1986 AND 1986-1987

	1979-1984 M.S./ Ph.D	Post Doc	Non Degree	1985-1986 Ph.D/M.S.	1986-1987 Ph.D/M.S.	Total Ph.D/M.S.	Non Degree
AFRICA							
Agron/Physiology	23	1	1	6 + 2	2	34	1
Plant Breeding	27	1		8	4	40	
Entomology	10			6	2	18	
Pathology	6			2	3	11	
Food Quality & Utilization	7		2	2	1	10	2
Farming Systems							
Socio-Economics				2	2	4	
Striga Research				1	1	2	
Sub-Total						(119)	(3)
NEAR EAST							
Agron/Phsiology	3	1	1	4 + 1		9	1
Plant Breeding	5		1	3		8	1
Entomology	-						
Pathology	1					1	
Food Quality & Utilization	-			2		2	
Farming Systems	-						
Socio-Economics	-			2	2	4	
Sub-Total						(24)	(2)
ASIA							
Agron/Physiology	4	1		3 + 1	7	16	
Plant Breeding	7			2	2	11	
Entomology	2	1				3	
Pathology	1		2	1	2	4	2
Food Quality & Utilization	1				2	3	
Farming Systems	-						
Socio-Economics	-			2	2	4	
Sub-Total						(41)	(2)

TABLE 2 - CONTINUED

SUMMARY TRAINING BY CONTINENT & DISCIPLINE

1979-1984, 1985-1986 AND 1986-1987

	1979-1984 M.S./ Ph.D	1979-1984 Post Doc	1979-1984 Non Degree	1985-1986 Ph.D/M.S.	1986-1987 Ph.D/M.S.	Total Ph.D/M.S.	Non Degree
LATIN AMERICA							
Agron/Physiology	13			3	1	17	
Plant Breeding	16		1	7	5	28	1
Entomology	6	1		5	4	16	
Pathology	9		2		4	13	
Food Quality & Utilization	11			4	3	18	
Farming Systems			11				11
Socio-Economics				1	1	2	
Sub-Total						(94)	(14)
OTHER (Canada, Australia, U.K. Europe)							
Agron/Physiology				2	1	3	
Plant Breeding	7		1			7	1
Pathology	1					1	
Food Quality & Utilization				1	1	2	
Sub-Total						(13)	(1)
U.S.							
Agron/Physiology				7 + 1	6	14	
Plant Breeding				17	4	21	
Entomology				3	2	5	
Food Quality & Utilization				6	4	10	
Socio-Economics				4	4	8	
Sub-Total						(58)	
TOTAL						349	22

TABLE 3

WORKSHOPS

1979 - 1986

	Attendance
Sorghum in the 80's. ICRISAT - 1984	100
Agri-Meterology of Sorghum/Millet in Semi-Arid Tropics. ICRISAT - 1982	75
Consultative Meeting and Review of Sorghum Research A.I.D. Development Los Banos, PI, 6-84	40
Evaluating Sorghum For Tolerance to Aluminum Toxic Tropical Soils in Latin America. CIAT - 5/84	50
Sorghum Disease - Short Course for Latin America. Mexico - 3/81	52
South Texas Sorghum Disease Confereence Corpus Christi, TX - 6/82	75
South Texas Sorghum Insect & Disease Conference. Corpus Christi, TX - 7/83	75
South Texas Graduate Training Field Day. Corpus Christi, TX - 6/84	75
Striga Workshop. Raleigh, NC - 8/82	27
Consultative Group. Discussion on Research Needs for Control of Sorghum Root and Stalk Disease. Bellagio,k Italy - 12/83	28
International Pearl Millet Workshop. ICRISAT/INTSORMIL - 5/86	100
INTSORMIL/INRAN Sorghum/Millet CRSP Workshop - 10/85	65
Sorghum Workshop - Dominican Republic - 3/84	45
Sorghum & Millets in Latin American Farming Systems - 9/84 - INTSORMIL/ICRISAT/CIMMYT	99
Hybrid Seed Workshop - Sudan - 11/84	33
INTSORMIL/ICRISAT/CIAT/CIMMYT Seed Workshop - 10-85	200
TOTAL ATTENDANCE	1139