UNCLASSIFIED
CLASSIFICATION

PD-AAP-238

PROJECT EVALUATION SUMMARY (PES) – PART I

Report Symbol U-4

1. PROJECT TITLE	2. PROJECT NUMBER	3. MISSION/AID/W OFFICE
CRSP-Sorghum/Millet	931-1254	S&T/AGR/AP

4. EVALUATION NUMBER (Enter the number maintained by the reporting unit e.g., Country or AID/W Administrative Code, Fiscal Year, Serial No. beginning with No. 1 each FY) 84-5

5/7/84

☒ REGULAR EVALUATION ☐ SPECIAL EVALUATION

5. KEY PROJECT IMPLEMENTATION DATES			6. ESTIMATED PROJECT FUNDING		7. PERIOD COVERED BY EVALUATION	
A. First PRO-AG or Equivalent	B. Final Obligation Expected	C. Final Input Delivery	A. Total	$ 19.7 mil.	From (month/yr.)	February 1982
FY 79	FY Cont'd	FY Cont'd	B. U.S.	$ 14.5 mil.	To (month/yr.)	January 1984
					Date of Evaluation Review	January 3-20, 1984

8. ACTION DECISIONS APPROVED BY MISSION OR AID/W OFFICE DIRECTOR

A. List decisions and/or unresolved issues; cite those items needing further study. (NOTE: Mission decisions which anticipate AID/W or regional office action should specify type of document, e.g., airgram, SPAR, PIO, which will present detailed request.)	B. NAME OF OFFICER RESPONSIBLE FOR ACTION	C. DATE ACTION TO BE COMPLETED
a. Reevaluate and prioritize constraints on sorghum/millet production, processing, marketing and consumption.	ME, TC, BD, EEP	6/84
b. Select principal countries for a fully integrated interdisciplinary program for sorghum and millet production, processing, and marketing. Geographic and ecological regions should be considered.	ME/ TC, EEP	7/84
c. Develop global plan	ME, S&T/AGR, TC	9/84
d. Select secondary countries to form regional networks of cooperation. Also include international and regional agricultural research centers.	ME, TC, EEP	8/84
e. Reconstitute External Evaluation Panel with emphasis on broad experience, both domestic and international, availability and commitment. Provide for ad hoc peer review committee by discipline. Establish criteria and scope of work for EEP, TC, discipline and country coordinators.	ME, TC, BD	4/84
f. Annual reports for years 2, 3 and 4 will be completed as separate entities and be included in a five year summary for the year 5 annual report.	ME	4/84
g. Evaluate CRSP internal communication process for improvement between ME and subgrant institutions, between institutions and with EEP.	ME, EEP	5/84

9. INVENTORY OF DOCUMENTS TO BE REVISED PER ABOVE DECISIONS

- ☐ Project Paper
- ☐ Financial Plan
- ☒ Logical Framework
- ☐ Project Agreement
- ☐ Implementation Plan e.g., CPI Network
- ☒ PIO/T
- ☐ PIO/C
- ☐ PIO/P
- ☐ Other (Specify) _____
- ☐ Other (Specify) _____

10. ALTERNATIVE DECISIONS ON FUTURE OF PROJECT

- A. ☐ Continue Project Without Change
- B. ☐ Change Project Design and/or ☐ Change Implementation Plan
- C. ☐ Discontinue Project

11. PROJECT OFFICER AND HOST COUNTRY OR OTHER RANKING PARTICIPANTS AS APPROPRIATE (Names and Titles)

S&T/AGR/AP:RIJackson _____ Date: _____
S&T/AGR/AP:JMYohe _____ Date: _____
S&T/AGR:JARoyer _____ Date: _____
S&T/PO:FCampbell _____ Date: 5/7/84

12. Mission/AID/W Office Director Approval

Signature: Anson R Bertrand 5/7/84

Typed Name: Anson R. Bertrand, Director

Date: S&T/AGR

Managerial Review

Project No. 931-1254.11

CRSP-S/M (INTSORMIL)

CRSP No. AID/DSAN/XII-G-0149

The United States Agency for International Development, Grantor

S&T/AGR

and

The Board of Regents of the University of Nebraska, Grantee

by

Elvin F. Frolik, Keith Byergo, Harve J. Carlson, and W. Fred Johnson

with

Robert I. Jackson, Program Manager

January 4-20, 1984

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PES PART II

13. Summary: The Sorghum/Millet CRSP (CRSP-S/M) grant was approved July 1, 1979 for five years with an A.I.D. contribution of $14.5 million. An additional $4.7 million has been contributed by the participating institution for a total of $19.2 million. The last evaluation, technical in emphasis was conducted February 1 and 2, 1982. This evaluation of an administrative nature will cover up to February 1, 1984. For activities prior to February 2, 1982, please refer to prior evaluations.

Eight U.S. universities are currently affiliated with CRSP-S/M, one is in an unfunded status pending submission and approval of a research project. Fourteen countries and four international centers (IARCs) have one level or another of collaborative activities ongoing with the CRSP. Only two, CIAT, and Honduras, have had the service of a long-term advsior. Botswana will have two agronomists and Tanzania one breeder in early 1984. Sudan and Egypt are possible countries where long-term staff can be located.

In-depth socio-economic studies have been conducted in Honduras, Upper Volta and the Sudan. The results of these studies will guide biological research and act as a base line for measuring the impact of CRSP activities in future technical evaluations. Similar studies are underway in Mexico and will be conducted in other countries before any major biological research is instigated.

Research on improved breeding material, agronomic practices, insect and disease control, seed quality, food quality, control of storage pests and stress characteristics has been carried on extensively in the U.S. institutions and to a limited extent overseas, where scientists and facilities were available.

The research and CRSP organization in the U.S. has progressed according to design. With the development of higher yielding more resistant breeding lines, and the implementation of an ongoing participant and informal training program, good progress is being made toward goal and purpose achievement.

Problems have occurred with reporting (no recent annual reports) and planning for overseas activity (no global plan). As a result of no global plan overseas contacts and projects have been developed as opportunities appeared. Consequently, a large number of diverse projects have been initiated in fourteen countries. Geographic or ecological regions have not been considered nor has a fully coordinated program evolved in any one country. The Review Team's recommendation is for a coordinated global plan, interdisciplinary in nature, that will develop sites representing various geographic and ecological regions.

Evaluations have also presented difficulties as the major decision action on projects fell to the Technical Committee (TC). The External Evaluation Panel (EEP) was not sufficiently involved with the program to satisfactorily fullfill their responsibilities. A reconstitution of the EEP with a specific scope of work for each evaluation has been recommended to resolve this issue.

The University of Nebraska is committed in its dual role as the ME and as a participating institution in the research activities. While recognizing the important roles and utilizing advice of the Board of Directors, the Administrative Council and the Technical Committee (TC) of the CRSP-S/M, the University of Nebraska administration, nevertheless, is well aware and responsive to the fact that, under the Grant Agreement, the institution is legally responsible to A.I.D. for the program and financial accountability.

B. The CRSP is a broadly based program internationally oriented with numberous publications, an extensive training program, and many linkages established among eight participating U.S. universities, four IARCs, and in institutions in 14 host countries. From discussions with LDC scientists attending the PIs conference and participant trainees in various institutions, the CRSP staff have developed excellent relations with their counterparts and laid the groundwork for far reaching long-term associations.

The observations and recommendations made here will, in the judgement of the team: (1) increase the effectiveness of the CRSP-S/M; (2) bring the program into full compliance with the terms of the grant; and (3) largely solve the problems brought to our attention by responsible and highly constructive criticism provided during the review of the CRSP.

C. An overall problem of the CRSP is the structure and balance of the overseas research activity. The great majority of the research has been accomplished in U.S. institutions. The overseas activity has been fragmented in 14 different countries with no complete program being developed in any one country. The activity in the collaborating LDCs has been primarily socioeconomic surveys, S/M nursery trials, and both academic and informal training projects. There has not been a concentration of resources needed to develop the institutional capability required to launch self-sustaining research programs designed to identify and solve S/M problems.

Only two countries have had long-term (one year or more) assignments of U.S. scientific staff. These are with the Ministry of Agriculture in Honduras and CIAT in Colombia. These programs have concentrated on germplasm evaluations at both sites plus socioeconomic studies in Honduras. Tanzania and Botswana are expected to get long-term U.S. staff assigned in the early spring of 1984.

To correct this problem of structure and balance in the CRSP, the Review Team recommends:

1. A reevaluation and prioritization of the constraints on improved S/M production, processing, marketing and consumption.

2. The selection of primary developing countries in which to establish a complete S/M development program. Consideration must be given to the importance of S/M as a staple food, geographic and ecological zone representation, the existing and potential for enhancing the research infrastructure and facilities, political and economic stability, cooperativeness and willing to have policies conducive to improved S/M production, processing and marketing.

3. The development of a broad global plan considering 1 and 2 above and the establishment of networks to secondary countries in the region of the principal countries. This plan should consider the broad areas of research and development that can be accomplished at LDC sites and the backup activity required in the U.S. or IARCs. It is recommended that the initial draft of such a plan be prepared by the ME in consultation with a representative(s) of AID/S&T/AGR utilizing a consultant(s) with strong scientific background and considerable overseas experience.

4. Regional and principal country plans can then be developed based on the Global Plan but tailored to the specific needs of the region, sites and institutions involved in the various networks. The principal country plans should be formalized with a Memorandum of Understanding (MOU) between the ME and the host country, and a long-term work plan with a budget that is revised annually. The work plan should include social science and nutritional studies as well as biological science research.

Other factors to consider in the principal country site plans would be:

a.) Long-term U.S. scientific and administrative staff postings;

b.) provisions to support TDY staff conducting research in the host country;

c.) provisions for technical assistance on research and institutional development;

d.) establish a manpower training program for research and institutional development and;

e.) provide for buy-ins, A.I.D./mission, or other donor support of CRSP activities which complement CRSP goals.

D. Another problem observed was the lack of involvement of the External Evaluation Panel (EEP). This Panel, comprised of prominent U.S., LDC and IARC scientists, provides the primary evaluation function. However, they have not been kept well informed of INTSORMIL activity; performed regular site visits or spent much time in program reviews. The result has been that most of the action involving fund reductions or increases, annual budgets, and project termination has fallen to the TC. This has caused some institutional and discipline pressures on TC members that has reduced evaluation effectiveness. Further, the broad gage external element of the evaluation has been lacking, sometimes resulting in less than objective assessments of a project or activity.

Review Team recommendations for the EEP are as follows:

1. Reconstitute the EEP giving major emphasis to members who are familiar with the land grant universities' research system and who have broad international experience; who have strong commitment and are available to spend up to four weeks per year on CRSP-S/M evaluations.

2. Develop criteria, job descriptions and scopes of work for EEP members.

3. Provide for ad hoc members to form peer review committees in selected disciplines.

4. Provide a distribution system for EEP members of documents, reports and minutes of meetings to keep them better informed on program activities.

5. Develop an annual calander of evaluation activities so members may plan actions accordingly.

F. A third area for comment concerns reports; communications; travel plans; A.I.D. audits and the publishing and distribution of selection criteria; job descriptions and appropriate scopes of work.

Annual reports have not been filed for the past three years. Plans are needed for a cumulative five year report. Communciations between the ME and collaborating institutions, within and between institutions and with the LDC collaborators and IARCs, needs to be more highly structured. Contact points within institutions and a system of circulating information copies requires formalization. As the CRSP becomes more active and has a larger roster of participants, this becomes more important.

Standard procedures are needed for adding and terminating institutions and projects and for developing annual work plans and budgets.

Once the above standard procedures and regulations are formulated, then a handbook incorporating the information should be published and distributed to the collaborating institutions.

Annual travel plans should be developed as a part of each institution's program with some flexability built in for unforeseen situations.

The ME, with the Review Team's concurrence, requests an A.I.D. audit of the CRSP-S/M at its earliest convenience.

G. Two other discrete actions that were raised as issues were the establishment of a gene bank and the need to request new proposals in three priority areas in which activity had been terminated.

Given USDA's primary responsibility for gene banks in the U.S. and the lack of a facility or source of funds for recurring costs, serious reconsideration should be made to spending sizable funds to initiate studies on the potential of this activity as a CRSP-S/M project.

Depending on the findings of the reevaluation of constraints and priorities, the ME and the Board of Directors, with TC comments, should consider requesting new project proposals in the recently terminated priority areas of:

1. Grain quality research;

2. research on insects in millet storage;

3. seed grain processing.

H. As a final comment, the Review Team wishes to express their appreciation for the cooperatation and hospitality shown by collaborating institutions. Both scientific and administrative staff were frank and open in their discussions, well informed on CRSP activities and receptive to requests and comments of the team.

WD0857f

MANAGERIAL REVIEW
SORGHUM AND MILLET COLLABORATIVE RESEARCH SUPPORT PROGRAM (CRSP-S/M)
January 4-20, 1984
Project Number: 931-1254.11
Grant Number: AID/DSAN/XII-G-0149
with the University of Nebraska as Management Entity (ME)

EXECUTIVE SUMMARY

I. PURPOSE OF REVIEW:

The purpose of this review was to provide information on the administration and management of the CRSP-S/M for use by A.I.D., the Joint Committee on Agricultural Research and Development (JCARD) and the Board for International Food and Agricultural Development (BIFAD) in the Triennial Review in considering an extension of the Program. While this team was not asked to look at technical aspects of the Program, it was necessary to consider some technical factors for an adequate analysis of management and administrative issues.

II. PROCEDURES:

The review was initiated by the team's attendance at the annual conference of the Principal Investigators (PIs) in Scottsdale, Arizona, on January 4-6, 1984. During this conference, meetings were held with representatives of the University of Arizona, Purdue University and the University of Kentucky. Following the Scottsdale conference, the team conducted reviews at the campuses of the following institutions: Mississippi State University, January 9-10; Kansas State University, January 12-13; Texas A&M University, January 16-17; and the University of Nebraska, the ME, January 18-20, 1984. The wrap-up at the University of Nebraska included a review of the research projects supported by the University of Nebraska and the university's role as the ME. The summary of observations and recommendations presented herein was presented orally at the University of Nebraska to Dr. Roy G. Arnold, Vice Chancellor, and Dr. Robert W. Kleis, Dean and Director of International Programs, Institute of Agriculture and Natural Resources.

III. OBSERVATIONS AND RECOMMENDATIONS:

A. The S/M CRSP, or INTSORMIL, as named by the ME, involves a large group of dedicated scientists in eight U.S. universities working collaboratively with scientists in 14 developing countries and 4 International Agricultural Research Centers (IARCs). The people involved in the Program whom we contacted showed dedication and commitment to making the CRSP a successful operation. Particular accomplishments are demonstrated by the breeding program and sorghum/millet (S/M) nursery exchanges, the socioeconomic base line studies, the extensive training program, both academic and informal, resistance to pests, and tolerance to adverse environments of new breeding lines.

14. Evaluation Methodology: This was an A.I.D. sponsored management review by a team of three consultants, a BIFAD representative and the A.I.D. Program Manager as a resource person. The outline of the scope of work is repeated as the format for the team report.

The team was provided with project documentation, previous evaluation reports current trip, and other pertinent project budget and progress reports. The annual principal investigators (PI's) meetings were attended and projects and country reports reviewed. Principal CRSP staff of three universities, Arizona, Purdue and Kentucky were interviewed on a standard format at the PI's meetings. The university campuses of Mississippi State, Kansas State, Texas A&M and Nebraska were visited, facilities toured, and principal staff interviewed again using a standard format. At the University of Nebraska the Management Entity (ME) staff as well as project research staff were interviewed. Meetings were also held with department heads, research directors, comptrollers and deans at each institution.

The meeting and report reviews gave the team a broad, detailed understanding of the workings and administration of the CRSP. Team meetings were held subsequent to each institution meeting to analyze and reach decisions on each presentation.

Cost of the review was $19,000
Team members included:
Dr. Elvin F. Frolik, Leader and Consultant
Mr. Keith Byergo, Consultant
Dr. Harve J. Carlson, Consultant
Dr. W. Fred Johnson, BIFAD, International Research Programs Officer
Dr. Robert I. Jackson, S&T/AGR Program Manager and Resource person

15. External Factors: The signing of Memoranda of Understandings (MOUs) with host country governments presented problems. Site emphasis had to be changed in the case of India and Egypt due to this difficulty and the start of other programs have been delayed. A suitable MOU format needs to be developed for the CRSPs to ease this problem.

The basic assumption remains valid. The oveaseas site selection criteria needs to be followed better to assure a satisfactory project location.

The phasing in of the four preceeding sorghum/millet projects, by the fact of their previous existance, have had considerable influence on the character of work done under the CRSP. Old relationships and activities were difficult to change thereby influencing the locale and scope of research under the CRSP.

16. Inputs: Inputs have been provided at a level commensurate with project activity. These have consisted primarily of technical assistance, formal and informal training with a small amount of supplies and equipment for research both in the U.S. and overseas. This will likely increase as more of the research is done in collaborating institutions in the LDCs.

17. Outputs: The development of improved breeding lines has shown excellent progress. There is a regular exchange of breeding materials on an international basis. Commercial cultivars in Mexico, Honduras and the Sudan are benefiting from the infusion of new germ plasm as are varieties in the U.S.

The training of personnel to fill research center positions in the LDCs has progressed very well. The establishment of self-sustaining institutions to do sorghum and millet research has not been accomplished. Good liaison has been established between U.S. and LDC scientists due to technical visits, breeding nursery exchanges, participant training, workshops and seminars.

INTSORMIL in 1983 had 167 graduate students working on various projects. About half were supported by INTSORMIL funds. The LDCs and MICs accounted for 93 students, 71 were from the U.S. and three from other industrial countries. Eight workshops have been held with an attendance of 530 participants. Seven study tours were set up and used by 17 LDC staff members. Three additional workshops are scheduled for 1984. This rather extensive training program is developing a cadre of sorghum and millet research scientists in key LDCs. However, it will require more long-term U.S. scientist activity in the LDCs to accomplish the institution building goals of the CRSP program.

The socio-economic studies in Honduras, the Sudan, Upper Volta and Mexico are underway and have been of considerable help in guiding crop research. An example is the information on the wide use of sorghum for food in parts of Central America. Also these studies will provide the base line data for determining the impact of the program on the surveyed areas.

The network of 14 countries and four IARCs that exchange germ plasm and technical knowledge on a regular basis is a major accomplishment and will be a major factor in extending the technology to the farmer level. Needed now is the infrastructure for adaptive research and extension activity to be used by this network of scientists to take their technology to the farmer.

Management comments are covered in No. 22 below.

18. Purpose: The purpose of this CRSP is to: a. Organize and mobilize financial and human resources necessary for mounting a major, multi-institutional U.S.-LDC collaborative effort which in turn is expected to provide the knowledge base necessary to achieve significant advances in alleviating the principal constraints to improved production, marketing, and utilization of grain sorghum and pearl millet in LDCs and b. improve the capabilities of appropriate LDC institutions to generate, adopt and apply improved knowledge on grain sorghum and pearl millet to local conditions.

The CRSP has made excellent progress in mobilizing resources for U.S.-LDC collaborative research. A considerable body of knowledge has been generated on plant breeding, pest control, stress related problems and socio-anthropological constraints. Work is underway on marketing and utilization and an extensive LDC staff training program is ongoing. The problem remaining is the development in the LDCs of self-sustaining research institutions which in turn can motivate the necessary extension activity to gain farmer adoption of the new technology.

The implementation of the organizational and evaluation recommendation in No. 22 should impact strongly on this problem.

19. Goal: The major goal of this CRSP is to increase production of grain sorghum/pearl millet in those countries where they are the principal crops. This is to be achieved by:

Sub-Goals

- Developing and testing new and improved technologies, and;
- Teaching local scientists to solve problems related to sorghum/millet production and use.

Progress has been made in the two sub-goals but this has not translated into increased production due to lack of adaption by many farmers. While the CRSP does not have the responsibility for gaining farmer adoption it must provide the training and motivation for research staff to work with their local extension divisions and assist in providing technology to farmers.

Plant breeding programs with the appropriate technology are now underway in a number of countries that will provide adapted varieties with increased yield potential necessary to increase farm production.

Progress to date is totally satisfactory and is a direct result of the mobilization of staff and resource and the development of breeding lines suitable for various LDC conditions by the CRSP-S/M staff.

20. Beneficiaries: The ultimate CRSP beneficiaries are producers and consumers of grain sorghum and pearl millet in the LDCs. Producers are expected to benefit through improved production methodologies which reduce the possibilities of crop failure, increasing crop yield and decreasing the per unit costs of production which should result in increased income and improved standard of living for producers. Consumers are expected to benefit through:

- More reliable supplies of these food grains at stable prices in the market place, and;
- Availability of food grains that are more nutritious and with desirable taste, color and digestibility characteristics.

The beneficiaries to date have been LDC staff who have received either long or short-term training or experience with counterparts. There has also been some improvement of facilities and equipment for research. The trained staff are already improving research quality in their respective positions. This will increase as more long-term participants return to their LDC posts.

The limited introduction of new varieties and the accompaning cultural practices give every indication that where adapted these new inputs will be readily accepted. Another caveat is that LDC governments must provide reasonable incentives in the form of farm gate prices if they expect to have farmers make the additional efforts and assume additonal costs to increase production.

21. Unplanned Effects: None pertinent at this time.

22. Lessons Learned: While the flexability allowed by a loosely structured program initially allowed a wide proliferation of activity, without a global plan to coordinate activity the result was a collection of subprojects and not a concise cohesive program. The Review Committee recommended the development of a global plan as called for in the grant agreement. This would follow a reassessment and prioritization of major constraints to increase sorghum and millet production. Prime countries would be selected as geographical and ecological centers of excellence that would have the staff and resources to potentailly be a leader in sorghum and millet technology in its area. A network of countries of similar ecology would be organized to work closely with the prime country and CRSP researchers in adaptive research and develop a production, processing and marketing system for the area.

It would be expected that a total program would be developed at the prime site with technology and training being distributed out from the point.

Improved communication in and between CRSP entities both in the U.S. and overseas would be very beneficial in the distribution of reports bulletins and other CRSP material.

Lack of involvement of the EEP resulted in CRSP evaluation problems. The EEP was not kept well enough informed or closely enough involved with the various CRSP projects to provide an indepth realistic review. Reconstituting and broadening the scope of the EEP and allowing for the formation of ad hoc peer review commitees for various disciplines would resolve the problems that arose when the major review responsibility was given to the Technical Committee (TC) and Board of Directors. Major changes of subprojects should be as a result of EEP review in which the TC and Board concurred.

In regards to the establishment of country programs, it should be the responsibility of the Management Entity (ME) to negotiate and finalize the Memorandum of Understanding (MOU). Scientific staff may be involved in the development of scopes of work but the ME representative is the only one qualified and knowledgeable about the lead institution's policies to conduct discussions and sign the MOU.

23. Special Comments: AID/W Administrative Review Report.

S&T/AGR/AP:KByergo:lsl:2/21/84: ext 235-2318 (WD 0834f)

I. THE GRANT AGREEMENT

The agreement for CRSP-S/M was entered into by the U.S.A. Agency for International Development, grantor, and the Board of Regents of the University of Nebraska, grantee, the effective date being July 1, 1979, and the expiration date June 30, 1984. The "Collaborative Research Support Grant" carries the No. AID/DSAN/XII-G-0149, and Project No. 931-1254.11 (1). (Numbers in paranthesis refer to the titles in Section X , "Literature Cited.") The document spells out in concrete terms and in considerable detail, the technical, fiscal and legal/ regulatory requirements of the Grant. The organizational chart for CSRS-S/M (Intrsormil) is shown in Appendix 1.

In the course of developing a CRSP for sorghum and millet, AID entered into an agreement with the University of Missouri for the preparation of a preliminary plan which would subsequently form the basis for the grant agreement (with the University of Nebraska). Once the present agreement was formalized and signed, it superseded the Missouri Plan. Accordingly, the Evaluation Team made no reference to the latter during the review.

II. TEAM COMPOSITION

A. The Team was composed of the following:

1. Elvin F. Frolik, Team Leader
   Agricultural Consultant
   Formerly Dean, College of Agriculture and Professor of Agronomy, University of Nebraska
   Lincoln, Nebraska

2. Keith Byergo, Consultant
   Formerly, AID Agriculture Officer, Project Manager
   SGT/AGR Division Chief and Acting Deputy Director
   Washington, D. C.

3. H. J. Carlson, Consultant in Science
   28 years U. S. Government Services as Research Administrator,
   Retired from NSF in 1972
   Cocoa Beach, Florida

4. W. Fred Johnson, International Research Programs Officer
   AID/BIFAD
   Washington, D. C.

B. Team Coordinator

1. Robert I. Jackson
CRSP-S/M (Intsormil) Program Manager
AID/S&T/AGR/AP
Washington, D. C.

III. PROCEDURE

The review began with the Team attending Intsormil Principal Investigators' Conference held at Scottsdale, Arizona January 4-6, 1984. Also during this period, the Team held conferences with representatives of participating universities which were not included in site visits, namely the University of Arizona, Purdue University and the University of Kentucky. Following the meetings at Scottsdale, the Team conducted reviews at the campuses of the following: Mississippi State University on January 9-10; Kansas State University January 12-13; Texas A&M University January 16-17; and the University of Nebraska, January 18-20.

Formats for the reviews were left largely to the respective universities. 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. Hence, all universities involved elected to provide an abbreviated presentation of their research projects, their training programs, and their work in host countries. The scientists and administrators were then given an opportunity to relate their thoughts on the management aspects of INTSORMIL at all levels. The Universities visited had more time to make their presentations than those interviewed at Scottsdale. Also they were able to include more staff members in their presentations and to show us some of their research facilities.

The staff members of the universities interviewed at Scottsdale were most cooperative in making their presentations in spite of the conferences having to be held in between the formal PI sessions.

The University of Nebraska had the double assignment of reporting both as the ME and a participating university. Added to this was a delay in the Team arrival (due to mechanical plane difficulties) which resulted in the forced cancellation of a session with Department Heads.

The Team wishes to express its appreciation for the cordiality extended by all of the participating universities. Two unique arrangements were the inclusion of INTSORMIL graduate students in the conferences at Texas A&M, and a luncheon with the graduate students at Nebraska (with none of the Nebraska staff present).

The lists of conferees from each University are shown in Appendix 4.

IV. THE ME - THE UNIVERSITY OF NEBRASKA, LINCOLN

The Grant agreement contains the following statement: "The Grantee will be the Management Entity for this CRSP....." The duties and responsibilities of the University as the ME for the program are clearly spelled out in the discussion which follows. Further, in the conferences held by the Review Team, there was never any question raised concerning the fact that the ME has full authority to administer the program. It was generally recognized that the committees and coordinators (listed in Section V), important as they are, can and do serve only in an advisory capacity to the ME.

The role of the University of Nebraska as the ME is well recognized by that institution. Assurances were given to the Review Team by Dr. Martin A. Massengale, Chancellor of the University of Nebraska, Lincoln, and by Dr. Roy G. Arnold, Vice Chancellor of the Institute of Agriculture and Natural Resources, that the University has a deep commitment to making the INTSORMIL program a successful one. They view their INTSORMIL responsibility as being of great importance, i.e., in no way do they consider the grant as something that is being carried out on a merely functionary basis.

Administratively and structurally, the University is well organized to carry out the terms of the grant agreement. Devoting full time to international programs and reporting directly to Vice Chancellor Arnold, along with three other Deans and two Directors, is Dean and Director of the International Programs Division, Dr. Robert W. Kleis. In his position, Dean Kleis has overall responsibility for the INTSORMIL program, operating primarily through the Program Director, Dr. Earl R. Leng, who also holds the title of Professor in the University. Dr. Kleis also has a liaison function with the Agriculture Experiment Station. Assisting Dr. Leng is Dr. Glen Volmar on a half-time basis, who holds the titles of Assistant Director, INTSORMIL, Assistant Dean of International Programs, and Professor, Agricultural Economics. Two other persons in the INTSORMIL office headquarters are Ms. Joan Frederick, Administrative Technician; and Ms. Dottie Stoner, Secretary.

Mr. Carl W. Mueller, Fiscal Manager of Grants and Contracts for the

University is in immediate charge of the fiscal and business aspects of the Grant. He reports administratively to Dr. John W. Goebel, Vice Chancellor for Business and Accounting, and Professor of Accounting.

The fact that all of the administrative staff listed above devoted considerable time to conferring with the Review Team, further demonstrates their interest.

V. COMMITTEES AND COORDINATORS

According to the Grant Agreement, "The Grantee will establish, as necessary, committees to provide advice on technical and administrative matters, to perform periodic evaluations, and to facilitate collaboration and coordination among the participating institutions." This requirement is fully complied with as shown by the following standing committees and coordinators, who provide leadership and counsel to the ME.

1) Principal Investigators are listed for seven (here physiology and agronomy are treated separately) major disciplines as follows:

   Breeding and genetics - 10; Physiology - 6; Pathology - 6; Entomology - 4; Utilization - 7: Socio-Economic - 9; and Agronomy - 7.

2) The Administrative Council consists of one representative from AID, one from ICRISAT, four from the ME at the University of Nebraska, two from Texas A&M University, and one each from the other 6 participating universities. (3)

3) The Board of Directors consists of three representatives of the ME plus one each from four other participating universities. (3)

4) The Intsormil Technical Committee is composed of two representatives of the ME plus one each from six of the participating universities (including one from Nebraska). (3)

5) The External Evaluation Panel consists of six research administrators of whom four are from foreign countires, one is a U.S. citizen stationed abroad, and one is a U. S. citizen located in this country. (3)

6) Country Coordinators are listed for 14 countries, plus two regions, (See Appendix 3).

7) Discipline coordinators: Six are listed with one person serving Agronomy - Physiology (see Appendix 3).

To the extent that duties and guidelines for the seven groups listed above were made available to the Review Team, they appear in Appendix 2.

VI. PROGRAM AND ACCOMPLISHMENTS

The fundamental and unique features of CRSP carried out by AID and participating state universities has been described by Dudley T. Smith and Rodney Foil (6). Information on the program and accomplishments of INTSORMIL are presented in an 18-page 9X21 cm. printed brochure entitled, "INTSORMIL - CRSP Sorghum and Millet - 1983 Progress Report Executive Summary" (2). The brochure includes a list of the eight participating U. S. Land Grant Institutions; the four cooperating International Agricultural Research Centers, a summary of activities up to June 1, 1983; brief write-ups on the programs in 14 host countires, a summary of recent activities on findings in the six major disciplinary areas of research at the participating U. S. Land Grant agricultural institutions, and a paragraph on training.

The Evaluation Team makes the following additional observations on accomplishments of Intsormil:

(1) New germ plasm have been developed by participating U. S. institutions and distributed widely; diseases and insects have been identified by U. S. institutions forming the basis of research on biological and other control measures.

(2) Socio-Economics, anthropological, and nutritional studies have been conducted in Honduras, Mexico and Sudan, which have established base lines for measurement of progress in these countires, and have provided understanding of factors which have guided biological and other agricultural research.

(3) A considerable number of LDC candidates have been trained in U. S. universities at the Masters and Ph.D. levels, and some of these have moved into research positions, in developing countries, and are serving as important research contacts for transferring technology and conducting cooperative nurseries.

(4) Research programs , conducted by CRSP scientists, on sorghum and millet are underway in varying degrees in three overseas countries (Ciat-Columbia, Honduras, and Sudan); two more country programs are scheduled to take place (Tanzania and Botswana).

(5) A scientific network has been established with some 18 cooperating countries with professional contacts by U. S. scientists and LDC scientists in varying kinds of working relationships.

(6) The program to date has brought some benefits to the developing countries (LDCs) and the United States, fulfilling the dual objective mandated in the Title XII legislation. Some of these benefits are tangible, such as the number of degrees awarded to LDC persons, and the number of contacts established with LDCs. However, most of the benefits are intangible, and some are assumed, such as the increased knowledge gained by international experience of U. S. scientists.

In summary, it can be stated that a broadly based program has been developed internationally, with much relevant research underway, resulting in numerous reports and publications, with an extensive training program, with many linkages having been established among the seven actively participating U. S. universities, four IARCs and institutions in 14 host countries, and overall a mutuality of benefits arising there from.

VII. TERMS OF REFERENCE WITH RESPONSES

The terms of reference were included in the Scope of Work (4) distributed to the Review Team in December 1983. The Team received additional instructions in USDA PO 40-319R-4-00518, Statement of Work. The latter included the statement "Review project approval and evaluation documents, project contracts, reports and publications and interview project technical and administrative staff concerning activities of the project since February 1982".

It should also be pointed out that although initially discussed as a possibility, no visits were made to host countries by the Team, per se, due to a lack of travel funds. Lacking first-hand information from site visits, the Team generally depended on information from persons involved in Intsormil who live in the U. S. and on Team Coordinator, Dr. Robert I. Jackson.

The "Problems and Issues to be addressed by the Team", as presented in the Scope of Work (4) are repeated herewith, accompanied by responses from the Team, as follows:

"1. The CRSP-S/M has just begun its fifth 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 AID and the ME of the CRSP projects in the U.S. and host countries been adequate? Several groups, such as the EEP, ME, Missions and AID are involved in various aspects of this function. Are there marginal or redundant activities that should be deleted from the CRSP?"

Response: Providing an adequate monitoring function for the CRSP:

1. Given the limited responsibility and authority of AID project managers in relation to grants, AID monitoring has been adequate. Better documentation for recommendation to the ME by the AID project manager would have facilitated the Review Teams appraisal of this function.
2. The ME practices a rather loosely structured management style with the CRSP PIs. This has worked well for accomplishing research; however, it has not produced a concise, well coordinated program. Rather it has resulted in numerous projects around the world corresponding to the individual PI or institution interest. A global plan with countries and regions of concentration would have prevented this disillusion of resources.
3. The external evaluation panel (EEP) has not been closely enough involved with the CRSP activity to provide proper monitoring. Closer communication with the EEP members by the ME and TC on a regular basis is necessary to keep them aware of CRSP progress and problems. Then during formal evaluations, they have the orientation and background to make informed evaluations and valid recommendations.
4. The AID missions have not been involved formerly in the evaluation process, during this review period. This is changing. With USAID Botswana and USAID Tanzania buying into the CRSP in their respective countries, other countries are also showing more interest and more such buy-ins are expected.
5. The TC and Board of Directors have just done a technical evaluation and budget development exercise. This resulted in termination of high priority projects the manner of implementation of which had been in question. This important research should be resubmitted in the new global plan.

"2. Is the CRSP-S/M 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 AID for travel, procurement, training, reports and budgets?"

Response: The CRSP-S/M would appear to be somewhat too loosely organized as it is now constituted. The high degree of decentralization,

although favorably reacted to by numerous Intsormil scientistis, makes management and accountability difficult. It appears that many individuals are pursuing a program of foreign assistance in accordance with their own interests, or the interests of their own small groups or university, rather than functioning primarily as a part of an overall joint and cooperative program. This type of arrangement maximizes personal initiative, but may not be effective in maximizing the effectiveness of the overall program. We believe the development of a global plan, with a limited number of primary host countries and a network of other countries, as outlined in another portion of this report, would strengthen the opportunity for stronger central management, which we believe is indicated.

With respect to the second question above, the answer is that there generally has been collaborative research where collaborators are available. Documentation is lacking in the way of annual Intsormil reports , but is available by individual host countries and U. S. Universities in (3) - except for Kansas State for which a report was provided separately (7), and through the rather large amount of material that was handed to us as we visited the universities, or was sent to us by those we were unable to visit. Up to this point, budgetary support appears to have been adequate.

With respect to the third and last question above, under the modus operandi which has been followed, the liaison among host countries, PIs, and Missions appears to have been fairly strong and adequate. AID/W has been largely left out of the picture, but not to a much greater extent than called for in the Grant agreement (1). Here again, the liaison can be more highly formalized, more completely carried out and documented, and with the appropriate role of AID spelled out, with the development of a global plan.

"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?"

Response: Fourteen MOUs have been initiated. However, only a few along with work plans are completed, and hence, in only a few cases are the plans adequately covered.

"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 specialty need more focus? Are there any that should be deemphasized?"

Response: The progress has been substantial. In 1983, there were 167 students (M.S., Ph.D. and Post Doctoral) working on Intsormil projects. Of this number, 93 were from LDCs and MICs, 71 were from the U.S., and 3 from other industrialized nations. There were students from 34 different LDC and MIC countries. About 50% of the total of 167 students were supported with Intsormil funds. (See Appendix 8 for workshops)

No discipline should be deemphasized but more personnel need to be trained in entomology and plant pathology. The SADCC training program will give emphasis to and will provide budget for training of almost 30 students at the MS level and 4 students at the Ph.D. level in various disciplines for research with sorghum. This is a 5-year project with southern Africa nations. The program has not been finalized. Intsormil will have leadership for this training.

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

Response: The limitation there is primarily a lack of qualified collaborators, especially in some disciplines. However, within limitations of available personnel and necessary financial support by the host countries, satisfactory progress is being made. Perhaps the most important factor here is the training phase, which, as pointed out in another section, is progressing at a fairly rapid rate.

The rate of progress of establishing linkages will increase substantially as more trained scientists return to their respective host countries.

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

Response: The answer to the first part of the question is "yes". The availability of additional funds for sorghum-millet research in both host countries and at the participating U. S. universities has resulted in more resources being devoted to research involving these crops than would have otherwise been the case. However, credit must also be given to AID for supporting four rather large programs of research prior to 1979 on these crops at as many of the present participating universities, which programs were "folded into" Intsormil when it was started.

In the judgment of the Team, Intsormil has had no effect on government policies, either in the U. S. or elsewhere.

"7. Have host country and U.S. institutional collaborators become involved at the project worksites? How? What are the feelings of collaborators about impact of the projects and the overall CRSP-S/M?"

Response: Collaborators have become involved at the project worksites through such means as exchanging of germ plasm, providing technical assistance, and training of students. Mexico is a good example of such exchanges. The feelings of the U. S. collaborators with respect to impact of the projects and the overall CRSP-S/M are generally very good. Our limited knowledge of the feelings of host country collaborators is also on the positive side.

"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?"

Response: The Team is unaware of any substantial directional shifts and changes since February 1982, in projects which continue to be active. Since the beginning of Intsormil, work has been completed in some host countries in some subject matter areas and the projects have accordingly been phased out, often with analagous work being undertaken elsewhere. Through action of the TC, Board, and the ME, there have been some shifts in amount of financial support, including some elimination, which obviously, has an effect on the degree and possibly on the direction of research. The reasons for shifts in financial support by the above entities appear to be valid, but the reasons were not always adequately explained in advance to the PIs involved, nor were the latter given adequate opportunities to defend their research programs.

"9. AID monitors the CRSP-S/M, 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. Would the CRSP be more effective or more efficient if a contract were used instead of a grant? Should the AID Program Manager play a more active role in the decision making process including project design and budgetary expenditures?"

Response: We believe that AID, through the Program Manager, should have a greater role in the decision making process, and he will have if our recommendations presented elsewhere are carried out. First of all, AID should be represented in the team that draws up the initial draft of the global plan. It would expedite the program if AID were given an opportunity to have an input in drawing up projects, budgets and determining expenditures especially for such items as equipment and travel. The answer to the question of grant vis-a-vis a contract is moot. The language of PL 94-161, Title XII (5) virtually dictates the grant approach.

"10. Should ME-PIs be responsible for the preparation of purchase requests including source/origin waivers? What authority should the AID Program Manager have in screening items to be procured using CRSP-S/M funds? What is the ME's responsibility in contractural requirements?"

Response: The ME should establish clearance procedures to assure that U.S. origin material is procured when possible, and that for their own protection, source/origin waivers be procured before the purchase of any non U. S. origin equipment or supplies.

Under the Grant Agreement (1), the ME is fully responsible for contractural requirements. The Program Manager is given no responsibility relative to same, but it might be well for him to spot check, from time to time, items being procured with CRSP-S/M funds.

"11. How cost effective has the CRSP-S/M been? Can a Cost benefit ratio be calculated? What success stories are there to support the cost effectiveness?"

Response: AID/S&T/AGR, as part of the management review, is examining the cost effectiveness of the CRSP-S/M, establishing base line data and a model for cost benefit analysis. There has not been enough implementation at the LDC level at this point in the life of the program to calculate a realistic cost benefit ratio. The model development and data being collected will establish a basis for such an analysis. (See Appendix 6).

Examples of success stories are as follows: Training, both formal and informal, has been very successful. New breeding lines have been introduced in a number of LDC CRSP-S/M breeding programs. They have been particularly successful in developing commercial varieties in Mexico, Honduras and the Sudan. In Mexico, because of its long

association with Texas A&M, a new agriculture industry of sorghum production and feeding has been developed.

In Honduras, a major sorghum insect pest was identified and measures implemented to control the pest.

Socioeconomic studies have been conducted in Honduras, Sudan, Upper Volta and are underway in Mexico. These base-line studies will be necessary to determine the impact of the CRSP-S/M on the regions once adoption of new cultural practices and seed has taken place.

Particularly evident in this evaluation was the close collegial relationships that had been developed between the project PIs and their LDC counterparts.

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

Response: One time technical assistance requests pertaining to the objectives of the CRSP present few problems for the CRSP-Sorghum/Millet however, requests to establish long-term programs would severely tax the CRSPs current resources. Such requests would require additional funding for a new staff as well as for supplies and equipment. The best way to handle the situation would be a separate contract outside of the CRSP umbrella using primarily different resources, funds and staff. Close coordination should be maintained between the CRSP-S/M and other sorghum and millet activity member institutions. Only as this new activity impinges on CRSP-S/M resources would S&T/AGR have any monitoring responsibility to assure that adequate staff and funding was available for CRSP-S/M activities.

"13. What mission projects has the CRSP-S/M supported? What are the missions' comments on in-country collaborative research projects through the CRSP-S/M?"

Response: Initially, there was little interaction between the missions and CRSP-S/M staff. The activity was additional to mission programs and they had few resources to support CRSP-S/M projects. With the CRSP-S/M proven track record in research and the time for missions to develop programs and budgets in their annual budget submissions, the CRSP-S/M is now getting involved with mission projects. Examples

are the Botswana Farming Systems Project where two CRSP staff will have long-term assignments and the Tanzania projects where long-term staff members will be posted in Tanzania. The CRSP-S/M is in close collaboration with ICRISAT, CIAT and IRRI. CRSP-S/M is a subcontractor on the AID/W funded grant with ICRISAT for sorghum improvement in Southern Africa.

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

Response: The working relationship between Intsormil and four IARCs, namely ICRISAT, IRRI, CIMMYT, and CIAT is very close. There is an exchange of germ plasm, attendance at each others workshops and other conferences, dialogue among the scientists, stationing of personnel at each others laboratories (for example, Dr. Maranville of Nebraska at IRRI, and Dr. Gourley of Mississippi State at CIAT), and in other ways.

The Team views the cooperation between Intsormil and the IARCs as shown above as being highly desirable -- there is bound to be a mutuality of benefits. However, as noted elsewhere in this report, the Team questions the practices of financing travel of ICRISAT staff to any meetings including those sponsored by Intsormil as well as financing ICRISAT publications, especially when the latter are to be sold by ICRISAT.

VIII. ADDITIONAL OBSERVATIONS AND RECOMMENDATIONS

The observations and recommendations by the Review Team are of two types, viz. (1) those which are of primary importance because they have to do with complying with the terms of the Grant; and (2) others resulting from suggestions/criticisms or problems and opportunities we observed where we believe improvements are possible.

There are only two principal observation/recommendations which fall into the first category. These are: (1) submission of an annual report and (2) development of a global (consolidated program) plan. We devote considerable attention to guidelines and content for the latter.

A. The Annual Report - Technical and Fiscal

Detailed requirements for annual reporting are outlined on page

five of the Grant document (1). The last such report filed by the ME was for 1980. The following statement appears on page 6 of the printed brochure (2), "The studies will be reported in detail in an expanded progress report, now in preparation."

The Review Team emphasizes the importance of annual reporting by the ME, both technical and fiscal. December 31 is suggested as the annual due date for such a report.

B. Global (Consolidated Program) Plan

The following statement appears on the first page of attachment A, "Program Description" of the Grant document (1): "The ME will develop a consolidated program plan that displays specific objectives, budget, schedule of expected inputs, outputs, and progress verification indicators of each project (both in the U.S. and with specific institutions in developing countries), and the critical and supporting relationships among projects. The consolidated program will be submitted to AID for approval and will be used to assess the progress of the program and its component projects. AID will retain the right to approve the addition, deletion, or changes in component projects."

At the Scottsdale conference (3) on January 4, 1984, Program Director Leng stated that the strength of Intsormil has been in its flexibility - but now that the limit of funds has been reached, there is need for a plan. He further stated: "But once we set up a plan, we lock ourselves in."

Presently efforts are scattered over 18 some countries without any apparent order of priority and without written over all planned global program or strategy. The projects in the five countries cited and the many scattered activities appear to have evolved more from opportunities than from an overall plan and strategy.

1. It is further recommended that constraints and priorities be reassessed and used to develop the global program with goals focused in a few countries, each selected on the basis of predetermined criteria. The criteria should include sorghum and millet as major food grains; government policies supportive of research, extension, and production; and assurance of political stability and ability to sustain a program. The existence of a minimum basic institutional research capability, at least one prime country, to represent each ecological zone or region such as the Sahel. The strategy would be to concentrate adequate scientific and other resources to assure

a reasonable opportunity for positive impact on production and consumption of sorghum and millet, and to result in sufficient institutional development within a reasonable time frame for continuation of a viable research program, without assistance, for that country to serve and benefit neighboring countries in each ecological zone. Such prime countries would be given priority in the allocation of CRSP resources.

Examples of such potential prime countries are: Sudan and Senegal in the Sahel, and Egypt and Botswana as other zones in Africa; and in Latin America - Carribean - The Dominican Republic; and in Asia - Pakistan and Thailand. It is recognized that Columbia, Mexico, and Brazil, while graduate countries, each would be eligible under the above criteria to serve as a prime country with less dependence on CRSP resources.

2. The Review Team further recommends that the initial draft be prepared by the ME in consultation with a representative of the AID/S&T/AGR/FA and a consultant with a strong scientific background and considerable experience abroad.

3. The overall program should be developed on the basis of reassessed priorities and identified constraints in each prime country and surrounding countries, forming a general ecological zone or region.

4. A country program for each prime country should be developed with specific country goals to serve that country and benefit neighboring countries through its leadership role. Each individual country program should follow the concepts of the broader, global program and strategy, but should be spelled out in detail to fit the specific needs of the country. The prime country program would be attached to the MOU.

5. Each prime country program should have goals and identified components, or projects, determined by assessed priority constraints, for participating U. S. institutions on the basis of their respective capabilities and interest. This participation would define the research to be done in the prime country and the back-up research that is to be done at the U. S. institution in the United States. The program would also contain training and institutional development goals. The project components should reflect a balance in disciplines necessary to achieve objectives, and should be integrated for an interdisciplinary team approach.

6. Annual work plans with budgets should be developed for each prime

country and each participating U. S. university, defining research to be conducted on LDC site(s) and research and training to be conducted at the U. S. institution.

7. An optimum number of U. S. scientists, at each site at least one with an administrative assistant (local, ex-patriate, or peace corps type) would compose a team in each prime country to serve all participating U.S. institutions and the local team members. These personnel should have some overseas experience. The scientists, to serve in-country, need not be senior scientists.

8. Socio-economic anthropological and nutritional studies should be conducted, and policies assessed, or existing such studies and assessments updated in each prime country, to form a base-line for measuring progress of future agricultural research, and to guide the nature of the research. These studies should precede or be conducted at the beginning of the agricultural research program in each prime country.

9. A Memorandum of Understanding MOU should be developed with each country, incorporating a program for that country. This should be signed by the Management Entity and the host country government and institution. This is an ME responsibility and should not be delegated.

10. Buy-Ins and Tie-In Countries

There are cases now and will be more opportunities in the future for buy-ins to the CRSP by USAID missions for research activities requiring the stationing of U. S. scientists and other personnel in particular countries. Also, opportunities exist for tie-ins by CRSPs with USAID and other donor-supported programs.

Capitalizing on such opportunities, may offer a cost-effective way of contributing to the goals of the CRSP in a prime country or ecological zone. Each case must be assessed in these terms, and the benefits of such associations weighed against the costs to the CRSP in scientific resource requirements which might impinge on other research and training activities.

Such a country should be identified in the zonal or regional strategy of the global program. The possibilities of such a country's serving as a prime country in an ecological zone or region would depend on its meeting the criteria.

11. Scientific Network Countries

Scientific network countries should be identified in the global plan and zonal strategy. Such would be a country where there is no CRSP staff member permanently assigned, but there is a relationship between an LDC scientist and a scientist of a U. S. institution participating in the CRSP. This relationship may consist of technology transfer, training of an LDC person in the U. S., and/or the operation by the LDC scientist of a cooperative nursery, utilizing germ plasm provided by the U. S. scientist, who may visit the country occasionally. There should be a MOU with a defined project.

It would be expected that one or more network countries would be established in an ecological zone served by one or two principal countries.

12. Plans for technical services (assistance) and training activities should be outlined in the global plan, even though both types of programs have already been receiving considerable emphasis by the participating universities. Each of these types of activities is discussed on Page 2 of Attachment A of the Grant Agreement (1). Matters dealing with training, workshops and conferences are to be included in the annual work plan.

13. Institutional development is one of the important goals of Intsormil. This matter should receive major attention at the prime sites, a corollary of which is increased production. Provision might also well be included for providing at least some minimal support to collaborative scientists, including persons who have recently obtained degrees in U. S. institutions, and who may have little in the way of facilities, equipment, and supplies to work with when they return to their home countries.

C. Other

1. AID/W should take necessary action to have an audit made - no general audit by a federal agency having been made to date. Dean Kleis at the Scottsdale Conference (3), on January 4th asked the question: "Why haven't we been audited?" He expressed concern over possible disallowances and noted that the longer the program continues without an audit, the more serious could the problem of possible disallowances become.

2. Evaluation of Programs and Projects

A. General Provisions:

There is need to improve on evaluation of programs and projects. This will require several management actions and rules:

b. The establishment of uniform criteria for measuring performance.

c. Standarized procedures for evaluation with clear roles and division of responsibilities between the External Evaluation Panel (EEP) and the Technical Committee.

d. Greater use of the EEP, including project evaluation periodically.

e. A rule that termination of a project will be based on the recommendations of the EEP only.

f. Any deviation from the EEP recommendation would be justified in writing in minutes of the Technical Committee (T.C.), the Board, and in documentation in the Management Entity.

g. The principal investigator(s) should be given the opportunity to defend his/hers (their) project(s) before the Technical Committee in those cases where the project is being considered for termination or reduction in budgetary support.

h. The External Evaluation Panel should be reconstituted, expanded and strengthened to include: greater U. S. representation with persons familiar with the U. S. land grant university system for a better balance with international members. Scientists should be included with varied disciplines to permit the establishment of working sub-panels in specialized disciplines to serve as peer groups, and to evaluate projects in greater scientific depths. Each peer group should have a chairman who would call on additional external experts to advise on particular disciplines.

A scope-of-work should be prepared for the EEP and for each working sub-panel.

i. The EEP should be required to evaluate the CRSP and submit a report annually, with individual project evaluations made by visits to LDC country sites and to U. S. universities on a rotational basis every other year.

j. The EEP should be asked to review and make recommendations on the annual budget allocations against the global CRSP plans, the ecological zonal strategy, prime country, and other country programs and work plans.

k. The recommendations of the EEP and any of its panel should form the basis for reviews by the Technical Committee. The T.C.'s comments

and recommendations on the EEP's recommendations should be submitted to the Board with justifications for any disagreements.

3. Important Research Needs are no longer covered after the phasing out of three research projects: grain millet quality research, storage insects of millet, and seed grain processing.

Priorities should be reassessed weighing these important areas against travel, conferences and related costs, such as financing the travel of ICRISAT employees, financing ICRISAT publications which they in turn sell, ~~and~~ germ plasm banks and degree training for developed or developing countries not associated with CRSP.

4. Germ plasm

In view of the questions raised by several participating institutions and the fact the USDA has prime responsibility for maintaining germ plasm in banks in the U. S., it is recommended that the germ plasm proposal be reconsidered in light of higher priorities

5. What should be the ratio of LDCs to U. S. activity in the CRSPs?

The issue of LDC activity compared with U. S. activity was widely discussed at the PIs meeting in Scottsdale, Arizona and at institutional visits during the review. A rule of thumb of 60% LDC activity and 40% U. S. activity was suggested and discussed. By doing most of the research in the U.S., having primarily TDY activity in the LDCs and only a small training component, even a 50/50 ratio would be impossible to attain. However, the reverse of the above would provide an acceptable LDC/U.S. ratio of activity.

Recommendation: Using the following criteria for determining the LDC costs, a minimum of 50/50 and preferably 60/40 ratio could be attained:

a. Pass-through funds spent in the LDC.
b. Equipment, resources and supplies furnished to LDCs regardless of source.
c. LDC staff participant trainee or other workshop or training program costs in or for LDCs.
d. Travel, per diem and staff salaries in and for LDCs.
e. Staff cost for long-term LDC assignments.

6. Guidelines

The roles, functions, and responsibilities, along with guidelines and procedures, should be spelled out in written form for each of the following:

a. The ME largely taken care of in the Grant Agreement (1).
b. Standing Committee/Administrative Groups.
c. EEP
d. Discipline and Country Coordinators.
e. Participating U. S. universities.
f. Cooperating foreign countries, institutions directly involved, and collaborators.

7. Handbook

The ME should prepare and update as necessary and make generally available a handbook covering (6) above.

8. Travel

The Review Team determined that official travel, particularly to LDCs, lacked planning and coordination. It was accomplished on an ad hoc basis without reference to annual or global plans. USDA staff, in fact, had trouble getting travel clearance because their Intsormil travel was not always on their annual travel plan submitted to USDA.

Travel should be planned as a part of a project annual plan and in conjunction with the Intsormil Global Plan. Some flexibility should be built in to allow for unforeseeable circumstances. Coordinated travel could in some cases, allow one traveler to do the work of two or more in similar disciplines. Generally speaking, travel should fall into one of the following categories:

a. Program support and development.
b. Technical assistance.
c. Research support for colleague or graduate student.
d. Workshops and conferences.

9. Persons to be contacted by the ME at the Participating Universities

Most, but not all, of the participating universities are satisfied with the method being followed by the ME in contacting their respective institutions. It is suggested that the ME request from each of the participating universities a list of person(s) to be contacted for each type of activity involved.

IX. ACRONYMS

BIFAD	Board for International Food and Agricultural Development
CIAT	Center for International Tropical Agriculture
CIMMYT	International Center for the Improvement of Maize and Wheat
CRSP	Collaborative Research Support Program
EEP	External Evaluation Panel
IANR	Institute of Agriculture and Natural Resources (University of Nebraska)
ICRISAT	International Crops Research Institute for the Semi-Arid Tropics
INTSORMIL	International Sorghum and Millet/CRSP
IRRI	International Rice Research Institute
LDC	Less Developed Country
ME	Management Entity
MIC	Middle Income Country
MOU	Memorandum of Understanding
PES	Project Evaluation Summary
PI	Principal Investigator
SADCC	Southern African Development Coordination Conference
S/M	Sorghum/Millet
T.C.	Technical Committee
IARC	International Agricultural Research Centers

X. LITERATURE CITED

1. United States of America Agency for International Development and the Board of Regents of the University of Nebraska, 1979. Collaborative Research Support Grant. No. AID/DSAN/XII-G-1049. Project No. 931-1254.11.

2. INTSORMIL - Collaborative Research Support Program (CRSP) - Sorghum and Millet - 1983 progress report executive summary. IANR, University of Nebraska - Lincoln (18 pages, 9 x 21 cm. printed brochure).

3. Intsormil's Next 5 Years, January 4-5-6, 1984. Intsormil's principal investigators conference, Scottsdale, Arizona.

4. Project evaluation scope of work. CRSP-Sorghum/Millet. Project Number 931-1254. Distributed by Dr. John Yohe, Division Chief, AID/S&T/AG/PA to the Review Team. December 1983.

5. Public Law 94-161. Foreign Assistance Act of 1961. Title XII - Famine prevention and freedom from hunger. December 20, 1975. Pages 12-19.

6. Smith, Dudley T., and Rodney Foil., November 14, 1983. The collaborative research program - a model for harnessing U. S. agricultural research capability for international development. An address presented at the 97th Annual Meeting of the National Association of State Universities and Land-Grant Colleges.

7. Intsormil progress report, December 1983. Kanasa STate University (listed because not included in (3) above).

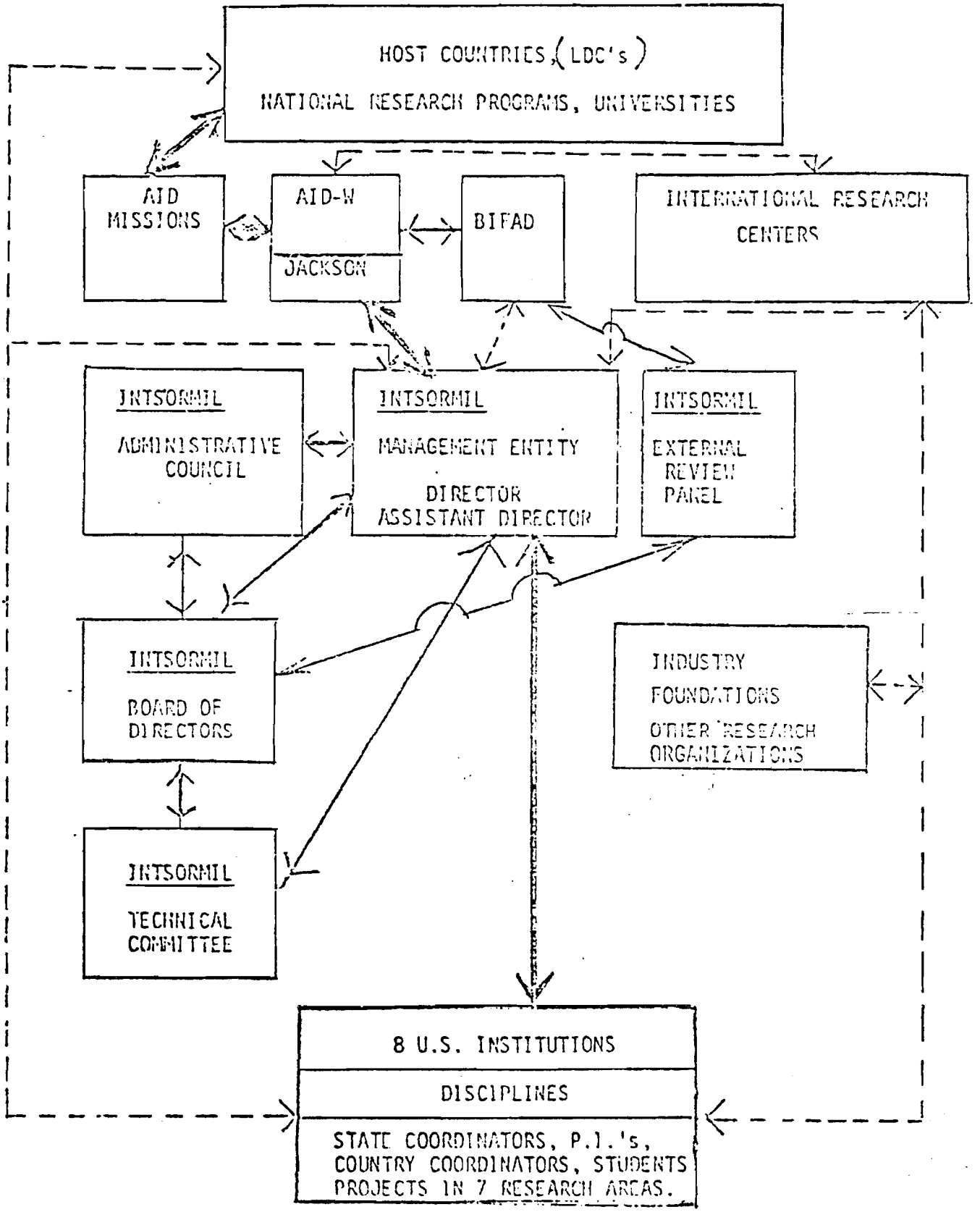
8. Intsormil external review, 1982.

9. PES. October 18, 1982 CRSP-S/M.

10. Summary of actions taken by Intsormil in response to external evaluation.

January 10, 1982

ORGANIZATIONAL CHART SHOWING INTSORMIL RELATIONSHIPS



Appendix 2

A. GUIDELINES FOR INTSORMIL COUNTRY COORDINATORS
January 10, 1983

1. Be responsible for overall coordination of INTSORMIL activities in the host country, and actual representation there. Coordinate with INTSORMIL Headquarters.

2. Establish working relationships with host country research institutions, International Research Centers, AID Missions, scientists, students, other CRSP's and others as the situation allows.

3. Formalize INTSORMIL/host country or institutional agreements where and when possible.

4. Coordinate budget planning for in-country activities.

5. Be alert for possible in-country funding sources in addition to INTSORMIL such as AID Mission funds, host government funds, and industry funds.

6. Have continued contact in the host country through trip visits and other communication. Some host countries offer excellent opportunities for off-season research. A goal might be to spend some time in the host country at least once a year. Keep a current file of host country data and information.

7. Inform other INTSORMIL scientists of research needs and possible involvement either short term or on a longer term basis with research and/or host country students.

8. Assist host country students who have interests in sorghum and millet to become involved in University programs or other training opportunities.

9. Make sure that research equipment gets on-site and is properly used and maintained. Some instruction may be required for effective use and maintenance.

10. Keep the INTSORMIL headquarters informed of developments, progress, problems and special needs.

11. Request that all INTSORMIL scientists that have contacts in the host country, keep you, the Country Coordinator, informed of contacts, research programs, trips, student programs, etc.

12. Enhance involvement by acquiring a knowledge of the host country's national language, e.g. French in West Africa. Developing language competency may be a goal of some Country Coordinators.

13. Submit an annual report and other reports as requested by the Management Entity.

B. DISCIPLINE COORDINATORS 1/

1. Discipline Coordinators are recognized by their peers and their respective scientific organizations to be leaders in their field of research. The discipline coordinators are approved by the Technical Committee on the basis of consensus by the scientists in a specific discipline. Input may be requested from the Management Entity. The TC may request the discipline coordinators to provide input for budget review or for other uses. The TC met with the Discipline Coordinators on Year 6 budget considerations.
2. Disciplines and Special Projects include the following:
   A. Disciplines
      Agronomy/Physiology
      Plant Breeding
      Pathology
      Entomology
      Utilization
      Socioeconomics
   B. Special Projects
      Striga (Dr. Nat Zummo, Mississippi State University)
      Germ Plasm (Dr. Keith Schertz, Texas A&M)
3. The responsibilities of Discipline Coordinators include:
   A. Coordinate activities and input such as representing discipline groups in time of budget reviews, scientific project review and planning.
   B. Inform the Technical Committee and/or the Management Entity of specific needs and problems.
   C. Assist in the development of INTSORMIL reports.
   D. Coordinate activities of the disciplines with Country Coordinators where specific discipline needs are recognized.
   E. Provide input in research training needs and location of students and technicians for training.
   F. Provide overall scientific-discipline leadership to the Intsormil collaborative research program.

1/ Not approved by the TC

January 10, 1982

C. CRITERIA FOR EVALUATING INTSORMIL PROJECTS*

1. PURPOSE.

The Intsormil program is reviewed periodically by our External Evaluation Panel and by A.I.D. We are planning a comprehensive internal review soon. While no one has established firm criteria for judging project performance, it is obvious from past review reports that some factors should weigh more heavily than others. The purpose of the criteria set forth here is to enable project leaders, whether of new or ongoing work, to understand how their projects are likely to be evaluated. In particular, project leaders need to know those factors which are considered vital if the project is to continue under Intsormil funding. The criteria presented here provide guidelines for preparing Intsormil project reports.

2. GENERAL MISSION OF INTSORMIL

As stated in our basic grant documents, the major goal of this CRSP is to increase production and utilization of sorghum and millet in developing countries where it is an important crop. This is to be done by

a. developing and testing improved technologies,

b. enhancing the ability of developing-country scientists to solve problems of production and use of these crops.

A specific provision is that "a substantial portion of the research will be done in the developing countries."

3. IMPORTANT CRITERIA.

These will be set out by title in this section, and further explained in 4 below.

a. Presence of work in LDC's or direct contact with closely related work in an LDC and enhancement of LDC research capabilities.

b. Relevance of the research to a real problem or constraint on production or utilization of the crop.

c. Physical presence of the U. S. researcher for significant periods, in LDC's involved.

d. Evidence that substantially the same research is not being done by other professionally-qualified agencies.

e. The need for a current, scientific approach.

f. Preference for overseas work needs to be given to countries where Intsormil has "programmatic" involvement. Usually these are countries with an active USAID Mission. There are, however, exceptions to this, and individual cases can be considered on their merits.

4. DETAILED EXPLANATION

a. LDC Involvement - Since Intsormil's major goal is to increase production and utilization of sorghum and millet in the LDC's, it is vital that Intsormil projects have research underway or are associated with direct contacts with institutions and scientists in the LDC's. It is vital that research on production practices, varieties, utilization alternatives to tested under LDC soils, climatic, and socio-economic conditions. Advising LDC students who are in the U. S. working on graduate programs provides LDC contact and opens the door for further LDC work.

LDC research capabilities and sorghum/millet research can be enhanced by direct involvement of Intsormil scientists with LDC scientists. Examples are collaborative research, workshop participation and scientist exchanges. LDC capabilities can also be enhanced by the training of LDC researchers and research technicians through graduate and other training programs. The placement of research equipment in LDC's and instructing scientists and technicians on its use is an additional means of enhancing LDC capabilities. Some LDC's need help with research organization, administration, data analysis, and publishing results. Intsormil scientists can contribute and have the responsibility to help build LDC research institutions that have an interest in sorghum and millet.

b. Relevance. In order to achieve increased sorghum and millet production and effective utilization of these grains for human food, constraints must be identified and research geared to eliminating or reducing the impact of specific constraints. LDC scientists, farmers and others can be of help in defining constraints. Intsormil research scientists along with those collaborating with projects should then organize research where the results can be applied to problem solutions.

c. Physical Presence. Effective research work requires knowledge of the resources and the constraints of specific LDC's and the building of a working relationship with LDC scientists. In order to do this, it is a must that Intsormil scientists spend time in the LDC's, that they are involved with. Time spent in an LDC establishes communication with research scientists, administrators, officials of the LDC government, AID Missions, and students. Researchers need to identify critical periods of their collaborative research where it would be important to be physically

present in the LDC - for some this might be where plots are planted or harvested. Scientists who are advising graduate students who are doing their research in a host country have a need to make LDC trips. Some LDC's react somewhat negatively if U. S. graduate students are sent to an LDC without any presence of a project's leader or other project scientists.

d. Duplication of Work. Intsormil scientists need to keep abreast with what other scientists are doing and share information regarding new technologies and germ plasm. For example, Intsormil and ICRISAT scientist's work should be collaborative and complimentary and should avoid duplicating work already underway. Intsormil's funds are limited. In order to get the most research return as funds are expended in a world-wide sorghum/millet research program, duplication of quality research should be avoided. Constant communication among scientists is important.

e. Scientific Adequacy. Intsormil research should represent investigations utilizing current scientific concepts and should be built upon the established technical base. Awareness of previous research, demonstrated awareness of current literature and use of efficient methodology should be intregal to each research project.

f. Programmatic Involvement. Intsormil can be most productive where research is a joint venture between U. S. scientists, host country scientists and the AID Mission in the host country. Intsormil has identified countires where program efforts will be concentrated. The philosophy is that better results can be shown if resources are not spread too thin. There are exceptions where an individual contact, and a relatively small amount of resources can result in a productive piece of work. These cases need to be evaluated on an individual basis. In general, host country activity where institutional ties have been established should be given highest priority.

D. INTSORMIL INTERNAL PROJECT REVIEW PROCEDURE ALTERNATIVES [1/]

I. CRITERIA

The January 10, 1982 Criteria for Evaluating INTSORMIL Projects appears to be satisfactory.

II. ALTERNATIVE PROCEDURES FOR EVALUATION

A. The Management Entity conducts an annual internal review of all research projects.

Advantages: This would be an efficient process. The ME has a broad knowledge and is current on research activity, LDC involvement, and staff interest in INTSORMIL.

Disadvantages: The ME results might not be accepted as an acceptable technical review.

B. Technical Committee carry out the Internal Project Review. This is the current procedure; general agreement is that a change is needed.

Advantages: The TC is an established committee of INTSORMIL researchers. The TC members are experts in their specialized research fields.

Disadvantages: The TC has too much other business to contend with. The TC, as elected, doesn't always represent all disciplines. The TC reviews committee member's (their own) projects. Committee members are involved in close disciplinary peer groups where there may be peer pressure to support all projects in the discipline regardless of quality. Institutional loyalty may be a problem.

1/ Prepared by the INTSORMIL ME, December 22, 1983

C. Annual Ad Hoc Internal Review Committee

The (TC or Board or ME) ask an ad hoc group of 3 or 4 past TC members to make an annual review of projects. If involved in an active project, reviewers would not review their own project.

Advantages: Review would be made by researchers with technical ability. They would have knowledge of INTSORMIL and related research activity. Their history of service on the TC would provide background and rapport for the review process. They would be recognized by the INTSORMIL PI's, since they have been TC members.

Disadvantages: Requires time of past TC members. Discipline peer pressure and institutional loyalty probably remains.

D. Research Administrator Review

The (TC or Board or ME) asks an ad hoc committee of research administrators (perhaps 2 or 3) to review projects. May or may not be from INTSORMIL institutions; might include ARS. If from non-INSORMIL institutions, they would probably need to be hired as consultants.

Advantages: Research administrators are involved with research project reviews on a continuing basis. Probably less peer and institutional concern than the other alternatives.

Disadvantages: If from non-INTSORMIL institutions a briefing would be necessary. Perhaps difficult to schedule busy people to do this.

E. Outside Review Team

The (TC or Board or ME) would appoint an ad hoc review team of researchers who do not have INTSORMIL projects.

Advantages: Should take an objective view of the projects.

Disadvantages: Most knowledgeable sorghum/millet researchers in the U.S. are invovled with INTSORMIL projects. Such a review team would require a program orientation.

F. Modification of Alternatives B, C, D, or E.

The (TC or Board) charge the ME with an annual preliminary internal review of all research projects. A relative small number of projects (perhaps 5 or 6) identified as possible problem projects. These projects, if any, would then be submitted for review by Alternatives B, C, D, or E.

Advantages: ME has a broad perspective and has knowledge of problem projects. This alternative would reduce review time required by Alternatives B, C, D, or E.

Disadvantages: The ME would be given review responsibility which may not be accepted. The reviewers of the projects would not review all projects.

Appendix 3

INTSORMIL DISCIPLINE COORDINATORS AND COUNTRY COORDINATORS

MAY 26, 1983

I. Discipline Coordinators

Agronomy/Physiology	Dr. Ed Kanemasu, Kansas State University
Entomology	Dr. George Teetes, Texas A&M University
Plant Pathology	Dr. Richard Frederiksen, Texas A&M Univ.
Socio-Economics	Dr. Billie DeWalt, University of Kentucky
Utilization and Quality	Dr. John Axtell, Purdue University
Plant Breeding	Dr. Fred Miller, Texas A&M University

II. Country Coordinators

Mexico and CIMMYT	Dr. Fred Miller, Texas A&M University
Honduras	Dr. Darrell Rosenow, Texas A&M University
South America	Dr. Richard Frederiksen, Texas A&M Univ.
Botswana	Dr. Glen Vollmar, ME
Niger	Dr. John Axtell, Purdue University
Sudan	Dr. Glen Vollmar, ME (Dr. Allen Kirleis, Purdue, on leave)
Mali	Dr. Art Onken, Texas A&M University
Egypt	Dr. Jerry Eastin, University of Nebraska
Tanzania	Dr. Fred Miller, Texas A&M University
Philippines	Dr. Jerry Maranville, Univ. of Nebraska
ICRISAT - India	Dr. Earl Leng, ME
CIAT	Dr. Earl Leng, ME Dr. Lynn Gourley, Mississippi State Univ.
Caribbean	Dr. Mary Futrell, Mississippi State Univ.
IICA-Costa Rica	Dr. Billie DeWalt, University of Kentucky
Upper Volta	Dr. Phil Abbott, Purdue University
Dominican Republic	Dr. Ralph Neild, University of Nebraska

Appendix 4

PRINCIPAL CONFEREES

University of Arizona

Al Dobrenz, Physiology, Plant Sciences
Sedley Josserand, Technician, Plant Sciences
Vicki Marcarian, Physiology, Plant Sciences
Robert Voight, Sorghum Breeding, Plant Sciences
George W. Ware, Director of Agriculture Experiment Station, Entomology
Orin Webster, Sorghum Breeding, Plant Sciences

Kansas State University

Frank Barnett, Millet Breeding, Agronomy
Utsab Chaudhuri, Agronomy
Charles Deyoe, Head, Grain Science and Industry
John Dunbar, Dean and Director
Jon Faubion, Grain Science and Industry
Kurt Fettner, Associate Dean and Director
Eugene Friedmann, Head, Dept. of Sociology
George E. Ham, Head, Dept. of Agronomy
Tom Harvey, Entomology
Roger Helgesen, Head, Entomology
Walter C. Hoffman, Assistant Comptroller
Carl Hoseney, Nutrition quality of pearl millet, Grain Science and Industry
Edward Kanamasu, Physiology, Agronomy
Mary Beth Kirkham, Physiology, Agronomy
Barry Michie, Anthropology and Social Work, Sociology
Robert Mills, Grain Storage and Preservation, Entomology
John Pedersen, Grain storage and preservation, Entomology
Ralph H. Perry, Comptroller
Al Praeger, Research Associate, INTSORMIL program
Floyd W. Smith, Director of Water Institute, INTSORMIL program; Agronomy
William Stegmeier, Millet Breeding, Ft. Hayes Experiment Station
L. V. Withee, Cultural Practices, Agronomy

University of Kentucky

Elizabeth Adelski, Graduate Student, Sociology
C. Milton Coughenour, Sociology
Billie R. DeWalt, Anthropology
Kathleen M. DeWalt, Behavior Science
William Lacy, Sociology
Herbert Massey, Director of International Programs for Agriculture

Principal Conferees (continued)

Mississippi State University

H. Dean Bunch, Director of the Office of International Programs; Agronomy
Roy G. Creech, Head of Agronomy
J. Curt Delouche, Director of the Seed Technology Lab, Agronomy
R. Rodney Foil, Director of the Agricultural and Forestry Experiment Station, Forestry
Mary F. Futrell, Home Economics
Lynn M. Gourley, Agronomy
Thomas J. Helms, Head of Entomology
Eunice McCulloch, Development Officer, Social Science Research Center
Norman C. Merwine, Agronomy
Henry N. Pitre, Entomology
Howard C. Potts, Agronomy
Sandra Sistrunk, Assistant Account of MAFES Accounting
Jean K. Snyder, Associate Dean of Agriculture and Home Economics, Head of Home Economics
Garnett Thomas, Administrative Officer of MAFES Accounting
Larry E. Trevanthan, Plant Pathology
Nat Zummo, Plant Pathology

University of Nebraska - ME

Roy G. Arnold, Vice Chancellor, IANR, Food Science & Technology
John W. Goebel, Vice Chancellor, Business & Finance, Accounting
Robert W. Kleis, Dean and Director, International Programs Division, IANR Agricultural Engineering
Earl R. Leng, Program Director, INTSORMIL, Agronomy
Martin A. Massengale, Chancellor, UNL, Agronomy
Carl W. Mueller, Fiscal Manager Grants and Contracts
Glen Vollmar, Asst. Director, INTSORMIL, and Asst. Dean, International Programs, IANR; Agricultural Economics

University of Nebraska - Participating University

D. G. Anderson, Marketing, Agricultural Economics
R. B. Clark, Mineral nutrition, Agronomy (USDA)
M.D. Clegg, Cropping Systems, Agronomy
J. D. Eastin, Stress Physiology, Agronomy
S. G. Jensen, Stalk rots, Plant Pathology (USDA)
J. W. Maranville, Nitrogen nutrition, Agronomy
David P. McGill, Interim Head, Dept. of Agronomy
William L. Miller, Head, Dept. of Agricultural Economics
R. E. Neild, Agricultural Climatology, Horticulture
W. M. Ross, Genetics, Agronomy (USDA)
C. Y. Sullivan, Stress Physiology, Agronomy (USDA)
Roger D. Uhlinger, Head, Dept. of Horticulture

Principal Conferees (continued)

Purdue University

Philip C. Abbott, Pricing, policy and trade constraints, Agricultural Economics
John D. Axtell, Sorghum genetics and breeding, Agronomy
Gebisa Ejeta, Sorghum breeding, Agronomy
Allen W. Kirleis, Utilization and quality, Agronomy Food Science
J. C. Rogler, Enhancement of high tanin sorghum utilization, Animal Sciences
Herman L. Warren, Plant Pathology
D. Woods Thomas, Director, International Programs

Texas A&M Sorghum Program - Speakers During Review

L. Ed Clark, Breeder-Agronomy, Vernon Center
J. Craig, Plant Pathology
R. A. Frederiksen, Plant Pathology
Frank Gilstrap, Entomology
Wayne Jordan, Physiologist, Texas Water Resources Inst.
Q. Kubicek, Plant Pathology
John Mann, Breeder, INTSORMIL/Tanzania
D. Mechanstock, Breeder, INTSORMIL/Honduras
Fred Miller, Breeder, Soil and Crop Sciences
Art Onken, Soil Chemist, Lubbock Center
M. Pawar, Plant Pathology
Gary Peterson, Breeder, Lubbock Center
Lucas Reyes, Agronomy, Corpus Christi Center
Lloyd Rooney, Cereal Chemist, Soil and Crop Sciences
Darrell Rosenow, Breeder, Lubbock Center
J. Sifuentes, Plant Pathology
Roberta Smith, Physiologist, Soil and Crop Sciences
George Teetes, Entomology
Robert Toler, Plant Pathology
G. Wall, Plant Pathology, INTSORMIL/Honduras

Texas A&M - Other Conferees

N. P. Clarke, Director, Texas Agricultural Experiment Station
Philip C. Limbacher, Director, Office of International Coordination
Dudley T. Smith, Associate Director, Texas Agricultural Experiment Station

Appendix 5

PARTICIPANTS AT THE INTSORMIL

PRINCIPAL INVESTIGATOR'S CONFERENCE [1]

January 4-6, 1984
Scottsdale, Arizona

UNIVERSITY OF ARIZONA

Vicki Marcarian
Robert Voight
Al Dobrenz
Orrin Webster

FLORIDA A & M UNIVERSITY

Hetty Banatte

KANSAS STATE UNIVERSITY

Frank Barnett
William Stegmeier
Tareke Berhe (Sudan)
Robert Mills
Ed Kanemasu
Floyd Smith
John Pedersen
Tom Harvey

UNIVERSITY OF KENTUCKY

C. Milton Coughenour
Billie DeWalt
Kathleen DeWalt
William Lacy
Elizabeth Adelski

MISSISSIPPI STATE UNIVERSITY

Lynn Gourley (CIAT-Colombia)
Nat Zummo
Henry Pitre
Mary Futrell
James Delouche or
Howard Potts
Rodney Foil

UNIVERSITY OF NEBRASKA

William Ross
Jerry Eastin
Stan Jensen
Ralph Neild
Charles Sullivan
Dale Anderson
Ralph Clark
Max Clegg
Charles Francis
Jerry Maranville

PURDUE UNIVERSITY

John Axtell
Herman Warren
Larry Butler
Philip Abbott
Allen Kirleis
John Rogler
Tom Housley

TEXAS A & M UNIVERSITY

Fred Miller
Gary Peterson
Darrell Rosenow
Wayne Jordan
Dick Frederiksen
John Mann
Frank Gilstrap
Robert Toler
George Teetes
Lloyd Rooney
Art Onken
George Wall
Dan Meckenstock

1/ List of names as of 12/20/83

(continued)

HOST COUNTRIES AND CENTERS

Vartan Guiragossian, CIMMYT
M. Palomar, Philippines (NE)
Curtis Jackson, ICRISAT
David Andrews, ICRISAT
Gebisa Ejeta, Sudan (PR)

MANAGEMENT ENTITY

Earl Leng
Glen Vollmar
Carl Mueller
Joan Frederick

INTSORMIL REVIEW PANEL

Bruce Maunder (DeKalb-TX)
John Monyo (FAO-Rome)

AID REVIEW PANEL

W. Fred Johnson, BIFAD
Harve Carlson, AID, Consultant
Elvin Frolik, AID, Consultant
Keith Byergo, AID/Washington

AID/WASHINGTON

Robert Jackson
John Yohe

ADMINISTRATIVE COUNCIL

H. Dean Bunch, MS
Herbert Massey, KY
George Ware, AZ
Robert Kleis, NE
D. Woods Thomas, PR
Dudley Smith, TX
Charles Kidd, FL
J.S. Kanwar, ICRISAT

Appendix 6

December 15, 1983

ACTION MEMORANDUM FOR THE AGENCY DIRECTOR FOR FOOD AND AGRICULTURE, BUREAU OF SCIENCE AND TECHNOLOGY

FROM : S&T/AGR, Anson R. Bertrand, Director

SUBJECT: Scope of Work, A.I.D. Team Evaluation for CRSP-Sorghum/Millet, Project Number 931-1254

Background: Your approval is required to proceed with an A.I.D. team evaluation of the CRSP-Sorghum/Millet to provide guidance to A.I.D. and the University of Nebraska, the Management Entity (ME), regarding an additional three-year authorization beyond July 1, 1985 for years 7, 8 and 9.

The review will bring the CRSP-Sorghum/Millet review schedule in line with stated policy for conducting in-depth reviews for CRSPs during each third year of the program operation.

Recommendation: In order to carry out this team review, your approval is required both for the Scope of Work and travel costs of the team.

APPROVED: _____

DISAPPROVED: _____

DATE: 12/27/83

Attachment:
Scope of Work

Clearance:
S&T/AGR/AP:J. M. Yohe (Draft) Date: 12/9/83
S&T/AGR, M. Mozynski (Draft) Date: 12/9/83
S&T/PO, F. Campbell _____ Date: 12/23/83
S&T/PO, B. Roche _____ Date: 12/27/83

S&T/AGR/AP:RIJackson:lsl:9/08/83:Ext. 235-1497 Retyped 12/15/83
Wang No. 0492f

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. Earl R. Leng
CRSP/SM Program Director

REVIEW DATES : A. Principal Investigators
Project Reviews January 3-6, 1984

B. Participating Institutions Visits
January 9-20, 1984

TYPE OF REVIEW : In-depth Managerial Review

TEAM COMPOSITION : A. Team Members:

1. Dr. Elvin Frolik
Consultant and Team Leader

2. Dr. Harve Carlson
Consultant

3. Mr. Fred Johnson
BIFAD

4. Mr. Keith Byergo
Consultant

B. Team Coordinator

Dr. Robert I. Jackson
Senior Agronomist
S&T/AGR/AP

A. PURPOSE AND RATIONALE FOR A.I.D. EVALUATION

S&T/FA receommended 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 permanent 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 next and third CRSP-Sorghum/Millet evaluation by the EEP is not scheduled until September 1984 and this will be too late for A.I.D.'s needs for future funding. It has been decided to conduct an A.I.D. managerial review at the beginning of CY 1984. This will correspond with the annual principal investigators meeting held at the beginning of each calandar year.

B. TEAM COMPOSITION

1. Dr. Elvin Frolick, Consultant and Team Leader, is the former Dean of the College of Agriculture at the University of Nebraska, an agronomist by training and currently a private consultant. He has wide experience with A.I.D. in project design and evaluation.

2. Dr. H. J. Carlson, Consultant. He has 28 years 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 a project at the University of Missouri.

3. Mr. W. Fred Johnson, BIFAD.

4. Mr. Keith Byergo, Consultant. He is a former A.I.D. Food and Agriculture Officer, Project Manager, S&T/AGR Division Chief and Acting Deputy Director. He has been working as an international agriculture consultant since his retirement in July, 1980.

5. Dr. Robert I. Jackson, Senior Agronomist with S&T/AGR/AP and Program Manager for the CRSP-S/M. He has had many years of experience as an agronomist and production specialist with A.I.D.

C. DATES AND PLACES OF EVALUATION

1. PARTICIPATING INSTITUTIONS

University of Arizona	- January 03 - 07, 1984
Mississippi State University	- January 09 - 11, 1984
Kansas State University	- January 12 - 13, 1984
Texas A&M University	- January 16 - 17, 1984
University of Nebraska	- January 18 - 20, 1984

2. PRINCIPAL INVESTIGATORS PROJECT REVIEW

Phoenix, Arizona - January 3-6, 1984

D. COST ANALYSIS FOR EVALUATION

1.	S&T/AGR/AP - Travel Per Diem for Dr. R. I. Jackson	$1,800
2.	RSSA Funds for 3 persons Travel, Per Diem and Consultancy Fee	$15,400

E. BACKGROUND

The CRSP-Sorghum/Millet 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. For this period, $14.5 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 CRSP-S/M research activities.

The long-range goal of the CRSP-S/M 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. Eight U.S. institutions are responsible for providing leadership to the projects and are actually subgrantees of the CRSP-S/M. At present there are ten 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 CRSP-S/M scientists are able to collaborate. These institutions provide the extension links for the practical adaption of sorghum and millet research 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 CRSP-S/M has just begun its fifth 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 EEP, ME, Missions and A.I.D. are involved in various aspects of this function. Are there marginal or redundant activities that should be deleted from the CRSP?

2. Is the CRSP-S/M 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.

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? Are there any that should be deemphasized?

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

6. Has the CRSP-S/M 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? How? What are the feelings of collaborators about impact of the projects and the overall CRSP-S/M?

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?

9. A.I.D. monitors the CRSP-S/M, 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. Would the CRSP be more effective or more efficient if a contract were used instead of a grant? Should the A.I.D. Program Manager play a more active role in the decision making process including project design and budgetary expenditures?

10. Should ME/PIs be responsible for the preparation of purchase requests including source/orgin waivers? What authority should the A.I.D Program Manager have in screening items to be procured using CRSP-S/M funds? What is the ME's responsibility in contractual requirements?

11. How cost effective has the CRSP-S/M been? Can a cost benefit ratio be calculated? What success stories are there to support the cost effectiveness?

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

13. What mission projects has the CRSP-S/M supported? What are the missions' comments on in-country collaborative research projects through the CRSP-S/M?

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

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 insitution and each project
4. External Evaluation Panel reports and subsequent actions taken by the Technical Committee and the Board of Directors
5. Sample trip reports
6. Newsletters

The last External Evaluation Panel (EEP) was held Feb. 1-5, 1982 evaluating the period from 1981 to Feb. 1982. The Management Entity and Technical Committee responded to the panel evaluation by making a number of recommended changes. This EEP will assess the effectiveness of these changes and also consider and respond to other problems and issues that have arisen during the current assessment period March, 1982 to January, 1984.

Having regional bureau participation on the review team was considered. However, as this is a domestic review and given the work load and shortage of travel funds in the bureaus it was decided to hold their participation until the international site reviews are made in mid-1984.

Attachment A: Most recent PES

GLEN VOLLMAR
FEB. 10, 1984

INTSORMIL SPONSORED AND COSPONSORED TRAINING

I. WORKSHOPS	(ESTIMATE) PARTICIPANTS
Sorghum Stalk Rot Workshop, Bellagio, Italy, November 27 - December 3, 1983	27
Striga Workshop, North Carolina State University and APHIS, USDA, August, 1983	17
Sorghum Utilization Workshop, (CIMMYT), Mexico, 1983	85
Sorghum Breeding Workshop - CIMMYT, Mexico April 10-16, 1983	120
Seed Workshop, Sudan, November 5-8, 1983	30
International Symposium - Grain Quality, India (ICRISAT)	198/200
Sorghum in the 1980's, India (ICRISAT) November 2-7, 1981	200
Plant Pathology - Mexico - CIMMYT	50

WORKSHOPS HELD TO DATE HAVE BEEN HIGHLY SUCCESSFUL IN TERMS OF INTEREST AND QUALITY OF THE PROCEEDINGS.

II. INDIVIDUALS OR SMALL TEAMS	PARTICIPANTS*
Sorghum Utilization - Purdue	2
Sorghum Soils Analysis and Fertility	3
Striga - (Bebawi-Sudan)	1
Seed - Sudan (MSU and other States)	3
Sorghum Breeding - Dr. Raphael Duverge - Dominican Republic	1
Physiology - ICRISAT	4
Plant Pathology - ICRISAT	3

*Our records on the above participants are rather incomplete at this time, the number indicated is estimated.

III. WORKSHOP IN THE PLANNING PROCESS

Sorghum-Acid Soils - Colombia (CIAT) - May 27-June 2, 1984.

Sorghum Insects - Texas A&M - July, 1984

Farming Systems - Mexico (CIMMYT) - September 16-22, 1984

DRAFT

ECONOMIC ANALYSIS OF A SORGHUM AND MILLET COLLABORATIVE RESEARCH SUPPORT PROGRAM SUBPROJECT

February 15, 1984

Bonni van Blarcom

EXECUTIVE SUMMARY

This study, while recognizing the problems inherent in evaluating agricultural research, undertook an economic ananlysis of a Sorghum/Millet Collaborative Research Support Program (S/M CRSP) subproject. The subproject entitled "Development of Agronomically Superior Germplasm," was evaluated for its projected economic impact in Sudan. A spreadsheet computer model was developed to assist in the calculations. Conservative estimates of a) farmers' ability to derive increased benefits from new technology and, b) adoption rates among farmers in Sudan, along with liberal estimates of c) production cost increases from the new technology were used. Preliminary work indicates a benefit-cost ratio of 1.32 and an internal rate of return of 21% to the subproject.

The study provides a framework for evaluating other agricultural research activities. Four attributes of the framework developed are: 1) data requirements are specified; 2) assumptions are explicit; 3) sensitivity analysis can be performed on most of the variables; and 4) the framework can be further refined when more accurate information is available.

In addition, this study collaborated with one university to develop a uniform financial reporting format to monitor CRSP expenditure trends. This format will be helpful in standardizing expenditure data reporting by the other universities involved in the S/M CRSP.

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II. Formulas Used in the Analysis

III. Data Sources Used in Project Evaluation

IV. Description of Project PRF - 3

V. Request for Financial Information and Data

Economic Analysis of a Sorghum/Millet Collaborative Research Support Program Subproject

Introduction

This report is prepared as a product of a contract with the Agency for International Development, Office of Agriculture, to examine and evaluate the cost effectiveness of agricultural research undertaken by the Sorghum and Millet Collaborative Research Support Program (S/M CRSP).

The S/M CRSP has been underway for five years. It is too early as yet to attempt any comprehensive economic analysis of the project or to develop sound measures of economic performance. However, it is appropriate now to develop a framework for evaluating individual projects, including indicators of the project's ex ante economic impact. These preliminary indicators include the benefit-cost ratios, net present values and internal rates of return. The analytical framework also indicates the approximate impact requirement for a specified internal rate of return.

This report looks briefly at the problems of evaluating agricultural research, describes the analytical framework developed, and examines its application to one S/M CRSP subproject, Project PRF - 3 "Development of Agronomically Superior Germplasm."

PART ONE

Evaluating Agricultural Research:
Problems and Practices

Because of its inherent nature, agricultural research is difficult to evaluate. Many different standards exist for evaluating the output of research -- knowledge creation. Numerous academicians and practitioners have dealt with these problems.[1/] After many years of model construction and application there is no one widely accepted approach or model for use in evaluating the economic impact of agricultural research. A case in point is the World Bank publication, Costs and Benefits of Agricultural Research: The State of the Arts, in which author C. Edward Schuh describes a number of different models to evaluate agricultural research, ex ante and ex post. In addition to deciding on the model to evaluate research, the evaluation needs to make many subjective judgements. As one agricultural economist notes "all ex ante research evaluation procedures are inherently subjective. The only difference is where subjectivity enters and how it is processed".[2/]

[1/] Robert E. Evenson, Vernon W. Ruttan, George W. Norton, Jeffrey S. Davis, Walter L. Fishel, Joseph Havlicek, C. Richard Shumway, Per Pinstrup Anderson, G. Edward Schuh.

[2/] C. Richard Shumway, Subjectivity in Ex Ante Research Evaluation, American Journal of Agricultural Economics Vol. 63, No. 1, February 1981.

And compounding the difficulty of evaluating agricultural research is the extensive information required, which renders the process time consuming. Difficulties aside, the reliablility of the results of a project evaluation will depend on the time, effort, applicability of the model, and depth of knowledge applied to the project

The following section summarized six major problems in evaluating the economic impact of agricultural research and note how they affect a project's evaluation.

1) One problem in evaluating research ex ante is the serendipitous nature of research. When economic evaluation is performed ex ante knowledge creation, the task is virtually impossible because it involves predicting when knowledge will be discovered. The results are more reliable when a technology or knowledge has been discovered, but not implemented. In such cases, many environmental factors are known and estimates of impact can be calculated, although the reliability of the results are as good as the accuracy of the numerous subjective judgements. The framework developed for this project assumes knowledge creation.

2) Another problem is the attribution of costs of previous research. For example, if a newly developed seed variety uses parent material obtained under a previously funded program some of the prior research costs could be allocated to the present project. AID does not have a rigid methodology for economic analysis, but one of AID's principles is that "investments made prior to the design of a given project should not be included as project costs."[2/]

[2/] AID Handbook No. 3.

This principle recognizes that although previous costs may have an effect on later projects, they can not be avoided and thus should be excluded. Application of this principle to our analysis permits all pre - S/M CRSP costs to be ignored.

3) Problems may also arise in accounting for the costs and benefits of collaborative research. If a colleague's work contributes sinificantly to a discovery, are the costs of his work to be included in total costs caculated for the project? Similarly, who receives credit for the benefits? In this area, no clear guidelines are possible and, subjective judgements are necessary. As long as similiar judgements are rendered on all evaluated projects, evaluations will be comparable. For this S/M CRSP subproject evaluattion, the researchers allocated the costs and benefits according to their best judgement. In the future, general guidelines for these subjective judgements should be established.

4) Research that renders "negative results" poses another problem in evaluation. Consider research to develop a drought- and striga- reistant sorghum line. If a line of sorghum is identifyed as drought resistant, but susceptible to striga this research, although constructive, renders a negative result. How are the costs and benefits calculated from this research? The costs would be immediately attributed to the project, while the allocation of benefits would be withheld until the discovery of a drought- and striga- resistant variety.

5) The unit of measurement used to evaluate research benefits is a fundamental decision that determins evaluation methodology. Three common

surrogates for evaluating the impact of new knowledge are: (1) The number of published articles in agricultural, scientific or technical journals, (2) the number of individuals trained, and (3) the impact on production. Each approach has different advantages and disadvantages, but the one most frequently used is the impact on production.[3/] This approach measures the output of research at the intended point of impact: the production level. One of the primary objectives of CRSP activities is to increase food production in LDCs. Granted, the transfer of knowledge through training of individuals and publication of information is also an objective of CRSP activities. As measures of knowledge transfered, these are benefits in and of themselves. But the important impact of these benefits is the use of the knowledge gained to increase production. The analytic approach described below measures the benefits by estimating impact on production.

6) One final problem is the evaluation of knowledge produced versus utilization of that knowledge. There is less concern with this concept in ex ante than in ex post evaluation, the reason being that ex ante evaluation assumes knowledge utilization. It also projects the expected impact once the product, knowledge, or technology is implemented.

The mandate of CRSP activities is research, and not the implementation of research (e.g. seed multiplication or extension work). Strictly speaking an evaluation of CRSP activities would consider the one objective of creating new knowledge. Practically speaking, however, an evaluation must examine the

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3/ E. Edward Schuh, Costs and Benefits of Agricultural Research: The State of the Arts. World Bank Staff Working Paper No. 360. 1979.

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impact of knowledge utiliztion, for if research is to have value, it must be used. The evaluation of the S/M CRSP sub-project attempts to measure the value of research by projecting the extent of knowledge utilizaion and its impact.

PART TWO

Description of the Analytical Approach

The analysis employs a basic computer spreadsheet format based on Price Gittinger's Economic Analysis of Agricultural Projects, and adopted to agricultural research and CRSP activities. Gittinger's well respected work uses a benefit-cost analysis approach. (The computer spreadsheet is in Appendix I, and the formulas used appear in Appendix II.)

The analytical framework applies to projects with expected benefits in terms of increased production resulting from increased yields. The number of refinements that can be made to the analytical framework are endless (contributions in this area are welcome). There are three central parts to the framework: 1) "Estimated Costs of a Project", 2) "Calculations to Estimate Benefits", and 3) "Calculation of Benefit Cost Ratios and other Economic Indicators".

The analytical framework discounts the incremental costs and benefits of the project to calculate a benefit-cost ratio, a net present value, and an internal rate of return. Attributing costs to the project is a stright forward procedure that uses expenditure information provided by the CRSP Managment Entity. Determining the benefits of the project, on the other hand, requires substantial information about the crop and the area where the benefits are expected to occur. The more pertinent information available

the more representative and accurate will be the framework's projections of the economic impact of the project.

The framework requires information on 1) the country where the new technology will be applyed such as average acreage, production and yield, and exchange rate, 2) farm-level data such as farmgate price, production inputs and costs, and probable adoption rates, and 3) cost of production and yield changes with the new technology.

Total costs are discounted to arrive at the present worth of expenditures. On the benefit side, the net value of increased production is calculated by subtracting the increased costs to the farmer from gross value of increased production. The incremental net values are discounted to calculate the present worth of benefits. From these figures, the benefit-cost ratio and net present worth are calculated. Calculations for the IRR, although based on the same data, entail netting out costs from benefits each year before discounting.

The framework can be applied to any number of projects (subprojects or any delineated unit) for which data are available. With refinements it can consider different production characteristics and be applied to a broader range of projects such as projects that benefit farmers by decreasing producion risks. A technology that provides the farmer with a greater certainty of annual production, but with a lower yield (even lower than the average of the fluctuating high and low yields) could be considered viable under a benefit-cost analysis if allowance is made for the risk factor.

Data requirements are as follows. An asterik indicates those items for which assumptions will probably be necessary. (This indication coincides with the assumptions required for the evaluation of the S/M CRSP subproject.)

*a) percentage of land where new crop technology can be applied (on a 5 year average)

*b) percentage of land where new technology will probably be applied within the project time frame, considering such factors as availability of extension services, seed multiplication practicies, etc.;

*c) farmers annual adoption rate over the period in which benefits are expected;

*d) expenses of the university(ies) and other contributors to the S/M CRSP subproject PRF-3;

*e) farmers' ability to "capture" the benefits from the technology introduced;

*f) farmers' increased costs (as percentage of total costs) resulting from application of new technology;

g) exchange rate of Sudanese pounds to U.S. dollars;

h) price received by farmers per unit sold;

i) potential yield of new seed based on research station trials;

j) national production in metric tons;

k) national production in area harvested;

l) farmers' cost of production per unit sold, and

m) AID's annual expenditures on CRSP subproject PRF-3.

Calculations made from these data are as follows:

a) value of one ton of sorghum in U.S. dollars;

b) farmers' expected yield;

c) ratio of experimental yield to national average;

d) ratio of farmers' expected yield to national average;

e) area of increased annual production due to adoption of new technology;

f) amount of increased annual production;

g) value of increased annual production;

h) increase in farmers' costs per unit sold, in Sudanese pounds;

i) increase in farmers' costs per ton, in U.S. dollars;

j) total expenditure for the subproject;

k) incremental present worth of benefits and costs;

l) benefit-cost ratio;

m) net present worth; and

n) internal rate of return.

PART THREE

Application of the Analytical Framework to a S/M CRSP Subproject

The framework was applyed to estimated costs of the entire S/M CRSP subproject PRF-3, while benefits were estimated from one part respresenting 60% of the subproject activities. Benefits were underestimated because information on potential benefits from 40% of the subproject's activities was not available. (The subproject entitled: "Development of Agronomically Superior Germplasm Including Varieties, Hybrids and Populations which have Improved Nutritional Value and Good (Evident) Grain Quality for Utilization in Developing Countries," is described in Appendix IV.)

Using preliminary data, the benefit-cost ratio was calculated at 1.32 and the internal rate of return to the subproject at 21%. Data used in the framework were largely drawn from 1) scientists working on the subproject PRF-3 (Dr. Axtell and Dr. Gebisa Ejeta), and 2) baseline data from another S/M CRSP subproject (University of Kentucky's socio-economic study in Sudan). (Much of the economic data from the socio-economic project are contained in Appendix III.)

The following describes the step-by-step application of the analytical framework to S/M CRSP subproject PRF-3.

I. Estimated Costs

In the application of the analytical framework to PRF-3, only approximate

and "other contibrutor costs" are estimated at 3% of AID's costs. These amounts are added to AID's expenditures for an estimate of total project costs. All data presentations outlined in red represent original or estimated data, whereas areas outlined in blue are calculations performed by the computer.

PART ONE: ESTIMATED COSTS OF A PROJECT

YEAR	A.I.D.	UNIVER.	OTHER	TOTAL
	- - - thousand dollars - - -			
1	371	122	11	505
2	371	122	11	505
3	225	74	7	306
4	450	149	14	612
5	55	18	2	75
6	0	0	0	0
7	0	0	0	0
8	0	0	0	0
9	0	0	0	0
10	0	0	0	0
Total	1472	486	44	2002

II. Calculating Benefits

A forumla in the computer spreadsheet uses data on the exchange rate and price received by the farmer to calculate the value per ton in U.S. dollars. Also calculated is a ratio comparing the domestic price of the product (sorghum) to the world price.

PART TWO: CALCULATIONS TO ESTIMATE BENEFITS

A. Exchange Rate and Price Variables

*1. Exchange Rate ($/LS):	1.30
*2. Price farmer (LS/sack):	23
3. Value of One Ton ($):	372
(Given wld price at $125, ratio of Sudan/wld price:)	2.96

To estimate the benefit of the new technology the farmers' expected yield and his percentage increase in production are calculated. Data input are 1) national average yield, 2) experimental yield, and 3) estimated ability of the farmer to obtain a percentage of the increased yields of the experiment station.

B. Calculations of Yield Increases

1. Average Yield (kg/fdn.):	298
*2. Experimental Yield:	450
*3. Farmer's Ability to capture incr (as % of inc. of exp over tradn)	0.35
4. Farmers' Expected Yield:	351
5. Ratio of new to old yields	1.18
6. Percentage Incr. in Prodn.	0.18

Using data on national yield and production averages, applicability of the new technology to the country, and expected annual adoption rates among Sudanese farmers, the framework calculates the increased annual production and the value of production resulting from research utilization. Production estimates are made both in amount of produciton (under Section 5 of the framework) and area of production effected (under Section 6).

C. Calculations to Determine Value of Increased Yield

*1. Total Production (thous. tons):	2408
*2. Equivalent land area (thous.fed)	8061
3. Technology applicable to what % cty's land:	1.00

*4. Projected Farmer Adoption and Consequential Benefits:

Year	Rates of Adopt.	Incr. Prodn (tons)	Incr. Value of Prodn. ($ '000)
1	0.0000	0	0
2	0.0000	0	0
3	0.0000	0	0
4	0.0000	0	0
5	0.0025	1075	400
6	0.0050	2149	800
7	0.0100	4299	1599
8	0.0100	4299	1599
9	0.0100	4299	1599
10	0.0100	4299	1599
Total:		20420	

5. Amount of land to which technology will be applyed:
(Given Assumptions Above)

Yr.	Frm Adpt	Area Adpt.
1	0.000	0
2	0.000	0
3	0.000	0
4	0.000	0
5	0.003	3060
6	0.005	6120
7	0.010	12240
8	0.010	12240
9	0.010	12240
10	0.010	12240
Total:		56142

The next step is to calculate the costs of using this new technology. (Even with a technology that does not require different cultivation practices or inputs, increased production will mean added costs for harvesting, and transportation.) The cost of production and percentage increase in costs are used to calculate the total cost increase in U.S. dollars.

C. Increased Costs of Prodn.	
*1. cost of prodn.(per sack;LS)	20
*2. % increase in costs	0.30
3. increase in costs (per sack;LS)	6
4. increase in costs (per ton;$)	97

A discount rate is input to calculate the annual discount factors used below.

D. Discount Rate:	0.15

The following page illustrates the data used in the calculation of the economic indicators.

PART THREE: CALULATION OF BENEFIT-COST RATIO

SECTION A:

Year	Costs	0.15 Discount Factor	Present Worth	Value of In Prodn ('000)	In of Prodn Costs ('000)	Net. Val. In Prodn. ('000)	0.15 Discount Factor	Present Worth
1	505	0.870	439	0	0	0	0.870	0
2	505	0.756	382	0	0	0	0.756	0
3	306	0.658	201	0	0	0	0.658	0
4	612	0.572	350	0	0	0	0.572	0
5	75	0.497	37	400	104	296	0.497	147
6	0	0.432	0	800	209	591	0.432	256
7	0	0.376	0	1599	417	1182	0.376	444
8	0	0.327	0	1599	417	1182	0.327	387
9	0	0.284	0	1599	417	1182	0.284	336
10	0	0.247	0	1599	417	1182	0.247	292
Total:		5.019	1409	7598	1981	5616	5.019	1862
		5.019	1409					

Benefit-cost at 0.15 = 1.32

Net present worth at 0.15 = 453

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The last section calculates the internal rate of return.

SECTION B:

Internal Rate of Return

	Net Cash Flow
1	-505
2	-505
3	-306
4	-612
5	221
6	591
7	1182
8	1182
9	1182
10	1182
Ttl	3614

IRR = 0.21

PART FOUR

Conclusions and Recommendations

Conclusions

The analytical framework developed to evaluate agricultural research projects was applied to one S/M CRSP subproject entitled "Development of Agronomically Superior Germplasm." Using the conservative calculations and speculative assumptions the following preliminary performance measures were derived: a benefit-cost ratio of 1.32, net present worth of $453,000 and an internal rate of return (IRR) of 21%. An IRR of 21% assumes the new technology is applied to approximately 58,000 acres over six years.

Three attributes of the analytical framework are:

1. data requirements identify information needed for future monitoring;
2. all assumptions are explicit which facilitates easy identification of the framework's weak as well as strong areas and allows for changes when data become available; (More specific data sources will be included in the final report. This will further highlight the difference between hard data, estimated input and assumptions used.)
3. sensitivity analysis can be performed on most variables, thus indicating the likely impact of possible management interventions.

Recommendations

Recommendations on future work fall into three categories: 1) refinement of the analytical framework, 2) guidelines for sensitivity analysis, and 3) data collection.

1) Refinements of the Analytical Framework

The analytical framework can be refined endlessly, but the most important refinements to make the computer model more functional are:

1. appplicability to a wider range of projects e.g. projects with benefits derived from less risky agricultural production;
2. calculations of the economic benefits and costs to the farmer; (Refinements could not only derive the farmers' benefits, but also provide for data input on amount and price of individual production inputs. Thus, high cost areas could be identified suggesting room for research contributions);
3. creation of a more interactive program allowing easy access of the analytic framework to individuals without computer familiarity;
4. development of formulas for manipulating the data in more depth, e.g. if data for 5 variables are given, what must be the quantify of the 6th variable to provide an acceptable IRR;
5. creation of program commands that require data sources to be identified alongside data. Thus permitting greater scrutiny of data sources.

2) Guidelines for Sensitivity Analysis

The analytical framework developed to date can be used to provide more in-depth information on a project's economic impact if sensitivity analysis is performed on a number of variables. It is likely that sensitivity analysis on the following data would be most revealing:

1. rates of adoption, e.g. from 0.25% to 15%;
2. farmer's effective yield increase, e.g. from 2% to 50%;
3. price to the farmer, e.g. 10-30% increase and decrease, and
4. exchange rate fluctuation.

3) Data Collection

As mentioned above, the more accurate the data are the more accurate the projected economic impact can be. The following are topics on which little data exist. Work in collecting information on these items would provide a stronger basis for evaluation:

1. probable use of the technology given considerations such as extension services, seed multiplication ability etc.,
2. farmers' adoption rates;
3. farmers' ability to derive benefits from the technology, and
4. inputs and costs of production.

Appendix I

The Models Application to CRSP Subproject PRF-3

EX-ANTE COST-BENEFIT EVALUATION

(Costs are based on one project whose benefits are expected in terms of increased production as a result of increased yields. The benefits are projected to effect differing amounts of the country's land resources dependent on assumptions made in the evaluation regarding which a sensitivity analysis can be run.)

PART ONE: ESTIMATED COSTS OF A PROJECT

Table 1. *COSTS OF ONE PROJECT

YEAR	A.I.D.	UNIVER.	OTHER	TOTAL
	- - - thousand dollars - - - - - -			
1	371	122	11	505
2	371	122	11	505
3	225	74	7	306
4	450	149	14	612
5	55	18	2	75
6	0	0	0	0
7	0	0	0	0
8	0	0	0	0
9	0	0	0	0
10	0	0	0	0
Total	1472	486	44	2002

PART TWO: CALCULATIONS TO ESTIMATE BENEFITS

A. Exchange Rate and Price Variables

*1. Exchange Rate ($/LS):	1.30
*2. Price farmer (LS/sack):	23
3. Value of One Ton ($):	372
(Given wld price at $125, ratio of Sudan/wld price:)	2.96

B. Calculations of Yield Increases

1. Average Yield (kg/fdn.):		298
*2. Experimental Yield:	1.51	450
*3. Farmer's Ability to capture incr (as % of inc. of exp over tradn)		0.35
4. Farmers' Expected Yield:		351
5. Ratio of new to old yields		1.18
6. Percentage Incr. in Prodn.		0.18

C. Calculations to Determine Value of Increased Yield

*1. Total Production (thous. tons):	2408
*2. Equivalent land area (thous.fed)	8081
3. Technology applicable to what % cty's land:	1.00

*4. Projected Farmer Adoption and Consequential Benefits:

Year	Rates of Adopt.	Incr. Prodn (tons)	Incr. Value of Prodn. ($ '000)
1	0.0000	0	0
2	0.0000	0	0
3	0.0000	0	0
4	0.0000	0	0
5	0.0025	1075	400
6	0.0050	2149	800
7	0.0100	4298	1599
8	0.0100	4298	1599
9	0.0100	4298	1599
10	0.0100	4298	1599
Total:		20417	

6. Amount of land to which technology will be applyed:
(Given Assumptions Above)

Yr.	Frm Adpt	Area Adpt.
1	0.000	0
2	0.000	0
3	0.000	0
4	0.000	0
5	0.003	3060
6	0.005	6120
7	0.010	12240
8	0.010	12240
9	0.010	12240
10	0.010	12240
Total:		58142

5. Increased Costs of Prodn. (per ton)

*a.	cost of prodn.(per sack;LS)	20
*b.	% increase in costs	0.30
c.	increase in costs (per sack;LS)	6
d.	increase in costs (per ton;$)	97

D. Discount Rate: 0.15

PART THREE: CALULATION OF BENEFIT-COST RATIO

SECTION A:

Year	Costs	0.15 Discount Factor	Present Worth	Value of In Prodn ('000)	In of Prodn Costs ('000)	Net. Val. In Prodn. ('000)	0.15 Discount Factor	Present Worth
	----COSTS----			----BENEFITS----				
1	505	0.870	439	0	0	0	0.870	0
2	505	0.756	382	0	0	0	0.756	0
3	306	0.658	201	0	0	0	0.658	0
4	612	0.572	350	0	0	0	0.572	0
5	75	0.497	37	400	104	296	0.497	147
6	0	0.432	0	800	209	591	0.432	256
7	0	0.376	0	1599	417	1182	0.376	444
8	0	0.327	0	1599	417	1182	0.327	387
9	0	0.284	0	1599	417	1182	0.284	336
10	0	0.247	0	1599	417	1182	0.247	292
total:		5.019	1409	7598	1981	5616	5.019	1862
		5.019	1409					

Benefit-cost at 0.15 = 1.32

Net present worth at 0.15 = 453

SECTION B:

Internal Rate of Return

	Net Cash Flow
1	-505
2	-505
3	-306
4	-612
5	221
6	591
7	1182
8	1182
9	1182
10	1182
Ttl	3614

IRR = 0.21

SUMMARY TABLE

asic Assumptions and Data Required

Costs AID/U/O/Tt	1472	486	44	2002				
Ag. Factors								
Prodn.	2408							
Area	8081							
Yield	298							
Price to frmer	23							
Tech Factors								
Applica	1.00							
Frm Adpt Rt (5-10yrs)	.00	0.01	0.01	0.01	0.01	0.01		
Area Adopted	3060	6120	12240	12240	12240	12240	Total:	58142
Exper Yld (% inc.)	1.51							
Frmer Yld (% inc)	1.18							
% inc. prodn costs	0.30							
Other Factors								
Exchange Rate	1.30							
Discount Rate	0.15							

esults

Benefit-Cost Ratio	1.32	NPW:	453
IRR	0.21	NPW:	0

Appendix II

Formulas Used in the Model

```
B4: 'EX-ANTE COST-BENEFIT EVALUATION
B6: '(Costs are based on one project whose benefits are expected in terms
B7: 'of increased production as a result of increased yields. The benefits
B8: 'are projected to effect differing amounts of the country's land
B9: 'resources dependent on assumptions made in the evaluation regarding
B10: 'which a sensitivity analysis can be run.)
B17: 'PART ONE: ESTIMATED COSTS OF A PROJECT
B18: "  ---------
C18: \-
D18: \-
E18: \-
F18: \-
B19: ^YEAR
C19: ^A.I.D.
D19: 'UNIVER.
E19: ^OTHER
F19: ^TOTAL
B20: ^ -----
C20: '--------
D20: '--------
E20: \-
F20: '  -----
C21: '- - - thousand dollars - - - - -
B22: 1
C22: 371
D22: +C22*0.33
E22: +C22*0.03
F22: +C22+D22+E22
B23: +B22+1
C23: 371
D23: +C23*0.33
E23: +C23*0.03
F23: +C23+D23+E23
B24: +B23+1
C24: 225
D24: +C24*0.33
E24: +C24*0.03
F24: +C24+D24+E24
B25: +B24+1
C25: 450
D25: +C25*0.33
E25: +C25*0.03
F25: +C25+D25+E25
B26: +B25+1
C26: 55
D26: +C26*0.33
E26: +C26*0.03
F26: +C26+D26+E26
B27: +B26+1
C27: 0
D27: +C27*0.33
E27: +C27*0.03
F27: +C27+D27+E27
B28: +B27+1
C28: 0
D28: +C28*0.33
```

```
E28: +C28*0.03
F28: +C28+D28+E28
B29: +B28+1
C29: 0
D29: +C29*0.33
E29: +C29*0.03
F29: +C29+D29+E29
B30: +B29+1
C30: 0
D30: +C30*0.33
E30: +C30*0.03
F30: +C30+D30+E30
B31: +B30+1
C31: 0
D31: +C31*0.33
E31: +C31*0.03
F31: +C31+D31+E31
B33: 'Total
C33: @SUM($C$22..$C$31)
D33: @SUM($D$22..$D$31)
E33: @SUM($E$22..$E$31)
F33: @SUM($F$22..$F$31)
B38: 'PART TWO:  CALCULATIONS TO ESTIMATE BENEFITS
B40: "A.
C40: 'Exchange Rate and Price Variables
C41: '-------------------------------
C43: '*1. Exchange Rate ($/LS):
F43: (F2) 1.3
C44: '*2. Price farmer (LS/sack):
F44: 23
C45: ' 3. Value of One Ton ($):
F45: (F0) (F44*12.444)*F43
C46: '(Given wld price at $125,
C47: ' ratio of Sudan/wld price:)
F47: (F2) +F45/125.57
B49: "B.
C49: 'Calculations of Yield Increases
C50: '-------------------------------
C52: ' 1. Average Yield (kg/fdn.):
G52: 298
C53: '*2. Experimental Yield:
F53: (F2) 1.51
G53: +G52*F53
H53: (F3) +G53/G52
I53: (F3) 444/298
C54: '*3. Farmer's Ability to capture incr
H54: (,0) (H53+1)*G52
C55: '     (as % of inc. of exp over tradn)
G55: (F2) 0.35
H55: (F3) 0.18/0.35
C56: ' 4. Farmers' Expected Yield:
B56: ((G53-G52)*G55)+G52
C57: ' 5. Ratio of new to old yields
G57: (F2) +G56/G52
H57: 1.18*298
B58: '
```

```
C58: ' 6. Percentage Incr. in Prodn.
G58: (F2) +G57-1
B61: "C.
C61: 'Calculations to Determine Value of
C62: 'Increased Yield
C63: '-----------------------------------
C64: '*1. Total Production (thous. tons):
G64: (F0) 2408
C65: '*2. Equivalent land area (thous.fed)
G65: +G64*1000/G52
C66: ' 3. Technology applicable to what
C67: '   % cty's land:
G67: (F2) 1
C71: '*4.  Projected Farmer Adoption and Consequential Benefits:
D73: 'Rates of
F73: 'Incr.
H73: 'Incr. Value
C74: 'Year
D74: 'Adopt.
F74: 'Prodn
H74: 'of Prodn.
C75: '----     --------
F75: '------
H75: '-----------
F76: '(tons)
H76: '    ($  '000)
C77: '1
D77: (F4) 0
F77: +$G$64*$G$58*D77*1000
H77: ($F77*$F$45)/1000
C78: '2
D78: (F4) 0
F78: +$G$64*$G$58*D78*1000
H78: ($F78*$F$45)/1000
C79: '3
D79: (F4) 0
F79: +$G$64*$G$58*D79*1000
H79: ($F79*$F$45)/1000
C80: '4
D80: (F4) 0
F80: +$G$64*$G$58*D80*1000
H80: ($F80*$F$45)/1000
C81: '5
D81: (F4) 0.0025
F81: +$G$64*$G$58*D81*1000
H81: ($F81*$F$45)/1000
C82: '6
D82: (F4) 0.005
F82: +$G$64*$G$58*D82*1000
H82: ($F82*$F$45)/1000
C83: '7
D83: (F4) 0.01
F83: +$G$64*$G$58*D83*1000
H83: ($F83*$F$45)/1000
C84: '8
D84: (F4) 0.01
```

```
F84: +$G$64*$G$58*D84*1000
H84: ($F84*$F$45)/1000
C85: '9
D85: (F4) 0.01
F85: +$G$64*$G$58*D85*1000
H85: ($F85*$F$45)/1000
C86: '10
D86: (F4) 0.01
F86: +$G$64*$G$58*D86*1000
H86: ($F86*$F$45)/1000
C87: 'Total:
F87: @SUM(F77..F86)
C90: '5.  Amount of land to which technology  will be applyed:
D91: '(Given Assumptions Above)
C92: 'Yr.
D92: 'Frm Adpt R
E92: 'Area Adpt.
D93: '-------- ----------
C94: '1
D94: (F3) +D77
E94: (F0) ($F77*1000)/($G$56)
C95: '2
D95: (F3) +D78
E95: (F0) ($F78*1000)/($G$56)
C96: '3
D96: (F3) +D79
E96: (F0) ($F79*1000)/($G$56)
C97: '4
D97: (F3) +D80
E97: (F0) ($F80*1000)/($G$56)
C98: '5
D98: (F3) +D81
E98: (F0) ($F81*1000)/($G$56)
C99: '6
D99: (F3) +D82
E99: (F0) ($F82*1000)/($G$56)
C100: '7
D100: (F3) +D83
E100: (F0) ($F83*1000)/($G$56)
C101: '8
D101: (F3) +D84
E101: (F0) ($F84*1000)/($G$56)
C102: '9
D102: (F3) +D85
E102: (F0) ($F85*1000)/($G$56)
C103: '10
D103: (F3) +D86
E103: (F0) ($F86*1000)/($G$56)
C104: '    Total:
E104: @SUM(E94..E103)
C106: 'C. Increased Costs of Prodn.
C107: '  *1.  cost of prodn.(per sack;LS)
H107: (F0) 20
C108: '  *2.  % increase in costs
H108: (F2) 0.3
C109: '   3.  increase in costs (per sack;LS)
```

```
H109: (,0) +H107*H108
B110: '
C110: '   4.  increase in costs (per ton;$)
H110: (H109*12.44)*F43
B113: "D.
C113: 'Discount Rate:
E113: (F2) 0.15
C114: '--------------
B116: 'PART THREE: CALULATION OF BENEFIT-COST RATIO
B117: '-----------------------------------------
B120: 'SECTION A:
B122: '-------------------------------
C122: '------COSTS
G122: '-----------------------------------------------
I122: '--BENEFITS
D124: (F2) +E113
G124: 'Value of
H124: '  In of Prodn
I124: 'Net. Val.
J124: (F2) +E113
D125: 'Discount
E125: 'Present
F125: '
G125: 'In Prodn
H125: '     Costs
I125: 'In Prodn.
J125: 'Discount
B126: 'Year
C126: ^Costs
D126: 'Factor
E126: 'Worth
G126: '  ('000)
H126: '     ('000)
I126: '  ('000)
J126: 'Factor
B127: \-
C127: '  -----
D127: '------
E127: '-------
G127: '--------
H127: '  -----------
I127: '------
J127: '--------
B128: 1
C128: +C22+D22+E22
D128: (F3) @PV(1,$E$113,$B128)
E128: +C128*D128
G128: +H77
H128: ($F77*$H$110)/1000
I128: +G128-H128
J128: (F3) @PV(1,$E$113,$B128)
B129: 2
C129: +C23+D23+E23
D129: (F3) @PV(1,$E$113,$B129)-@PV(1,$E$113,$B128)
E129: +C129*D129
G129: +H78
```

```
H129:  ($F78*$H$110)/1000
I129:  +G129-H129
J129:  (F3) @PV(1,$E$113,$B129)-@PV(1,$E$113,$B128)
B130:  3
C130:  +C24+D24+E24
D130:  (F3) @PV(1,$E$113,$B130)-@PV(1,$E$113,$B129)
E130:  +C130*D130
G130:  +H79
H130:  ($F79*$H$110)/1000
I130:  +G130-H130
J130:  (F3) @PV(1,$E$113,$B130)-@PV(1,$E$113,$B129)
B131:  4
C131:  +C25+D25+E25
D131:  (F3) @PV(1,$E$113,$B131)-@PV(1,$E$113,$B130)
E131:  +C131*D131
G131:  +H80
H131:  ($F80*$H$110)/1000
I131:  +G131-H131
J131:  (F3) @PV(1,$E$113,$B131)-@PV(1,$E$113,$B130)
B132:  5
C132:  +C26+D26+E26
D132:  (F3) @PV(1,$E$113,$B132)-@PV(1,$E$113,$B131)
E132:  +C132*D132
G132:  +H81
H132:  ($F81*$H$110)/1000
I132:  +G132-H132
J132:  (F3) @PV(1,$E$113,$B132)-@PV(1,$E$113,$B131)
B133:  6
C133:  +C27+D27+E27
D133:  (F3) @PV(1,$E$113,$B133)-@PV(1,$E$113,$B132)
E133:  +C133*D133
G133:  +H82
H133:  ($F82*$H$110)/1000
I133:  +G133-H133
J133:  (F3) @PV(1,$E$113,$B133)-@PV(1,$E$113,$B132)
B134:  7
C134:  +C28+D28+E28
D134:  (F3) @PV(1,$E$113,$B134)-@PV(1,$E$113,$B133)
E134:  +C134*D134
G134:  +H83
H134:  ($F83*$H$110)/1000
I134:  +G134-H134
J134:  (F3) @PV(1,$E$113,$B134)-@PV(1,$E$113,$B133)
B135:  8
C135:  +C29+D29+E29
D135:  (F3) @PV(1,$E$113,$B135)-@PV(1,$E$113,$B134)
E135:  +C135*D135
G135:  +H84
H135:  ($F84*$H$110)/1000
I135:  +G135-H135
J135:  (F3) @PV(1,$E$113,$B135)-@PV(1,$E$113,$B134)
B136:  9
C136:  +C30+D30+E30
D136:  (F3) @PV(1,$E$113,$B136)-@PV(1,$E$113,$B135)
E136:  +C136*D136
G136:  +H85
```

```
H136:  ($F85*$H$110)/1000
I136:  +G136-H136
J136:  (F3) @PV(1,$E$113,$B136)-@PV(1,$E$113,$B135)
B137:  10
C137:  +C31+D31+E31
D137:  (F3) @PV(1,$E$113,$B137)-@PV(1,$E$113,$B136)
E137:  +C137*D137
G137:  +H86
H137:  ($F86*$H$110)/1000
I137:  +G137-H137
J137:  (F3) @PV(1,$E$113,$B137)-@PV(1,$E$113,$B136)
B139:  "Total:
D139:  (F3) @SUM(D128..D137)
E139:  @SUM(E128..E137)
G139:  @SUM(G128..G137)
H139:  @SUM(H128..H137)
I139:  @SUM(I128..I137)
J139:  (F3) @SUM(J128..J137)
D140:  (F3) @PV(1,E113,10)
E140:  @NPV(0.15,C128..C137)
A142:  'Benefit-cost
C142:  '  at
D142:  (F2) +E113
E142:  '=
F142:  (F2) +K139/E139
A144:  'Net present worth at
D144:  (F2) +E113
E144:  '=
F144:  +K139-E139
A148:  'SECTION B:
A150:  'Internal Rate of Return
A151:  '----------------------
B152:  'Net Cash Flow
B153:  '-------------
A154:  1
B154:  +I128-C128
A155:  2
B155:  +I129-C129
A156:  3
B156:  +I130-C130
A157:  4
B157:  +I131-C131
A158:  5
B158:  +I132-C132
A159:  6
B159:  +I133-C133
A160:  7
B160:  +I134-C134
A161:  8
B161:  +I135-C135
A162:  9
B162:  +I136-C136
A163:  10
B163:  +I137-C137
A165:  'Ttl:
B165:  @SUM(B154..B163)
```

```
B167: 'IRR =
C167: (F2) @IRR(0.42,B154..B163)
B174: 'SUMMARY TABLE
B177: 'Basic Assumptions and Data Required
B178: '-----------------------------------
B180: '  Costs  AID/U/O/Tt
E180: @SUM($C$22..$C$31)
F180: @SUM($D$22..$D$31)
G180: @SUM($E$22..$E$31)
H180: @SUM($F$22..$F$31)
B182: '  Ag. Factors
B183: '     Prodn.
E183: (F0) 2408
B184: '     Area
E184: +G65
B185: '     Yield
E185: 298
B186: '     Price to frmer
E186: 23
B188: '  Tech Factors
B189: '     Applica
E189: (F2) 1
B190: '     Frm Adpt Rt (5-10yrs)
E190: (F2) +D81
F190: (F2) +D82
G190: (F2) +D83
H190: (F2) +D84
I190: (F2) +D85
J190: (F2) +D86
B191: '     Area Adopted
E191: (F0) +E98
F191: (F0) +E99
G191: (F0) +E100
H191: (F0) +E101
I191: (F0) +E102
J191: (F0) +E103
B192: '     Exper Yld (% inc.)
E192: (F2) +H53
B193: '     Frmer Yld (% inc)
E193: (F2) +G57
B194: '     % inc. prodn costs
E194: (F2) +H108
B197: '  Other Factors
B198: '     Exchange Rate
E198: (F2) 1.3
B199: '     Discount Rate
E199: (F2) +E113
B201: 'Results
B202: '  Benefit-Cost Ratio
E202: (F2) +F142
F202: 'NPW:
G202: +F144
B203: '  IRR
E203: (F2) +C167
F203: 'NPW:
G203: +F149
```

```
A209: 'Given a Change in Production, Number of Farmers Effected Would be:
A212: 'Change in Production (%):
E212: (F4) 0.001
A213: 'Amount Changed (tl 6 yrs:tons):
E213: ((+G64*1000)*E212)*6
A214: 'Number Frmers Effected (tl 6yr):
E214: +E212/12
```

Appendix III

Data Sources Used in Project Evaluation

Data for Historic Benefits

Summary for Farmers who Pay for All Labor By Crop

Sorghum

Land Acreage	Mean	St Deviation	minimum maximum
Total Acre Cultivated n=3	24.83 mekh	11.73	15.50 - 38.00
Total Area Fallow	203.33	257.36	40.00 - 500.0
Area in Sorghum	4.33	4.93	1.00 - 10.00
One person renting	5.06	5.00	5.00
Yield in Sorghum n=3	231.00 mids = 7.7 sacks	152.59	90.00 - 393.00
yield per mekh =	1.78 sacks		

Input Costs

Cost of sorghum seeds	[illegible]	2.54	0.00 - 3.60
Cost of seed treatment (n=2)	4.05 cs	2.76	2.10 - 6.00
amount of seed treatment (n=2)	2.00 rolls	1.41	1.00 - 3.00
amount of DDT (n=3)	4.16 rolls	5.11	.50 - 10.00
Cost of DDT (n=3)	4.06 c.s.	5.13	1.00 - 10.00

Land Clearing Cost — — —

Sorghum

Cost of Labor for each Operation

1st Planting	mean	St. Deviation	minimum - maximum
Costs (n=3)	6.47 cs	4.88	1.00 - 10.40

Labor arrangements: dahwa 1/3 = 33%; makh 2/3 = 68%

Cost per makh = 1.49 cs

2nd Planting (n=3)	mean	St. Deviation	minimum - maximum
Costs	5.27 cs	3.74	1.00 - 8.00

Labor arrangements: dahwa 1/3 = 33%; makh 1/3 = 33%; serbo 1/3 = 33%

Cost per makh = 1.21 cs.

1st Weeding (n=3)	mean	St. Deviation	minimum - maximum
Costs	43.40 cs	49.53	8.00 - 100.00

Labor arrangements: makh 3/3 = 100%

Cost per makh = 10.02 cs

2nd Weeding (n=3)	mean	St. Deviation	minimum - maximum
Costs	36.17 cs	46.92	4.00 - 90.00

Labor arrangements: makh 3/3 = 100%

Cost per makh = 8.35 cs

Cutting (n=3)	mean	St. Deviation	minimum - maximum
costs	6.93 cs	2.72	4.80 - 10.00

Labor arrangements: dahwa = 1/3 33%; makh = 1/3 33%

Cost per makh = 1.60 cs

Sorghum (cont.)

Threshing	mean	S.D.	minimum - maximum
Costs	8,78 LS	2,66	5,73 - 10,60

Labor arrangements

more than one 3/3 - 100% (Sack + Mid)

cost per metric = 2,03 LS

Sorghum total labor costs per metric = 24,72 LS

Remaining Data Needed for Intsormil Benefits

1. Correlation Between Sesame cost of labor and

	Pearson r	Prob	N
Total cultivated land	.71	.0001	203
Area in sesame	.76	.0001	180

	Mean	St Deviation	Range
2) Area in Sesame (N=183) (for those farmers who grew the crop)	6.26	6.55	.25 - 46.00
Area in Groundnuts (N=132)	2.35	2.40	.13 - 12.00

3) Sesame yield per makh = $\frac{7.69}{6.20}$ = 1.24 sacks per makh

Groundnut yield per makh = $\frac{18.71}{2.35}$ = 7.96 sacks per makh

4) Amount of Seed used and Cost

		Mean	St Deviation	Min - Max
Sesame	amount	7.64 mids	11.54	0.00-90.00
	cost	9.93 LS		
Millet	amount	4.55 mids	4.76	0.00-30.00
	cost	5.64 LS		
Groundnuts	amount	1.16 sacks	1.86	0.00-11.00
	cost	14.5 LS		
Sorghum				

5) For those farmers who paid something for 1st weeding millet ($n = 70$)

mean	5t Deviation	range
40.60	41.97	1.4 - 216.70

6) yield in sorghum ($n = 145$)

	mean	5t Deviation	range
	172.62 mids = 5.73 sacks	208.91	2.00 - 1350.00

Note: Like I gave farmers before were wrong on this

yield per mokk $= \frac{5.73}{3.16} = 1.81$ sacks per mokk

7) For farmers who paid for all labor operations for millet

~~Groundnut~~

Millet Seed

	mean	5t Deviation	Range
amount of seed used	9.78 mids	6.58	3.00 - 22.00
cost	12.13 L.S.		

8) For farmers who paid for all labor operations for sesame

	mean	5t Deviation	Range
amount of seed used	32.33 mids	30.78	1.00 - 90.00
Cost	42.03 L.S		

9) For those farmers who paid for all labor operations for sorghum

	mean	5t Deviation	Range
amount of seed	5.00 mids	6.08	1.00 - 42.00
costs	6.2 L.S		

10.) For farmers who paid for all labor operations for groundnuts

	Mean	St Deviation	Range
Amount of Seed	3.8 sticks	3.04	1.2 - 8.00
Costs	47.5 Ls		

11.) Millet - Cost of labor per mokh for each operation for all farmers who paid for that particular operation

1st Planting	1.29 Ls per mokh
2nd Planting	.98 Ls " "
1st Weeding	
2nd Weeding	4.65 Ls " "
Cutting	2.70 Ls " "
Threshing	3.40 Ls " "

Is would be similar to 2nd Weeding costs ?

12 Sesame Cost of Labor per Mokh for each operation for all farmers who paid for that particular operation

1st Planting	2.09 Ls per mokh
2nd Planting	.83 Ls " "
1st Weeding	7.20 Ls " "
2nd Weeding	4.52 Ls " "
Cutting	2.44 Ls " "
Threshing	1.77 Ls " "

13.- Sorghum Cost of Labor per makh for each operation for all farmers who paid for that particular operation

1st Planting	1.64 L.S. per makh
2nd Planting	1.24 L.S. " "
1st Weeding	6.43 L.S. " "
2nd Weeding	5.76 L.S. " "
Cutting	3.51 LS " "
Threshing	3.06 LS " "

14: Groundnuts Cost of Labor per makh for each operation for all farmers who paid for that particular operation

Weeding before 1st Planting	7.35 LS per makh
~~1st~~ Planting	7.66 LS " "
[redacted]	[redacted] " "
1st Weeding	9.01 LS " "
2nd Weeding	9.80 LS " "
Pulling	6.24 LS " "
Threshing	3.35 LS " "

15. There were no examples of farmers who grew millet who did not pay for some part of the cropping operation. Also the groundnut data for farmers who paid for no labor is not available due to programming Errors.

16. For those farmers who grew sesame and did not ~~[illegible]~~ pay for any labor – mean values on the following variables are given

Variable	N	Mean	ST Deviation	Range
Area in sesame	61	3.33 mekh	2.84	.25 - 14.0
Total Area in cultivation	83	8.61 "	7.79	1.25 - 57.0
" in fallow	83	12.08	45.16	0.00 - 400.00
yield in sesame	83	89.42 mids (2.79 sacks)	115.80	0.00 - 640.00
sesame ~~[illegible]~~ yield per mekh		.84 sacks per mekh		
Amount of sesame seed used	83	2.86 mids	3.84	0.00 - 23.00
Sesame Cost of seed		3.72 LS		
Amount of seed treatment	82	.19 rotls	.50	0.00 - 3.500
cost of seed treatment		.43 LS	1.13	0.00 - 8.75
Amounts of DDT used	81	.81 rotls	1.36	0.00 - 7.00
cost of DDT	81	.69 LS	1.16	0.00 - 5.00
~~[illegible]~~				
Cost of hired in labor in land clearing	8	14.56 LS.	18.18	1.50 - 57.00
36% of the farm was rented in land				
Average size land rented	30	5.66 mekh	3.75	1.00 - 18.00

17. For those farmers who grew sorghum and did not pay for any labor - mean values on the following variables are given.

Variable	N	Mean	St Deviation	Range
Area in Sorghum	42	1.52 mekh	1.13	.25 - 5.0
Area in Cultivation	42	8.96 mekh	5.35	2.00 - 27.00
Area in Fallow	42	10.55 mekh	15.66	0.00 - 52.5
Yield in Sorghum	39	73.74 mids 2.46 sacks	75.14	3.00 - 303.0
Sorghum yield per mekh		1.62 sacks per mekh		
Amount of sorghum seed used	40	3.19 mids	5.31	.25 - 25.00
Cost of sorghum seed		3.96 LS		
Amount of seed treatment used	42	.20 retls	.35	.00 - 1.50
Cost of seed treatment	42	.52 LS	1.01	0.00 - 5.40
Amount of DDT used	42	1.48 retls	3.20	0.00 - 20.0
Cost of DDT	42	1.30 LS	3.20	0.00 - 20.0
Cost of Labor Land Clearing	9	14.50 LS	17.79	1.50 - 60.00
29% of these farmers rented in land and average area rented	12	5.56 mekh	3.75	1.00 - 18.00

18. The best estimate for average rental cost of land is approximately 4.00 LS per mekh.

Data: New Technology to be Used

Perdue Striga tolerant line with some drought tolerance (P-121089) was identified by Gebisa in Sudan. The table below indicates the yield of variety P-121089 from field station experimental plots in Sudan. Also, yields from local varieties are presented to provide a comparison.

Yield Comparisons *

Location	Variety Yield (kg/hec) 121089	local	% Increase
Wad Medana	4495	4245	5.9
Gadambali	2831	1831	54.9
Agadi	2647	1332	98.7
Kadugli	1467	261	462.1
Overall mean:	3324	?	?

The important information derived from the table to be used in calculating the benefits from this variety, is the percentage increase in production due to using the new variety. The specific yield of the new variety can not be used as a comparison to overall national average (298), as the actual local yields in the areas this variety was tested were significantly above the national average.

The figure used in the evaluation is the percentage increase in yield due to the new variety. This is approximated at 51%.

Appendix IV

Description of Project PRF-3

PRF-3 INTSORMIL Project Description

Date: November 22, 1983 Institution: Purdue University

Project Identification Number: PRF-3

Project Title: Development of Agronomically Superior Germplasm Including Varieties, Hybrids and Populations Which Have Improved Nutritional Value and Good "Evident" Grain Quality for Utilization in Developing Countries

Project Leaders:

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Foreign Collaboration with Institutions and Individuals:

Sudan -
Agriculture Research Corporation (ARC), University of Khartoum; Mrs. Laila Monawar
ICRISAT/Gezira Research Station, Wad Medani; Dr. Gebisa Ejeta
Food Research Centre; Dr. Sit Badi

Niger -
Purdue/Niger Cereals Project, Niamey; Dr. John Clark
INRAN, Director General; Dr. Moussa Saley

India -
ICRISAT; Dr. R. Jambunathan, Head of Biochemistry Department
ICRISAT; Dr. Lee House, Sorghum Project Leader
ICRISAT; Dr. Sam Mukuru, Head Sorghum Breeder
ICRISAT; Dr. Dallas Oswalt, Chief Training Officer
ICRISAT; Dr. D.S. Murty, Plant Breeder

Mali -
ICRISAT; Dr. John Scheuring

Egypt -
EMCIP; Dr. Ahmed Hassan and Dr. Fakhry Fayed

Brazil -
EMBRAPA; Dr. Robert Schaffert, Sorghum Breeder

Colombia -
CIAT; Dr. Lynn Gourley

Mexico -
ICRISAT; Dr. Vartan Guiragossian
CIMMYT; Dr. Ron Cantrell

Contacts have also been made in Pakistan, Kenya, Upper Volta, and Tanzania regarding possible collaborative research.

Domestic Collaboration with Institutions and Individuals:

University of Arizona; Dr. Victoria Marcarian, Dept. of Plant Sciences
Mississippi State; Dr. Natale Zummo, USDA-SEA, U.S. Sugar Crops Field Station
Texas A&M University; Dr. Fred Miller, Dr. Frank Gilstrap and Dr. Lloyd Rooney
Kansas State University; Dr. William Stegmeier
DeKalb-Pfizer Genetics; Dr. Bruce Maunder
Cargill/PAG; Dr. Charles Berry
John Hopkins University; Dr. George G. Graham
Ross Laboratories; Dr. William MacLean

International Centers

CIAT - International Center for Tropical Agriculture
CIMMYT - International Maize and Wheat Improvement Center
ICRISAT - International Crops Research Institute for the Semi-Arid Tropics
IRRI - International Rice Research Institute

Project Objectives

1. Determine how sorghum is processed, prepared into food and consumed, under actual LDC consitions.
2. Devise standard procedures for preparing traditional village foods made with sorghum and use them to develop simple screening tests for use in breeding programs to predict grain food quality.
3. Conduct basic studies to determine what components in sorghum are related to the functional characteristics that constitute food quality.
4. Identify, develop and evaluate sorghum lines or mutants with improved nutritional quality and superior food grain quality using both chemical and biological methods.
5. Investigate the potential for developing varieties of sorghum with high nutritional value and good food properties for potential use as nutritional foods for young children, pregnant women and nursing mothers.
6. Train LDC personnel in cereal chemistry and plant breeding research.

Research Procedures

1. Devise standard laboratory test procedures. DeveTop a simple, reliable, and rapid procedure that can be used in breeding programs to predict sorghum grain hardness. Selected sorghum samples will be evaluated for grain hardness using both physical and chemical procedures. Continued participation in the ICRISAT-ARC-INTSORMIL collaborative "Sorghum Food Quality Assessment" project.
2. Conduct basic studies on sorghum components. Examine the physical and chemical properties of sorghum starch and determine its relationships to food quality. Develop techniques that will allow separation and N-terminal amino acid sequence analysis of kafirin protein subunits.
3. Evaluation of modified endosperm high lysine sorghum. Vitreous endosperm high lysine selections will be grown at the Agronomy Farm and laboratory evaluation for protein and lysine content will be completed.
4. Two processed sorghum foods will be evaluated for digestibility by Dr. MacLean in Peru. Decorticated and extruded sorghum flour will be used in a feeding experiment in Peru. A fermented baby food called "Nasha", which is prepared from sorghum flour by the Sudanese, will be used in experiments.
5. A 2-dwarf sorghum "stiff-stalk" population with good yield potential and acceptable grain quality is being developed. Recurrent selection programs using Purdue populations plus introduced material are in progress to attain this objective over the next several years.

Research Site(s): Purdue University, W. Lafayette, IN; Niamey, Niger; Wad Medani and Khartoum, Sudan. LDC linkages already established at other locations (i.e. Hyderabad, Colombia, Brazil, Pakistan, Kenya) will be continued but we anticipate concentrating and expanding the program primarily in West and East Africa.

Schedule of Research Activity (1983-86):

More of the breeding activities will be conducted in developing countries. Much of the breeding will be conducted in Niger, Sudan and perhaps with the ICRISAT Southern Africa and East Africa regional centers. Gebisa will continue his collaboration with the Sudan on striga tolerance and drought tolerance. He and Axtell plan to spend considerable time and effort working with Sudanese scientists on grain quality using pedigree breeding as well as population and hybrid development. A major effort will be made to develop A&B lines with good grain quality, striga tolerance, drought tolerance which are adapted to Sudan and Niger.

Axtell will continue breeding for good grain quality in elite sorghum cultivars which also have African adaptability, good yield and other needed agronomic traits. Characteristics such as kernel hardness have now been identified which will facilitate breeding for grain quality. This program also will be carried out jointly with Niger and Sudan. Much of the breeding work will be done in Niger with backup using laboratory facilities at Purdue. Screening and trials will be conducted at 3 locations in Niger as well as in Sudan.

Training M.S. and Ph.D. LDC students will continue as in the past. The addition of Gebisa Ejeta to the staff will greatly enhance Purdue's ability to train African graduate students.

Publication Possibilities: Proc. Natl. Acad. Sci. USA; Jour. of Cereal Science; and Crop Science.

Student Training Involvement: Graduate student training at Purdue will continue at the rate of 4 M.S. and Ph.D. candidates per year over the next few years. Thirteen Niger students are currently in the U.S. studing English and will begin graduate training in 1984. Purdue breeding staff will continue to participate and contribute to INTSORMIL and ICRISAT workshops, conferences and symposia. We plan to host a major striga workshop in 1985 or 1986 in Niger with INTSORMIL/ICRISAT/Purdue Support.

A substantial number of students trained at Purdue hold key positions in sorghum breeding programs, both domestically and internationally. A partial list follows:

Dr. Charles Berry	Director of Sorghum Research, Cargill/PAG, Plainview, TX
Dr. Ed Cantrell	Director of Sorghum Research, CIMMYT, Mexico
Dr. John Clark	Sorghum Breeder Purdue/Niger Cereals Project, Niamey, Niger
Dr. Gebisa Ejeta	ICRISAT Sorghum Breeder in Wad Medani, Sudan
Dr. Bantayehue Gelaw	CIMMYT Maize Program, El Baton, Mexico
Dr. Vartan Guiragossian	Latin American Sorghum Breeder for ICRISAT, El Batan, Mexico
Dr. Lee House	Sorghum Program Leader at ICRISAT, Hyderabad, India
Dr. Bruce Maunder	Research Director & Sorghum Breeder, DeKalb-Pfizer Genetics, TX
Dr. D.P. Mohan	Virginia State College, Petersburg, VA
Dr. Sam Mukuru	Head Sorghum Breeder at ICRISAT, Hyderabad, India
Dr. Dallas Oswalt	Chief Training Officer at ICRISAT, Hyderabad, India
Dr. Kay Porter	Station Manager, Sorghum Breeder at Pioneer Hybrid Seeds, TX
Dr. Tom Prest	Sorghum Breeder, Northrup King & Co., Minneapolis, MN
Dr. Robert Schaffert	EMBRAPA Sorghum Breeder, Sete Lagoas, Brazil
Dr. Rameshwar Singh	Sorghum Breeder, Pantnagar, India
Dr. R. Jambunathan	Head of Biochemistry Dept. ICRISAT, Hyderabad, India
Current students:	Osman Ibrahim (Sudan) and Emanuel Monyo (Tanzania)

Appendix V

Request of Financial Information and Data

COMPLETING REQUEST FOR FINANCIAL INFORMATION

The attached sheet asks that information on Intsormil project finances be broken out three different ways: 1) according to the source of funds, 2) the allocation of funds among expenditure categories, and 3) the distribution of funds between U.S. and overseas activities.

Please note that the totals provided for each of these breakouts should be the same, i.e. total amount of sources provided to CRSP activities should equal total expenditures. Expenditure of carry-over funds should match up annually with source of funds.

Definitions to Use in Completing Request for Financial Information

1. AID and official matching resources should be self-explanatory.

2. Unofficial Matching Funds: resources directly dedicated to accomplishment of the CRSP objectives, but which do not qualify, or are not documented to qualify as offical match. These can include state subsidies to educating CRSP sponsored students, which would not have been spent without Intsormil activities, land, laboratories, equipment and labor.

3. Host Country Resources: contributions from the host country government or private institutions, which contribute to CRSP activities. For example, they can include waived transport charges, subsidies to gasoline purchases, staff, land, laboratories, equipment, transport, office space, and other labor contributions.

4. Other Donor Resources: USAID mission's project travel, housing, or medical facility contributions, FAO, World and Regional Banks, or other country program loans or grants that contribute to INTSORMIL activities.

5. Overhead Costs: costs required by the contract to be allocated to the university as overhead.

6. Administrative and Overhead Costs: ME costs, MOU costs, administrative cost of a host country office, and other general and administrative costs for administering activities undertaken.

7. Training Costs: Formal academic and non-formal training, including special studies, seminars, workshops, conferences and short-courses.

8. Technical and Research Functions: activities related to the research objectives of the program, including research proposing and planning, technical implementation, and evaluation. Also includes technical assistance and technical management of research activities, and computer costs incured in research.

9. Other Costs: other costs not specified above.

10. Overseas Expenditures: include long and short term training costs for host country nationals, pass through funds to host country, equipment and supplies furnished for overseas use, travel per diem and salary costs for TDY assignments and long term assignment costs.

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REQUEST FOR FINANCIAL INFORMATION

	THE PAST/PRESENT				THE FUTURE	
	Actual: Yr. #1-4	Est: Yr. #5	Total Yr. #1-5	%	Budget: Yr. #6	%
			(Thousand Dollars)			
BREAKOUT NO. 1: SOURCE OF FUNDS						
cial Match Funds						
ficial Match Funds						
Country						
r Donors						
al total:	total:		total:	100%	total:	total: 100%
BREAKOUT NO. 2: ALLOCATION OF FUNDS						
head						
nistration						
ning						
nical/Research						
r (Specify)						
al total:	total:		total:	100%	total:	100%
BREAKOUT NO. 3: DISTRIBUTION OF FUNDS						
seas*						
al total:	total:		total:	100%	total:	100%

timate expenditures for projects in the following two countries: Sudan (pst/pres)_____ Honduras (pst/pres)_____
Sudan (Yr. 6) _____ Honduras (Yr.6) _____

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REQUEST FOR FINANCIAL INFORMATION

	THE PAST/PRESENT				THE FUTURE	
	Actual: Yr. #1-4	Est: Yr. #5	Total Yr. #1-5	%	Budget: Yr. #6 1/	%
BREAKOUT NO. 1: SOURCE OF FUNDS						
AID	550,257	209,598	759,855	69%	211,235	71
Official Match Funds	216,623	53,770	270,393	25	82,500	27
Unofficial Match Funds	12,803	9,785	22,588	2	6,000	2
Host Country	22,295	5,615	27,910	3	7,000	
Other Donors	8,850	1,900	10,750	1	1,000	
Total	total: $ 810,808	total: $ 280,668	total: $ 1,091,476	100%	total: $ 308,300	total: 100
BREAKOUT NO. 2: ALLOCATION OF FUNDS						
Overhead	202,113	72,235	274,348	25%	76,159	25
Administration	65,739	24,621	90,360	8	23,354	8
Training	7,600	5,000	12,600	1	5,000	2
Technical/Research	530,953	176,027	706,980	65	199,927	65
Other (Specify)	4,403	2,785	7,188	1		
Total	total: $ 810,808	total: $ 280,668	total: $ 1,091,476	100%	total: $ 308,300	100%
BREAKOUT NO. 3: DISTRIBUTION OF FUNDS						
U.S.	455,395	136,446	591,841	54%	220,136	72
Overseas*	355,413	144,222	499,635	46	88,164	28
Total	total: $ 810,808	total: 280,668	total: 1,091,476	100%	total: 308,300	100%

1/ Data for Year #6 is a projected budget which has not been approved by the Management Entity.