DN-AAO-918
ISN 36289

21

PROCEEDINGS

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INTSORMIL'S NEXT 5 YEARS

INTSORMIL PRINCIPAL INVESTIGATOR'S CONFERENCE

SCOTTSDALE, ARIZONA
JANUARY 4-5-6, 1984

000882

The Institute of Agriculture and Natural Resources, University of Nebraska-Lincoln

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INTRODUCTION

This report is the proceedings of the Sorghum/Millet CRSP (INTSORMIL) Principal Investigator's Conference held at Scottsdale, Arizona, January 4, 5, and 6, 1984.

The program was designed to focus on possible collaborative research program improvements over the next five years as contrasted to a program of detailed research reports. Eighty U.S. University scientists and administrators, host country participants, AID/W, and BIFAD representatives participated in the conference. The INTSORMIL Technical Committee developed a "Strategy Report" during the conference. This was presented and discussed by the participants.

The Conference Planning Committee extends its thanks to those who participated and made the conference a success.

Dr. Glen Vollmar, ME, Committee Chairman
Dr. Vicki Marcarian, Arizona
Dr. George Teetes, Texas A & M
Dr. Charles Francis, Univ. of Nebraska
Dr. Darrell Rosenow, Texas A & M

CONFERENCE THEME: INTSORMIL'S NEXT 5 YEARS

INTSORMIL PRINCIPAL INVESTIGATOR'S
CONFERENCE

January 4-5-6, 1984
Scottsdale, Arizona

WEDNESDAY, JANUARY 4

SESSION CHAIR	Dr. Dean Bunch, Chairman INTSORMIL Board of Directors
8:00 - 8:20 a.m.	Opening Remarks, Glen Vollmar, Conference Planning Committee
8:20 - 9:20 a.m.	INTSORMIL - CRSP OBJECTIVES--ARE WE ON TRACK? Dr. D. Woods Thomas, Purdue University
9:30 - 10:00 a.m.	Discussion of Dr. Thomas' Presentation
10:00 - 10:30 a.m.	Break
10:30 - 12:00 noon	PANEL: INTSORMIL HOST COUNTRY COMMITMENTS DeWalt (Chairman), Marcarian, Kleis, Gourley, Lacy (45 minute panel discussion and 45 minutes open discussion)
12:00 - 1:45 p.m.	Lunch CHAIR: Dr. D. Woods Thomas, Purdue University SPEAKER: Dr. John Yohe, Division Chief, Agricultural Production Division, Office of Agriculture, Bureau for Science and Technology, AID/W AID/W'S VIEW OF THE CRSPS Discussion
SESSION CHAIR	Dr. Bruce Maunder, Chairman, INTSORMIL Internal Review Panel
1:50 - 2:30 p.m.	THE CRITICAL ISSUES WE FACE: Dr. George Teetes, Texas A&M
2:30 - 3:00 p.m.	Discussion of Teetes' Presentation
3:00 - 3:15 p.m.	Break
3:15 - 4:40 p.m.	PANEL: ACHIEVING THE MOST COMPLEMENTARY ICRISAT AND INTSORMIL SORGHUM/MILLET RESEARCH RELATIONSHIP Axtell (Chairman), Gibesa, Andrews, Rooney, D. Smith (represented by R. Frederiksen) (45 minute panel discussion followed by 40 minutes open discussion)
4:40 p.m.	Adjourn
4:40 p.m.	INTSORMIL Board Meeting

THURSDAY, JANUARY 5

SESSION CHAIR	Dr. Robert Kleis, Board of Directors
8:00 - 8:40 a.m.	ISSUES REGARDING UNIVERSITY RESEARCH PROGRAMS AND INTSORMIL Dr. Jerry Eastin, University of Nebraska
8:40 - 9:20 a.m.	Discussion of Eastin's Presentation

9:20 - 9:40 a.m.	Work Group Instructions: Glen Vollmar, ME
9:40 - 10:00 a.m.	Break
10:00 - 11:00 a.m.	Discipline Work Group (1)
11:00 - 12:00 noon	Discipline Work Group (2)
12:00 - 1:20 p.m.	Lunch CHAIR: Dr. Robert Kleis, University of Nebraska SPEAKER: Dr. Earl Leng, ME Director INTSORMIL'S FIRST FIVE YEARS-OUR ACCOMPLISHMENTS
SESSION CHAIR	Dr. Vicki Marcarian, University of Arizona
1:20 - 2:30 p.m.	Discipline Work Group Reports and Discussion
2:30 - 2:45 p.m.	Break
2:45 - 3:30 p.m.	Special Projects and Training Work Group (1)
3:30 - 4:15 p.m.	Special Projects and Training Work Group (2)
4:15 - 5:00 p.m.	Special Projects and Training Reports and Discussion
5:00 p.m.	Adjourn
7:30 p.m.	Administrative Council Meeting
7:30 p.m.	Technical Committee Meeting

FRIDAY, JANUARY 6

SESSION CHAIR	Dr. Robert Jackson, AID/W
8:00 - 9:00 a.m.	Host Country Work Group (1)
9:00 - 10:00 a.m.	Host Country Work Group (2)
10:00 - 10:15 a.m.	Break
10:15 - 11:00 a.m.	Host Country Work Group Reports and Discussion
11:00 - 12:00 noon	TC Prepare Strategy Report - INTSORMIL'S NEXT 5 YEARS DeWalt (Chairman), Marcarian, Kanemasu, Frederiksen, Francis and Kirleis
11:00 - 12:00 noon	AID/W Review Team, Dr. Elvin Frolik, Team Leader Discussion with the Conference Participants
12:00 - 1:15 p.m.	Lunch
SESSION CHAIR	Dr. Fred Johnson, BIFAD
1:15 - 2:00 p.m.	TC presents INTSORMIL'S NEXT 5 YEARS-A STRATEGY REPORT DeWalt, et. al.
2:00 - 2:45 p.m.	Reaction Panel: Rosenow (Chairman), Axtell, Teetes, Eastin, Bunch, and Thomas
2:45 - 3:00 p.m.	Break
3:00 - 3:50 p.m.	Open Discussion
3:50 - 4:00 p.m.	Concluding Remarks - Glen Vollmar, ME
4:00 p.m.	Adjourn

WORK GROUP DISCUSSIONS

Each Work Group session will be repeated 1 time. The chairman of each group will make a 10 minute presentation and will then lead the group in discussion. Each group will discuss critical questions such as, are we working on the right problems, input balance, host country collaboration, etc. Reporters should give Glen Vollmar a written copy of their reports before the end of the conference.

**Discipline Research

1.	Agronomy and Physiology	Chair Reporter	Charles Francis Art Onken
2.	Pests - Plant Pathology, Entomology	Chair Reporter	Stan Jensen Frank Gilstrap
3.	Utilization, Quality, Storage, Nutrition	Chair Reporter	John Axtell Lloyd Rooney
4.	Socio-Economics	Chair Reporter	Phil Abbott Kathleen DeWalt
5.	Breeding	Chair Reporter	Fred Miller Bill Stegmeier

**Special Projects, Training and Technical Assistance

1.	Striga	Chair Reporter	Nat Zummo Tareke Berhe
2.	Germ Plasm Program	Chair Reporter	Darrell Rosenow Orrin Webster
3.	Student Training, SADCC Training, Staff Exchanges, Workshops	Chair Reporter	Charles Francis Dale Anderson
4.	Technical Assistance	Chair Reporter	Bob Jackson Ed Kanemasu

**Host Country Programs

(Appropriate questions might be: Where? In-country staffing, Technical Assistance, AID Mission relationships, how much and how long?)

1.	Africa	Chair Reporter	John Axtell Milt Coughenour
2.	Latin America: Caribbean, Mexico, Central and South America	Chair Reporter	Fred Miller Richard Frederiksen
3.	Near East and Far East: Northern Africa (Egypt), India, Philippines, et. al.	Chair Reporter	Earl Leng Jerry Maranville

TECHNICAL COMMITTEE PRESENTATION
PI CONFERENCE
SCOTTSDALE,AZ
January 6,1984

PLANNING THE NEXT FIVE YEARS

Introduction

This meeting, in contrast to the other PI conferences is about where we are going rather than where we have been. We are not here to pat one another on the back and to congratulate one another for a job well done. Instead, our purpose has been, in part, to look at our failings, to identify areas in which we can improve, and to take steps that will bring greater success in the years to come. This can be a discouraging activity that creates an air of pessimism, but throughout the last 3 days I have sensed excitement and optimism about the prospects ahead.

Much has been said about the balance between serendipity and planning and that, maybe, serendipity or opportunism has guided us too much. I'm not sure if that is the case, but even if it was, I think that I and the TC feel some frustration because now we are perhaps locked in too much. Anyone who has been connected with INTSORMIL's budget process can tell you that our flexibility is pretty much gone.

Now, as to the question of planning the next five years, the TC could not possibly come up with such a plan, nor would we necessarily want to do so. We have taken as our charge to try to summarize the issues that have been raised over the past few days. As you will see, there is quite a list of issues. We will try to summarize the issues and any potential solutions or proposals about them. The TC's mandate in the future, along with the ME and the Board will be to do the best that we can to address these issues. All of you are to be congratulated for your participation the past few days in raising issues and discussing them.

PROJECT EVALUATION PLAN

Evaluation of individual projects is a continuing challenge to the consortium, and is initial to decisions on continuation, expansion, or reduction of funding for each activity. No financing of new projects nor substantial shifts of funding among countries or centers is possible without arbitrary decisions by the ME or the Board, or by some comprehensive and objective evaluation procedure. Criteria for evaluation were proposed and circulated by the ME in January, 1982; these include:

- presence of work in LDC's or direct contact with LDC work and enhancement of LDC research capabilities.

- relevance or research to a real constraint to production or utilization of crop.

- physical presence of U.S. researcher for significant periods in LDC's involved.

- evidence that the same research is not being done by other projects or agencies.

- application of a current, scientific approach.

- preference for work in countries where agreements are signed and INTSORMIL has programmatic involvement.

Alternative procedures for evaluation were prepared by the ME in December, 1983, and the memo lists advantages and disadvantages of each approach.

- Management Entity conducts an annual internal review.

- Technical Committee conducts an annual internal review.

- Ad hoc group of 3 or 4 past TC members conducts an annual internal review.

- Ad hoc group of 2 or 3 research administrators conducts an annual review.

- Outside ad hoc researcher committee conducts an annual review.

- Some logical combination of the above alternatives.

There is a critical need to establish a project review procedure, set out precise criteria for evaluation, and provide PI's with a clear statement of why, how and when evaluation will be done. Researchers need lead time to staff up or scale down a project, and there should be no major surprises when these evaluations are circulated. The Board, ME and the TC should put major priority on developing this evaluation plan as quickly as possible.

New Proposals - New Institutions

New proposals may be requested by the TC whenever research areas that need strengthening are identified and if funding is available. A mechanism for receiving new proposals was developed by the TC, but this procedure did not meet with approval. Although direct addition of new institutions to INTSORMIL is discouraged by USAID, sub-contracting or other vehicles may be used to add principal investigators which have expertise needed by INTSORMIL.

Collaborative Research Program Guidelines

Guidelines will be developed for collaborative research projects with LDC scientists and institutions. These guidelines will permit a flexible approach depending on the availability of funds for individual PI's and country or regional coordinators.

Germ Plasm

This is a critical issue:

A program for the preservation, identification and distribution of sorghum/millet germ plasm for INTSORMIL will be developed. We recognize that the long range solution of sorghum germ plasm needs must be addressed by the USDA and that our role can be in the development of working collections, methods of distribution and recommendations for long term storage.

Country vs. Regional Focus

This relates to how much of an impact INTSORMIL can have for its expenditure of resources. We would like to have our results help solve problems wherever sorghum and millet are grown. It seems to me that from centers of operation in a few areas of the world, we need to make collaborative linkages that will allow us to have a wider impact on similar ecological regions. This relates to the potential problem of spreading ourselves too thin. It seems to us that there is no simple policy that can be developed here but that we want to think more in regional terms rather than simply in terms of single countries.

Striga

Striga is a major constraint to sorghum/millet production. INTSORMIL should provide both leadership and focus toward the understanding and control of this pest and work to secure additional funding for Striga activities.

COMMUNICATION

Training Strategy

Graduate student training is one of the most valuable activities of the consortium. This component of institution building has the potential for a long-term and direct contribution to an enhanced research capacity in each developing country and to collaborative research. There is a need to develop a more comprehensive scheme to identify and screen candidates for training and to carefully select appropriate course schedules and thesis topics. Thesis research in the home country or an international center is an option which should be encouraged in cases of mature students who can be adequately supervised and supported. Follow-through visits and limited financial support after graduation can enhance the returned scientists potential for immediate research productivity. (Details are given in a January 5 workshop summary).

Faculty Exchange

The long-term experience of staff assignment to another research location on sabbatic leave or other basis can lead to professional growth of the scientist as well as attaining INTSORMIL's goals. An LDC scientist or ICRISAT staff member who comes to the U.S. can learn new techniques, use specialized equipment or facilities, and work to solve specific problems which are important in his or her country and could not be solved otherwise. A CRSP scientist who lives in an LDC learns about the total constraints of living and working in another culture as well as initiating or accelerating research in a specific area. Both types of assignment should be promoted, encouraged and built into project planning for the next 5 years. (Details are given in a January 5 Workshop summary).

Integration

As INTSORMIL matures as an institution, direct efforts will be made to attract interdisciplinary approaches to the solution of research questions on sorghum and millet. These approaches will recognize the needs of individual scientists as well as those of the host country collaborators and their mutual research goals.

COUNTRY

Country Coordinators

Given the decentralized nature of INTSORMIL, country coordinators have had to assume an important role in planning and implementing our activities. In general, this system has worked well in most cases. There have been some problems.

As the country coordinator system has evolved, a set of guidelines has been established (dated January 10, 1983). These are useful and important and we need to be constantly reminded of them. As we think about whether it is important to move INTSORMIL toward a more regional focus, I (DeWalt) have written a proposal to the technical committee to revamp the country coordinator system into a regional coordinator system. One problem that has already been pointed out is that this would place even more responsibility on a few already overburdened individuals. This is something we will be addressing in the next several months.

What is clear to me is that we need to have more regular meetings among the INTSORMIL scientists working in host countries and, perhaps more importantly, with our collaborators in the LDC's. Collaboration needs to be better operationalized.

Sustainable Host Country Programs

Development of sustainable host country programs is an important goal of INTSORMIL. It is recognized that varying levels of technological expertise in sorghum/millet production will be encountered at the initiation of a linkage. However, with a reasonable period of time, evaluations should be conducted to ascertain if host country commitments in line with inputs are in line with inputs provided by INTSORMIL.

PHILOSOPHICAL

Domestic versus International Involvement in Projects

Program wide, AID strives for a 60% overseas, 40% domestic partitioning of funds. It is our understanding that this includes the cost sharing portion of projects. Presently, the INTSORMIL overseas budget is about 30%; therefore, in order for the PI's to meet AID goals about 50% of their budgets must be spent on overseas activity (this is disregarding the cost sharing portion). A clear and consistent formula is needed to identify what is classified as overseas; therefore, a truer picture of our overseas activity may result. We realize that our domestic research activity feeds our international activity.

Basic and Applied Research

It is doubtful that we can all agree on what activity is basic or fundamental research and that which is applied because there is a continuous spectrum. Both of these research activities take place in our domestic and international projects. While there is a need for balance in each individual's program, should INTSORMIL fund all of these activities? Should basic research activity be primarily directed at the international component?

Outside Funding

There is a general consensus that INTSORMIL needs to expand its resource base through outside funding. The caution has been made, however, that we do not want to solicit or obtain funds that would divert us from our central mission.

Herb Massey was spurred to jot down some notes about what sort of activities were justifiable ones for which we should solicit outside funds. Briefly, he suggested such things as obtaining AID mission support for expanding research activities in a few countries,or obtaining additional funds for training LDC scientists would be useful. Others might be added. With his permission, we think the TC can use the document he generated as a basis for coming up with some general guidelines on this issue.

Number of Working Sites

During the next 5 years, we must carefully plan additional host country sites and define objectives before moving in or out of sites. The level of activity in Africa and Latin America is presently near the correct level.

Integration of Linkages with CRSP's and Institutions

Linkages with other CRSP's and institutions will continue to be strengthened. Cooperative host country agreements with other CRSP's have proven to be a viable approach. In host countries where other CRSP's are operating, communication and cooperation among projects should be encouraged.

Cooperative linkages with international institutions including ICRISAT will be maintained and strengthened. Institutions affiliated with INTSORMIL project's should be included in the communications chain.

Workshop Planning

Workshops have emerged as a major component in INTSORMIL's program to bring people together and transmit techniques and share germ plasm. Formal and informal communication which takes place at workshops is a valuable activity. This helps national program scientists keep up to date on available parent materials, testing procedures, or other discipline-specific information needed in their home countries. The proceedings are topical reviews of the "State of the Art" on specific topics. Current references are invaluable to scientists with limited access to library and other formal information resources. Although apparently useful to scientists and efficient as a method of communication, we have no objective measure of the cost effectiveness of this approach nor a set of guidelines on how to structure follow-through after a workshop. Because of the proliferation of workshops, scheduling is a problem. We need to evaluate the impact of this means of communication as compared to others. All workshops should be coordinated and announced through the management entity in order to promote participation and bring together appropriate sources of support. (Details are given in a January 5 workshop summary).

Reporting Procedures - External Evaluation

This topic refers to the reporting procedures for the total INTSORMIL program. Because of the lean nature of the management entity, we have not done a good job of reporting our accomplishments. We recognize and are concerned about this. The executive summary prepared by the ME is a start. The ME is committed to

write a larger report in the next few months. One proposal that received some discussion in a recent TC meeting was to hire an advanced journalism student at Nebraska to assist in preparing such reports.

We believe something must be done to address this problem. We must project a better image at all levels of the program. Individual investigator's project summaries and trip reports, for example, should be monitored. (Social Scientists' reports are too long). At all levels, we must be concerned about documenting successes. The AID review team wants to establish procedures for doing cost/benefit analyses of our programs. It is up to us to document the benefits.

Collaboration with Commercial Organizations

The private sector contains substantial expertise in areas which complement those of INTSORMIL. For example, the private sector has seed production capabilities that are not available to INTSORMIL PI's. The seed industry success story in India can be cited as an example of what can be accomplished when the private and public sector join resources. We already collaborate with private organizations and this should be more formalized.

Integrative Activities

More effective collaboration and greater integration have been key phrases that have come up throughout the PI Conference. How we put it all together is a key question? At one level our concern is: as commodity researchers, how do we integrate our work into cropping systems and farming systems? Collaboration with other CRSP's, the IARC's, AID mission projects in host countries, and national programs is essential. Possible models for solving this problem may be found with INTSORMIL's work with the ARC and WSARP in Western Sudan, and with our collaboration with CATIE, ICRISAT-Mexico, and the CLAIS group in Central America.

On another level, putting it all together relates to the problem of extension. Our mandate is research, not extension. But unless we can demonstrate results and benefits we will be in trouble. So we have to be concerned with extension. There is no simple answer to this problem, but again effective host country collaboration seems to be a key.

Communication with the External Review Panel and Internal Communication

Reports, newsletters, etc. should be sent on a regular basis to members of the external review panel. It is essential that continuity be maintained with the EEP between Program reviews. Newsletters and trip reports provide a needed communication link.

Issue-oriented and Country-oriented Programs and Reporting as opposed to Single Project Reporting

Our reporting procedures are still too much individual investigator and individual project oriented. This may continue to be necessary for evaluation and budgetary purposes but we think we have heard a general consensus that conferences, workshops, and programs that are centered around issues and/or country concerns are more valuable for integrating the disciplines and furthering research objectives. That is, what do we have to contribute to the solution of specific problems?

We believe this would also help us in projecting a better and truer image to the wider world, especially for AID evaluations of the overall program. We are not just a conglomeration of individual projects, but rather a collection of a smaller number of relatively well-integrated programs working toward the solution of important problems.

Role, Selection and Term of the Discipline Coordinator

The discipline coordinator has taken or has been given a greater role in project evaluation. We need to develop a consistent policy on their responsibilities, selection, and term of office. The discipline coordinator can play an important role in integrating activities, evaluation of projects, and in initiating workshops and collaborative arrangements.

THE SORGHUM AND MILLET COLLABORATIVE RESEARCH SUPPORT PROGRAM --IS IT ON TRACK?--[1]

I am most pleased to meet with the INTSORMIL Principal Investigators at your Annual Conference. I am particularly appreciative of the opportunity to reflect with you on the degree to which the INTSORMIL program is moving toward the attainment of its fundamental objectives.

My pleasure and appreciation are based on a long-time professional interest in collaborative research between the American agricultural research establishment and our counterparts in the developing nations.

During the decades of the 50's and the 60's, numerous expatriates involved in agricultural development work in the LDCs became convinced that such collaborative work constituted an absolutely necessary, if not sufficient, condition for accelerated development and social progress in the developing nations. This conviction, during the decade of the 1960's, prompted a small group to expend considerable personal and professional energy in promotion of the collaborative research concept and in seeking means, through both public and private routes, to obtain the resources essential to "putting legs on" this concept.

One such initiative involved the establishment of a non-profit foundation known as the International Agricultural Research Foundation (IARF). This foundation was brought into being as a legal entity.

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[1]Presentation by Dr. D. Woods Thomas, Associate Dean and Director, International Education and Research and International Programs in Agriculture, Purdue University, at the Annual Principal Investigators Conference of the Sorghum/Millet Collaborative Research Support Program (INTSORMIL); Scottsdale, Arizona, January 4-6, 1984.

The basis for the creation of IARF was precisely the same as that underlying the CRSP program. It was conceived as a means of providing the resources to permit American and LDC agricultural scientists to work together in the systematic investigation of problems of mutual concern to agriculture in the developing countries and in the United States. Unfortunately, this movement failed in that it was impossible to raise sufficient private resources to support the work.

These efforts continued into the early 1970's with continuing movement toward the development of a definitive conceptualization of a CRSP-like model for U.S./LDC research in the agricultural sciences. Not entirely by accident, these concepts found their way into the language and authorizations of the Title XII Amendment to the Foreign Assistance Act of 1961.

In the late 1970's, the BIFAD, its Joint Research Committee (JRC), colleagues in AID, and friends in the Congress cooperated in the convoluted and complex process of planning, funding and implementing the initial set of Collaborative Research Support Programs.

Since the early 1980's, I have had the challenging opportunity to work with, if only in an administrative capacity, "real live examples" of collaborative research between the U.S. agricultural research community and agricultural research scientists in the developing countries. Working with INTSORMIL over the past four years has been most interesting and has provided a great deal of professional satisfaction.

This morning, in order to get your discussions underway, I propose to do three things.

First, I will review quickly the fundamental rationale for

collaborative research among U.S. and LDC agricultural scientists.

Second, I will refresh our memories relative to the basic assumptions undergirding the CRSP model.

Third, against this background, I will raise a few, substantive issues vis-a-vis the question as to whether or not the INTSORMIL program is "on the right track."

The Agricultural Development Rationale for Collaborative Research

The world community has been seriously concerned about and involved in external assistance to the LDCs in their process of agricultural and economic development for some 40 years. The concern has focused largely on poor people in poor nations. While generally well-intentioned efforts by these societies as well as by external donors have been associated with every possible mistake, many important and positive things have taken place. One is that much of the historical mythology vis-a-vis the reasons for the co-existence of rich and poor nations has been unveiled and discarded. A second is that a great deal has been learned about the process of economic development and social progress and, in particular, the role of agriculture in that process.

One basic tenet crucial to all LDC development efforts is that agriculture in traditional societies tends to be in a state of equilibrium. Farm-level decisionmakers maximize their objectives through allocating the scarce resources over which they have control in a manner which is both technically and economically efficient.[2]

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[2]Long-time agricultural development economist Frosty Hill, of the Ford Foundation and Cornell, captured all of this by saying, "Developing country farmers may not be able to read or write but they sure can figure!"

This has been documented in numerous studies in the developing countries.

The basic problem is that technical and other constraints on farm-level production functions are such that the productivity of land, labor, capital and managerial resources invested in farming is extremely low. The result of all of this is that agricultural output is low, agriculture does not contribute that which it must to general economic development and growth, and people are poor. Such will continue to be the case until the productivity constraints are relaxed.

A necessary though not sufficient condition to accelerated agricultural development and all that it implies in the developing country context is the discovery of effective means of shifting technical farm-level production functions upward.

There is only one way that this can be accomplished. This is through systematic, long-term research on the right set of issues.

It is also true that poor nations are characterized by the lack of sufficient internal scientific capacity to do the quantity, quality and kind of agricultural research essential to the requisite technical change in agriculture. Sustained growth of agriculture in these nations will require the development of adequate indigenous agricultural research capacity. In the long run, there is no substitute for this. The difficulty is that developing adequate indigenous agricultural research capacity, even with external assistance, is a matter of generations. In the interim, people will be hungry and continue to be poor. This is unacceptable. Interim means of helping provide the adapted technology and related information and knowledge required to shift production functions

upward must be found. Collaborative research among agricultural scientists in the industrialized nations and their colleagues in the developing nations is one measure which holds considerable potential.

Fundamentals of the CRSP Model of Collaborative Research

The CRSP model is one of several possible means of bringing the massive agricultural research capacity of the more developed nations, particularly that of the United States, to bear effectively and efficiently on the key problems of agriculture in the poor nations. It is not or cannot be a short-term panacea or a long-term solution, but it does hold a great deal of promise as a cost-efficient, productive means of making significant contributions to agricultural development in the developing countries as a mid-term, interim measure.

Despite all the complexities of the CRSPs, bureaucratic and otherwise, the basics are simple and straightforward. The CRSP model is based on three fundamental assumptions.

One is that there exists some set of problems which are common in important ways to agriculture in the United States and in the developing nations.

A second is that collaborative research among agricultural scientists in the United States and their counterparts in the developing nations will be highly complementary. This is to say that the results of such efforts will be useful in accelerating the agricultural development process in the developing countries through contributing to the upward shifting of farm-level production functions and the relaxation of other constraints. It is also to say that it

will be complementary in the sense of providing knowledge, information and technology useful to the solution of productivity and adjustment constraints faced by U.S. agriculture.

Third, the model assumes that from the fixed stock of research resources available to agriculture, worldwide, the scientific output will be greater as a result of such collaborative work than would otherwise be the case. A corollary assumption, above, is that the expanded output will be mutually beneficial to the LDCs and to the more developed nations.

As we pursue our corporate "soul searching" vis-a-vis the "are we on the right track?" issue over the next three days, it would be useful to do so against this short, straightforward list of assumptions. I say this because it seems to me that the above notions specify some of the fundamental issues surrounding not only the INTSORMIL program but also the set of sister programs under the CRSP. We cannot, in my judgment, ignore the questions of commonality of agricultural problems in the global sense, complementarity of collaborative research, and the realms in which scientific output will be increased and mutually beneficial.

The Right Track Issue

In thinking about what I might say today, I concluded that I am not wise enough nor knowledgeable enough to provide final answers to the "right track issue." I also concluded that the best I could do would be to raise a series of questions which might be useful "grist" for the deliberations of the scientists involved in the forthcoming structured and non-structured discussions. Hence, I would like to

place before you six broad questions which it seems to me are highly relevant to both the agricultural development constraints outlined briefly above and the conceptual statement of the CRSP model.

The Disciplinary Research Project Mix

The first of these questions deals with the substance of the research program of the Sorghum/Millet CRSP. In the broad context of production and utilization constraints of sorghum and millet on a global basis, there are any number of disciplinary issues toward which the limited funds and scientific resources available to the INTSORMIL might be directed. The substantive question is whether or not the particular problems currently being investigated under the INTSORMIL rubric are the most relevant and important. Further, is the "mix" of the disciplinary issues being investigated optimal?

Not all of the constraints facing producers and consumers of sorghum and millet on a worldwide scale can possibly be addressed with the limited resources available to the INTSORMIL. It is equally self-evident that the allocation of funds among the several disciplinary sets of issues will determine the impact which the results of your efforts will have on agricultural productivity in the developing nations and, in the complementary sense, on agriculture in the United States.

The objective of your consideration of the research program substance issue is straightforward. It is to discover the set of disciplinary projects and the levels of investment in each which will maximize the returns to LDC agriculture and U.S. agriculture in accord with the contributions being made by AID, host countries and the involved U.S. universities.

There is no simple, objective answer to this question. The answer must be subjective. It is a most difficult question to answer, even in a subjective way. Despite this, there is no way that this group can, in good conscience, ignore it. It must be dealt with. There is no better group to deal with it and come up with the best possible solution than the highly knowledgeable principal investigators assembled at this conference.

Research Program Structure

The second major question deals with the structure of the INTSORMIL research program. This question consists of several parts.

One part is whether the INTSORMIL is utilizing a truly interdisciplinary approach or is the current research program simply a collection of disciplinary projects. It seems to me that the productivity of this program, as it will be measured at some time in the future, will depend importantly upon the answer to this question. Again, it is difficult and subjective. We cannot avoid it. We simply must honestly ask ourselves this question in terms of what currently exists and what ought to exist.

A second part of the program structure issue is one of collaboration, per se. Has research collaboration among the U.S. sorghum and millet principal investigators and their institutions increased as a result of the INTSORMIL program and has it been productive and beneficial? The related substantive question is whether or not collaboration among U.S. and LDC scientists is taking place at optimal levels. This includes an assessment of collaboration on "right" issues, by the "right" people, doing the "right" things. Again, no easy answer, but a highly relevant question.

The bottom line is whether or not the collaborative work is such that it has, is, and will continue to make a significant difference in LDC and U.S. agriculture.

Campus-Field Program Balance

A third issue is associated with the optimal balance between research being conducted on the campuses of participating U.S. universities and that being conducted in the LDCs. By design, the INTSORMIL research program started out with much of the work being done at the participating U.S. universities. From this base, it expanded systematically and significantly to the LDCs. Collaborative work is now taking place in fourteen LDCs.

Early on, there was a considerable amount of concern, externally and internally, vis-a-vis the lack of collaborative work in the LDCs. Given what has taken place over the last three years, there are concerns that the pendulum might have swung too far and that too much of the work is being done at LDC sites at the expense of high payoff investments in work that can best, or perhaps only, be done in the laboratories of U.S. universities.

There is a tendency in some quarters to believe that any work done abroad will have a higher payoff than any work done in the U.S. Reflection on the potentially high payoffs to the solution of complex productivity problems being faced by farmers in the LDCs associated with some rather basic and fundamental research clearly rejects this position. On the other hand, site-specificity of many constraints to increased resource productivity in sorghum/millet production and utilization indicates that some important fraction of the total

program must be done abroad in collaboration with scientific colleagues.

This issue breaks down into two parts. One is the identification of priority research which can best and most cost effectively be done in the LDCs and that which can be best and most cost effectively done in the laboratories of participating U.S. institutions. A second is the probable weight associated with the importance of research being conducted abroad and that being conducted in the United States measured in terms of impact on agricultural productivity, levels of income and the rate of broad-based economic development in LDC societies. Under the CRSP model, attention must also be given to the incidence of benefits to the United States.

These factors must be taken into account in the decision matrix of the Principal Investigators, the Technical Committee, the Board of Directors and the Management Entity of INTSORMIL.

Research Program Scope

A fourth issue is associated with the scope of the INTSORMIL program. Given the resources available, including AID grant funds, university matching funds and other contributions, as well as support from AID country missions, host countries and other donors, what is the optimal size of the research program?

Stated more succinctly, is the INTSORMIL trying to do too much with too little? This leads to the policy cum program issue of whether or not the program ought to be expanded, retrenched or restructured. If so, what really makes sense, and how can we get there?

There is a growing demand for the wide range of services available through the people and the institutions collaborating in the INTSORMIL program. This demand will continue to grow as the program becomes better known as a rich source of potential benefits to LDC agriculture. This demand will be fed also by the activities of the scientific entrepreneurs involved. It is only natural for people of worth to try to do more and more. While this is laudable, it also constitutes a real danger. It seems to me that the INTSORMIL must be on guard that it does not spread itself so thinly that its aggregate impact becomes less than that which it might be.

Adequacy of Support

The fifth issue deals with the adequacy of AID/university/other donor support of the research and related work of INTSORMIL. To those involved directly in the program, the quick answer is that the support is far from adequate. Scientists and administrators involved see many opportunities to do useful things if there were but more resources with which to work.

This quick answer must be conditioned by the multiple objectives and the resource constraints faced by donor entities--AID, the universities, host countries and other donors. All of these institutions face serious limitations on funds and huge demands for the utilization of their funds. Each, in its own wisdom, must allocate its scarce resources in a fashion such that its multiple objective function will be maximized. And this we must understand and appreciate.

Having made the above point, the INTSORMIL Management Entity and the participating institutions must seriously appraise the magnitude of probable returns from additional investments in an active, productive and growing program. It may well turn out that these institutions will conclude that additional resources would be well spent. The opposite conclusion is also possible. The question needs to be asked.

The related question is associated with the policy position which the INTSORMIL Board, jointly with the Management Entity, has taken vis-a-vis the active solicitation of additional program funds from donors other than those which are presently contributing. This policy position has been one of not actively pursuing additional funding from other donors until funds already available were felt to be utilized in optimal fashion. This has been a wise policy. However, the INTSORMIL program may well be at a point where it could productively absorb additional financial support. If this is so, INTSORMIL might be well advised to actively seek additional funding.

I would add the caution that it must be prepared to make the substantial investment associated with attempts to find resources. There are costs. This should be objectively considered before embarking upon such an undertaking.

Accessibility of Research Output

The final issue is of quite different order. It concerns the form of the output of the INTSORMIL research program from the standpoint of the agricultural development objectives of the developing countries. I am not questioning the quantity, quality or value of the research

output. This is large, excellent and valuable. I am raising the question as to whether or not this has been or is easily accessible to and in a form most useful to efficient, effective and useful dissemination, not only to researchers but also to decision makers throughout the private and public sectors of the developing countries.

Such findings are available in scientific journals and other publications which scientists read and use. Do resource allocation decision makers in the LDCs have easy access to such publications? Is this wealth of knowledge available in a form which non-scientific actors in the developing country agricultural scene might readily understand and utilize?

I recognize that I am treading on that fine line between research and "extension." My biases are those of a development economist concerned about the urgent problems facing the developing nations. And they are urgent. It is a concern over the extended delays associated with serious imperfections in communication of information and knowledge and the transfer of technology between those who have it and those who might use it.

Might INTSORMIL find means to expedite such transfers across international boundaries in a world in which existing institutional mechanisms are rife with imperfections and dissemination is unacceptably slow? If appropriate means could be found to expedite this process, I believe that the investment would prove to be worthwhile.

* * * * *

In closing, I must compliment all of those who have been involved in the INTSORMIL program. To the principal investigators, their

students and their colleagues, a sizable accolade is due. This group of 80 American agricultural scientists and a large number of colleagues in the developing nations have worked tirelessly toward the attainment of the objectives of the international sorghum and millet CRSP. The work which has been done is impressive. It is also important. The potential for the future is even greater and more important.

A special vote of thanks is due the INTSORMIL's Technical Committee. This group has labored long, diligently, and thoughtfully in the selfless interest of making the INTSORMIL program an outstanding example of productive international interaction in agricultural research. It has been exemplary.

The INTSORMIL Board of Directors has performed its policy making and recommendation roles superbly. It has faced many difficult decisions. It has not shirked these responsibilities. It has consistently operated in a statesmanlike manner in the best interest of the objectives of the program.

The Management Entity, individually and institutionally, has done a remarkable job of running a terribly complex and difficult enterprise. It has done this well.

The Agency for International Development, as INTSORMIL's principal donor, deserves special mention. It has provided funds in a timely and flexible manner. The Agency's Washington and LDC Mission staffs have been most supportive and helpful in making this program work. Along with our colleagues in the LDCs and in the International Agricultural Research Centers, they have been true and effective partners.

I look forward to the deliberations which follow. They will be productive and useful. The results will serve mankind well.

INTSORMIL PRINCIPAL INVESTIGATORS CONFERENCE

The Collaborative Research Support Program (CRSP) is a product of Title XII legislation. The structure and implementation of the programs have been the result of the collective efforts of the Joint Research Committee of the Board for International Food and Agriculture and of A.I.D. The Sorghum/Millet CRSP was one of the first two CRSPs planned and implemented. Early in the development of the CRSP programs, there was skepticism from the field on how effective these new programs would be in promoting research training and institution building. In this Principal Investigators Conference, we are taking an introspective look into the Sorghum/Millet CRSP, now four and a half years old. I would like to make some general observations about the CRSP programs and how they are viewed by A.I.D., some programmatic issues such as travel, and some thoughts about the review and extension process for extending the CRSP grants.

After four and one half years, we are beginning to see measurable output coming from the program. This is important because the Administrator of the Agency and the Senior Assistant Administrator for the Bureau for Science and Technology are interested in knowing if this mode for conducting research on developing country agricultural problems is cost effective, efficient and productive.

Our experience to date is that the model is effective and one that is gaining wide acceptance by A.I.D. Missions and host countries. Another strong point is the collaboration and coordinated manner in which the CRSP and ICRISAT are working together to further the development of an increased body of knowledge on the cultivation and production of grain sorghum and pearl millet.

With this positive experience to date, there are some points about which we need to remind ourselves. First, the Sorghum/Millet CRSP is a research program, not a production/extension type of activity. The CRSP program should be one with a global plan with strategic activities designed to address the major constraints to production and utilization in the major sorghum/millet producing countries in the developing world. We must reassess our efforts to assure that the program is made up of the right mix of projects, that they form an interdisciplinary approach to problem solving and that we don't revert to a collection of disciplinary projects not well coordinated. We must continually ask, "Are we doing the right things with the right people, with the right institutions?" The Agency wants the CRSPs to fine tune their programs and to be responsible to the needs of research in the host countries.

Another area we need to be cognizant of is travel. All international travel must have the clearence of both the USAID Mission and host country, as well as approval by A.I.D./Washington. This is necessary because when you have USAID Mission clearance, the mission is accepting responsibility for your welfare in the country. One CRSP has already had an experience where two investigators lost their personal belongings. Because they were officially cleared to be present in the host country, their losses were covered and they have been compensated. Travel is one of those areas where costs can and should be minimized. S&T/AGR would like to see all PIs plan their travel one year in advance, knowing that there will be exceptions and changes. This will allow the Management Entity to coordinate all travel and to avoid unncesssary duplication of trips. Cooperation in this area will be greatly appreciated.

Finally, as we look forward to years 6, 7, 8 and 9, we need to focus on the future. As the CRSP remains tight, viable and continues to strengthen collaborative relationships with host countries, ICRISAT and CIAT, the outlook appears to be positive. We recognize that the CRSP cannot respond to all the needs, however, we can focus on those research needs; training and institutional development which is the obvious forte of the CRSP university community.

We look forward to continued fruitful relationships.

John M. Yohe
AID/Washington

Drafted:JMYohe:bw
3/1/84 WD 0856f

THE CRITICAL ISSUES WE FACE

George L. Teetes
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The major goal of the Grain Sorghum/Pearl Millet Collaborative Research Support Program (CRSP) (INTSORMIL) is to increase production of grain sorghum/pearl millet in those countries where these are principal crops. This is done by developing and testing improved techniques and by enhancing the abilities of developing country scientists to solve problems related to grain sorghum/pearl millet production and use. Research, training and technical assistance are involved and a substantial portion of each are supposed to be done in the developing countries.

Not unexpectedly, each of the currently existing CRSP's under the Title XII program was developed differently, and in time has taken on its own mode of operation, characteristics and even perhaps its own level of success or failure. INTSORMIL has its own uniqueness in terms of its methods of operation, involved scientists, management, research, and international involvement. INTSORMIL is composed of a set of integrated, long-term research projects with related training and technical services capabilities. Unlike the other Title XII CRSP's, INTSORMIL was formed primarily from institutions that already had a history of direct relationship with USAID through research contracts. These existing relationships formed the basis to organize and mobilize financial and human resources necessary to mount a major multi-institutional U.S.A. - LDC collaborative effort to provide the expertise and knowledge base necessary to achieve significant advances in alleviating the principal constraints to improved production, protection, marketing, and utilization of grain sorghum/pearl millet in LDCs. Research activities cover a wide range of subject matter categories responsive to the most urgent technical needs.

Management of INTSORMIL consists of a headquarters staff, a Board of Directors and an Administrative Council which are provided recommendations by a Technical Committee composed of principal investigators. Review and evaluation are by submitted written reports, oral reports at conferences, by USAID Personnel, and an External Evaluation Panel. Originally designed, the term of the grant was from July 1, 1979 to June 30, 1984 with extention possibly based on mutual agreement. The June 30, 1984 date is an important and critical one to INTSORMIL. In terms of this conference and in future plans and goals it represents an opportunity for assessment. Already today we have heard and discussed the topics of "INTSORMIL's First Five Years--Our Accomplishments", "INTSORMIL - CRSP Objectives - Are We on Track?", and INTSORMIL Host Country Commitments." Now we turn to another issue, as we assess INTSORMIL and look into its future. What are "THE CRITICAL ISSUES WE FACE."

It would be impossible for me to address every issue that INTSORMIL faces, but there are a number of them that I will attempt to bring out as my presentation is intended to stimulate thought and discussion.

My objective is to raise some questions and perhaps some problems that INTSORMIL faces. By no means am I intending to say that INTSORMIL has no strengths, because it does. INTSORMIL has made significant accomplishments. My intent is to address critical issues for INTSORMIL as evidence that we want to do even more and be better at what we do. My perspective on this issue is that of a principal investigator, a researcher. I have served as a Technical Committee member for three years and was chairman for two of those years. Also, I have been a country Coordinator and presently am the entomology discipline coordinator. This experience has led me to identify these critical issues, that I hope we can discuss today. Since the issues exist, is also evidence that my contributions to INTSORMIL have not resulted

in their being resolved.

I have divided or subtitled the critical issues that INTSORMIL faces into ten categories. These are: management, Technical Committee, disciplines, domestic versus international research, program flexibility, LDC commitments, collaborative research versus institution building, USAID philosophy, review and evaluations, and missions and International Centers. It is likely that by this time, several of these issues already have been discussed. If so, that simply verifies their importance.

Management

INTSORMIL has a small management staff; a program director, a part-time zz assistant director and two support staff members. That is a small headquarters organization. The management approach is a decentralized system. This is in direct contrast to the management entities of most other CRSP's which are management intensive. The issues that arise relative to management, however, are critical. By program organizational design as required, the management entity is the legal and fiscal institution that receives and administers AID funds under the grant, enters into subgrants zzwith INTSORMIL member institutions and developing country institutions, and provides central program direction and technical management. It monitors subgrants, is accountable for administration of funds, and provides required reports relative to grant activities.

In practice, the management entity is directed by a Board of Directors which receives recommendations from a Technical Committee composed of member institution scientists. The ability of the management entity to carry out its assigned responsibilities has been impressive in light of the few number of staff members. Its performance and interaction with USAID personnel has resulted in effective progress of INTSORMIL.

Critical issues relating to the management entity that might be considered relate to a stronger role in terms of possible expansion in number of staff, expansion of its role as a stronger decision making force, and providing greater input into the direction of INTSORMIL in terms of projects and collaboration. The management entity has in the past provided suggestions, for example, in matters relating to projects and project funding to the Technical Committee which in turn provided recommendations to the Board of Directors. Is this a valid procedure?

A critical issue at hand that is a management related item is the failure of INTSORMIL to have a formal multi-year plan of action, and well defined objectives, goals and procedures. One might contend that INTSORMIL has functioned well without such statutes and work plan, but it is certainly valid to ask if the lack of such planning has led to other critical issues that INTSORMIL faces. Difficult issues such as institution retention or addition, project retention or addition, evaluation of projects in terms of contributing to INTSORMIL objectives, etc. have been painful to deal with and to some extent ineffective. What is the management entity's role in this critical issue?

Technical Committee

This committee which provides institution and discipline representation is the backbone of INTSORMIL operation. In theory, it is the initiator of INTSORMIL activities that provides guidance recommendations. Historically, the members that have served on this committee have spent many, many long hours in attempts to fulfill their responsibilities and provide dedicated, unbiased leadership. In many ways this committee has been responsible for much of the success of INTSORMIL.

Since the Technical Committee plays such an important role within INTSORMIL it is very much involved in the critical issues that the CRSP

faces. In relation to actions and decisions that have had to be made that do not relate to funding, the Technical Committee has performed well and has dealt with some very difficult tasks. In terms of dealing with matters of funding, a most sensitive issue, there has been some failure of the Committee as a whole to holdforth the courage of its convictions and take necessary, almost always difficult, actions. The solution to this is difficult, but the reason recognizable. It is most difficult for a group of scientists that compose a committee within a grant receiving organization to be responsible for making recommendations regarding projects, project evaluation, and especially project funding. The ability of this committee to make substantial changes in program direction and funding has been minimal. Evidently, scientists don't do well in dealing with such financial issues. The premise is that the scientists within INTSORMIL are in the best position to deal with money matters. This seems logical. Most scientists are dedicated to good science, work hard and strive to improve and increase their contributions. Selfishness may or may not be the issue here. The matter of deleting projects, changing funding levels of projects and adding new projects and perhaps even institutions, as well as reviewing and evaluating project contributions is one of the most critical issues INTSORMIL faces. These must be deal with.
Is the Technical Committee the appropriate group to deal with these issues?

Discipline Balance

The discipline imbalance within INTSORMIL is considerable in terms of numbers of projects and scientists, and funding. That imbalance will not be documented here, but it exists. The critical issue is whether or not there needs to be a reassessment of INTSORMIL's discipline structure and the mechanism to do so and who does it. Perhaps it is logical for there to be greater input in some disciplines than others, and I am sure

justification could be provided by those of any disciplines. Difficulties arise, however, at evaluation time, when contributions to the objectives of INTSORMIL are considered. The issue is evaluation in terms of discipline support.

The discipline imbalance in terms of number and funding level is one issue, but another is the difference in opportunity, perhaps ease and nature of LDC collaborative research of discipline groups. Some disciplines lend themselves well to collaborative research efforts, some do not. Crop protection, for example, is an involved process that requires many different approaches to pest and disease control, which complicates collaborative efforts. Another issue relative to disciplines relates to the basic or applied research nature. Drought resistance breeding obviously has LDC application, but the application of the physiology of drought resistance is less obvious. An additional issue is that for some disciplines there are few well trained LDC sorghum/millet research scientists. The differences among disciplines in many aspects are certainly important issues.

Domestic Versus LDC Research

All INTSORMIL scientists have U.S. institution research responsibilities. A critical issue we all face is fulfilling that commitment and adequately contributing to the objectives of INTSORMIL and the expectations of USAID. The opinion that any research that is done, or any knowledge that is accumulated will help developing countries is not acceptable in terms of the mandates of the Title XII program. As scientists we face the issue of evaluation and contribution to our scientists peers, our administration and to the state tax payer. Can we do both and more importantly can we have the best of both worlds? Is this really a "versus"

situation? Should we do more of one than the other? Can there be compatibility? Can we satisfy all concerned and interested parties? Of course, balance between the two is a possibility.

The production problems we deal with and are responsible for solving in our home states may or may not be the same as those in developing countries. Likewise, our professional responsibilities and areas of research specialization may not mimic the needs in the developing world. In some cases our level of science and technology may be too sophisticated to match the needs of those in the developing world. These are issues that are real to us all and that we struggle with.

Flexibility

Improvement in any organization requires a degree of flexibility necessary to meet required objectives. The Missouri Planning Group in all its wisdom could never propose an organizational framework or propose all the proper ingredients of an organization to allow the Sorghum/Millet CRSP to carry out its mandates. Inevitably changes in composition of an effort as large and diverse as INTSORMIL are required. INTSORMIL must be in a position to enact change. Changes may be in terms of personnel, projects, funding or funding levels, country involvement, adding or deleting member institutions, and perhaps many others.

In theory, the design and administration of INTSORMIL does not preclude the flexibility required to make identified needed changes. But in practice, few have been made. Those changes that have occurred have been minor, and certainly not of the magnitude that would substantially help INTSORMIL meet its objectives as new opportunities arise. A few projects have been deleted, and a few very small projects added. Issues relating to this topic will also be raised in a section on review and evaluation that follows.

Most of us surely recognize the need for flexibility. The critical issue is how to impose the needed changes as well as how to identify what changes need to be made. This issue relates back to a long-term plan of action to meet the objectives of INTSORMIL. Are some projects "sacred" because they become part of INTSORMIL under the "grandfather clause"? Who makes the decisions as to what changes are needed?

LDC Involvement

There are at least two critical issues that face INTSORMIL in terms of LDC involvement. One relates to the number of developing countries with which INTSORMIL is working and the other is the extent and nature of the involvement. These issues pose such questions as 1) is it better to do a little bit in a large number of countries, or maintain a larger involvement in fewer countries, and 2) what constitutes country involvement?

At this point in the life of INTSORMIL should we still be identifying countries to work with? Why is it that we never identified a set of countries and then developed the collaborative efforts that we were expected to? One reason is that there has never been a plan or set of guidelines. INTSORMIL's mode of operation has been to take advantage of unique opportunities as they arise for LDC involvement.

The list of countries with which INTSORMIL is involved is quite lengthy. But, would the extent of involvement with some of these countries stand the test of really true collaborative efforts. If a plant breeder sends sorghum seed to Chad for drought resistance screening, is that a collaborative effort. If I send sorghum midge resistant sorghums to Honduras or an Insect Identification Handbook to Mexico, is that a collaborative effort? The issue is extent and nature of LDC involvement.

Collaboration versus Institution Building

By title and perhaps definition the CRSP's are to be collaborative in nature. However, within INTSORMIL there seems to be a push to hire and station scientists, usually U.S. scientists, in developing countries. I was directly involved and probably pushed harder than anyone to hire and station Dan Meckenstock in Honduras and he has been able to develop one of the finest programs anyone could be expected to develop. His presence has allowed for a multitude of collaborative efforts. This may be a poor example, but the point is and the issue we face is one of collaborative research versus institution development or stationing people in the field. Maybe both are required. There was no sorghum program in Honduras until Dan developed one. INTSORMIL faces the issue of how best to satisfy the mandates as set forth in the Title XII Program in terms of collaborative efforts.

In some cases developing country scientists simply are not present. Even if they are, their level of support is too low to allow for much collaboration. Well trained scientists with which INTSORMIL can collaborate are few in number. Related to that problem and an issue that magnifies the problem is that good scientists often do not stay in their home country and are hired by countries that can provide better salaries and more research support such as Saudia Arabia and the United States. Has INTSORMIL failed to define true collaborative efforts?

USAID Philosophy

From the beginning of the CRSP effort it has never been clear really what AID expected from the program or how it expected the program to function. It has been apparent that AID wanted quick results even though there were tunes of a long-term effort. There was voiced opposition to the CRSP's by some AID personnel and acceptance of any chance of success was slow coming. There is less of that now, but there still exists the critical

issue of knowing what AID really wants and expects. Without the leadership we have had from the INTSORMIL Director and his time spent in Washington, INTSORMIL may have never made it this far. Knowing what AID wanted, even needing to know it in advance of announcement, certainly has been a difficult issue.

INTSORMIL still faces a critical issue with AID in terms of accomplishments, evaluation, contributions and a true sense of assisting and carrying out INTSORMIL's grant obligations and commitments. The sense of the CRSP's being forced onto AID must be resolved and put behind us. A sense of partnership and mutual trust and sincere dedication to assisting developing countries needs to be reached and the accepted mechanism to be so defined.

Review and Evaluation

The most critical issue INTSORMIL faces is documentable evidence that it is achieving its objectives. This involves the process of review and evaluation. No other professional is reviewed more, or writes more reports to justify their activities than public researchers. They face peer review, publication review, promotion and tenure review, administration review and on and on. However, review and evaluation of INTSORMIL itself and the member scientists is a most critical issue and one that must be dealt with. There have been attempts made, but to unknown or perhaps to no effect. A reason for this might be that we really do not know what is expected and what or how to evaluate.

INTSORMIL is made up of scientists responsible to more than one organization. Scientists want to do good science, they must publish and meet approval of their peers and public administrators. AID supposedly wants INTSORMIL scientists to help developing countries. Is there a

conflict here? If so, how is it resolved. How is a review process established that acknowledges contributions to science, yet allows for and acknowledges efforts to transfer technology to developing countries? Can we do both? Can we satisfy AID and our state administrators and tax payers and maybe more importantly ourselves?

The critical issue of review and evaluation must be resolved. There is more to the process than second grade "show and tell" meetings. If AID knows what they want from us they should be able to tell us. I understand there will be an AID review team at Texas A&M University in January. We don't grow much sorghum in Texas in January. Why doesn't the review team go to Honduras? I guess we are all good at playing games. But I promise, I can convince anyone in January that I am really doing a good job. Couldn't you?

Missions and International Centers

INTSORMIL has good relationships and cooperates closely with some AID Missions and International Centers. I believe our relationship to International Centers is especially good, namely with ICRISAT, CIMMYT, IRRI, and CIAT. Our relationships to some missions are less well established. Some pay no attention to us and doubt any true capability. Some believe we are just another source of funds. Critical issues we face are establishing trust, mutual efforts, and a sense of a full partnership with AID Missions and International Centers.

Parting Remarks

My presentation has been for the purpose of stimulating though and discussion relative to the critical issues that INTSORMIL faces. Now it is your time to react. I am sure there are issues that were omitted that you think are important. Perhaps some that I did discuss are really not very important. One of my major concerns is that we cannot expect serendipity to

make INTSORMIL succeed. I read a definition of serendipity the other day as "looking for a needle in a hay stack and finding the farmer's daughter." INTSORMIL won't be that lucky; it will take hard work.

One grant has brought together the sorghum/millet expertise of state institutions in the United States. In essence, the leading sorghum/millet researchers have been made available to USAID for the purpose of improving life of the poorest people in the developing world. INTSORMIL scientists are committed to that goal, but the task is not a simple one. USAID has existed for a long time and there is still lots of poverty. The CRSP strategy is a unique approach, but one that has not yet had all the kinks worked out. We are here today to work out some of these.

ISSUES REGARDING UNIVERSITY RESEARCH PROGRAMS, INTSORMIL AND DEVELOPING COUNTRIES

by

J. D. Eastin

The US AID Title XII sorghum and millet program (INTSORMIL) with US universities is a relatively new program. As such its utlimate impact on developing countries, ICRISAT and INTSORMIL universities remains uncertain but work is in progress, goals are being achieved and a variety of patterns of operation are emerging. However, there is little doubt that improvements can be made in the manner in which developing countries, ICRISAT and INTSORMIL interrelate in order to enhance mutual benefits. The individual concerns of the three groups might seem to vary somewhat in that US AID and developing countries are interested primarily in improving production in the developing countries while U.S. universities have constituency obligations in both foreign countries and at home. Hopefully we will be able to visualize how these interests are mutually valuable more than competing interests.

Periodically questions are raised regarding the proportions of research under the Title XII program which should be directed toward domestic vs international activity as well as so called basic versus applied research. In truth there is not a clear cut distinction between either domestic and international effort or basic and applied research. The training of international students more often than not requires an extensive research effort onsite at a US university. Further the research effort may involve a fairly specific problem in a US state, the nature of which may well surface some years hence in the developing country scientist's home as agriculture develops there. Often such research would be viewed as basic research as opposed to applied research. Basic research is generally considered to be investigation in areas where immediate application of results is not always directly obvious. Some suggest there is a continuum between the basic and applied extremes which seems quite reasonable in real life. Despite interpretive problems, the terms international, domestic, basic and applied efforts will be used some in this consideration of how can university and INTSORMIL interests fit together productively. A first consideration is to look at the intent of the Title XII section of the law and consider the opinions expressed by the authors.

Title XII intent

The US Congress enacted Public Law 94-161 in late 1975. The Title XII component of PL 94-161, Famine Prevention and Freedom from Hunger, is now a commonplace phrase in the minds of most people here. However, details of the Title XII component are possibly less well known to most. Attached are three pages of the full text of PL 94-161 for your study later. The following selected portions are included for review now to increase our awareness of the total program and improve our involvement. Some of the following sections are quoted directly and some are paraphrased for the sake of brevity. When in doubt consult the attached full text.

Sec. 298. General Provisions. Prevent famine and hunger by (1) strengthening U.S. universities in program-related agricultural institutional development and research and (2) improve the participation of US universities in other US supported international efforts applying science to improve food production and nutrition.

The Congress so declares because it finds

(1) that the establishment, endowment, and continuing support of land-grant universities in the United States by Federal, State, and county governments has led to agricultural progress in this country;

(2) that land-grant and other universities in the United States have demonstrated over many years their ability to cooperate with foreign agricultural institutions in expanding indigenous food production for both domestic and international markets;

(7) that universities need a dependable source of Federal funding, as well as other financing, in order to expand, or in some cases to continue, their efforts to assist in increasing agricultural production in developing countries.

(c) The United States should--

(3) assist such universities in cooperative joint efforts with--

(A) agricultural institutions in developing nations, and
(B) regional and international agricultural research centers, directed to strengthening their joint and respective capabilities and to engage them more effectively in research, teaching, and extension activities for solving problems in food production, distribution, storage, marketing, and consumption in agriculturally underdeveloped nations.

Sec. 297. General Authority. The President is authorized to carry out programs to prevent famine and hunger.

Sec. 298. The President established the Board for International Food and Agricultural Development (BIFAD) to assist in program development and administration.

Sec. 297 (b) Programs under this title shall be carried out so as to--
(1) utilize and strengthen capabilities of US universities to (a) help developing countries develop classroom teaching and (b) promote "agricultural research to be conducted in the cooperating nations, at international research centers, or in the United States."

Sec. 297 (b) Programs shall

(2) take into account the value to US agriculture of such programs, integrating to the extent practicable the programs and financing authorized under this title with those supported by other Federal or State resources so as to maximize the contribution to the development of agriculture in the US and in agriculturally developing nations;"

In summary then, The Congress recognized (1) that land-grant universities have a good record in boosting agricultural production, (2) that land-grant universities have demonstrated the ability to cooperate with foreign agricultural institutions in expanding indigenous food production for both domestic and international markets, (3) that universities need a dependable long-term source of Federal funding if they are to effectively assist in increasing agricultural production in developing countries, (4) that funds should be used in cooperative joint efforts with agricultural institutions in developing nations and the international research centers and (5) that programs utilizing Title XII funds plus other Federal and State funds should be integrated to the extent practicable to "maximize the contribution to the development of agriculture in the United States and in agriculturally developing nations."

This constitutes much of the substance of the intent of Title XII legislation. The emphasis is clearly on improving developing country production and nutrition. However, the substantial contribution to increased production that has been made by the traditional US university mix of both basic and applied research was recognized and care should be taken to maintain a productive balance in the interests of both domestic and foreign agriculture.

Title XII implementation

As pointed out earlier the President established the BIFAD to assist in administering Title XII programs. BIFAD responsibilities in general involve participation in planning, developing, implementing and monitoring appropriate program activities. One specific charge to the BIFAD is "participating in the formulation of basic policy, procedures and criteria for proposal review, selection and monitoring." BIFAD responsibilities in general involve participation in planning, developing, implementing and monitoring appropriate program activities.

Any scientist who has an INTSORMIL project has participated either directly or indirectly with the BIFAD by virtue of having developed a research proposal which was reviewed, accepted, funded, and is now being monitored. How effective INTSORMIL is in the future depends, in large part, on how well we plan jointly with the BIFAD and US AID (which implies third world countries and ICRISAT)) and how well we implement and execute projects funded jointly by US AID (INTSORMIL), other Federal funds and State Experiment Station funds.

Current status

We have covered the general intent of PL 94-161 and something regarding its administration. You have already heard reports on INTSORMIL'S First 5 years - Our accomplishments, The Critical Issues We Face and INTSORMIL-CRSP Objectives - Are we On Track? Here we are addressing the question how to best use University and AID resources to be on target and address the critical issues. We have made a good start these first five years. How should we continue to best meet obligations to AID and our US constituency?

Since an explicit directive in PL 94-161 is to work cooperatively with international centers and third world scientists, some effort was made to gather opinions via a questionnaire (attached) on what INTSORMIL training and research activities should be. Seven responses were received from ICRISAT scientists (breeders, pathologists, physioloists) and 8 responses

were received from advanced level Ph.D. students who have had research experience in developing countries and will return upon receiving a Ph.D. This is a very small sample but appears, nontheless, to be significant. Attempts were not made to canvas scientists at IRRI, CIMMYT or CIAT. Results will not be tabulated but selected comments follow.

Question 1. What kinds of research should US Experiment Station scientists with international interests be doing? Thoughts on both basic and applied research and training activities needed to complement ICRISAT and third world countries would be especially useful. Your categorization as basic or applied is optional.

Scientists commented on at least seven research areas and generally categorized what they felt INTSORMIL people should be doing in terms of basic vs applied work. Averaged across disciplines ICRISAT scientists felt INTSORMIL should be engaged in about twice as many basic science efforts as applied. Applied effort was generally associated with entomology, farming systems, pathology, production and physiology, and plant breeding. Some basic research votes were found for all categories. The gist of selected comments follows. ICRISAT scientists do product or result oriented research because organized national programs are often lacking in the semi-arid tropics (SAT). They look to INTSORMIL and other agencies to cooperate and collaborate on basic research aspects. They felt INTSORMIL scientists do need to do both basic and applied research and be involved as much as possible in LDC's. The necessity for basic research to help provide the basis for deciding current and future research strategies was mentioned.

Most scientists felt the need for added communication and research cooperation.

In addition to seeking responses from individual ICRISAT scientists, Dr. Lee House and Mr. David Andrews, ICRISAT sorghum and millet program leaders, respectively were asked to give their views at the conference. Both are veterans of many years of service in Africa and India. Dr. House was unable to attend but sent a letter from which the following views were extracted (not verbatum).

(1) INTSORMIL scientist participation overseas, with few exceptions, will be on a short term consultancy basis.

(2) INCRISAT's focus is applied and farmer oriented, yet questions and problems arise requiring a relatively sophisticated research input and are referred to INTSORMIL for help.

(3) Good use has been made of US developed material over the span of an entire overseas career. Useful US material was often developed years prior to overseas use. Hopefully both INTSORMIL and donors will recognize the time lag since impact usually does come many years later.

(4) Looking back at Indian Agriculture in the 60's, it seems obvious that development of the Agricultural Universities was a dominating contribution. The role of INTSORMIL Universities in education is critical. More attention should be devoted to Experiment Station management and operation.

(5) Donors and scientists should get together to evolve a thrust on Striga.

Mr. Andrews did speak to the group. Some of the points he made follow.

(1) We should establish routine information exchanges from project planning through execution at the ICRISAT, INTSORMIL institution and in-country levels. Emphasize representation at each other's in-house reviews plus joint sponsorships of workshops and information documents.

(2) We should consider the relative spectrum of expertise of the two organizations and their operational limitations in relation to defined research problem priorities.

(3) Germplasm exchange should be improved and the possibility of joint breeding programs should be explored.

(4) Training in agricultural research is so fundamental to increasing agricultural production in the LDC's in the long term that it needs top priority and according to the Institutions capability.

Questionnaire responses of 8 advanced Ph.D. students from developing countries were received. As expected they treated training rather strongly. They felt it necessary to get a good basic research appreciation to better prepare them for duties upon returning home. They generally felt understanding various biological phenomena was critical to sound research planning even though research in their countries might remain rather simplistic and applied for the next few years. Basic research during Ph.D. training was felt essential in order for them to be sound scientists 10 to 20 years from now. Also some will return to become teachers and administrators in the near future and felt a good basic training background was essential to plan sound, long-range research strategies for their local situations. Adequate student training depends heavily on understanding basic phenomena. Most felt, however, that a healthy mix of both basic and applied research training was essential. Some felt the need for training in experiment station management and training in computer use to store and retrieve research data for national use since program discontinuity frequently results in data losses for remote areas. The need by production scientists and breeders to understand plant responses to harsh environments was emphasized.

Summary

The Congress recognized in Title XII legislation

(1) That long term support of land-grant universities has led to agricultural progress in the US.

(2) That land-grant universities have demonstrated ability to cooperate with developing country institutions to increase food production.

(3) That universities need a dependable long-term source of Federal funding if they are to continue and/or expand assistance in developing countries.

(4) That funds are needed to foster cooperation between international centers, developing country institutions and the universities.

(5) That such cooperative programs are of value to United States agriculture and that Federal funds from this program, other Federal funds and State resources should be used "to maximize the contribution to the development of agriculture in the United States and in agriculturally developing nations;"

Impressions from a limited number of ICRISAT and developing country student scientists regarding university activities.

(1) Scientist training probably is the dominating useful offering of universities.

(2) Basic and applied research are both key features of scientist training.

(3) The impact of basic research usually requires several years.

(4) Developing country scientists in training feel a mix of basic and applied research and course work is necessary for them to develop the ability to project research policy to appropriately serve their countries 5 to 15 years ahead.

After reviewing the intent of the Title XII section of PL 94-161 and the comments of colleagues in developing countries and at ICRISAT, it is clear that the scientific training of developing country scientists by INTSORMIL is paramount.

Developing country food problems are both short term and long range problems. Scientists must be trained accordingly. They must know how to recognize and implement research with immediate application for short term needs. However, population trends dictate that they must also handle the more difficult dual tasks of projecting what long term food production research needs will be and then setting up programs to address those needs. The latter tasks are more difficult and will likely yield faster to those who have good basic science training tempered by experience with the production realities of the more or less harsh environments common to many developing countries. These students must be basically trained in sound scientific principles to meet long range program planning and execution. INTSORMIL scientists training them must likewise develop sound judgments regarding needs of the students based on experiences with the realities of developing country production problems and related social constraints. Therefore, INTSORMIL scientists need to have some research projects going in developing countries cooperatively with developing country and/or ICRISAT scientists.

Research based in the US and in developing countries has generally been highly complementary. Developing country students doing basic long term research in the US, admittedly with a sometimes limited level of immediate application, are being trained in basic sciences which will be useful in setting up appropriate long term research programs in their native countries. At the same time they are contributing to the progress of agriculture in the U.S. Conversely, INTSORMIL scientists involved in developing country research should be gaining valuable perspective pertinent to production problems both abroad and in the U.S.

Scientists and administrators from developing countries, AID, ICRISAT, BIFAD and INTSORMIL should make a renewed effort to consciously evaluate adequacy of the balances between short term applied effort and longer term so called basic research associated with student training and long range food production goals. The brief survey reported here was rather cursory, nonetheless, quite illuminating. The levels of concern and thoughtfulness expressed by students was particularly gratifying. Very possibly a more extensive survey of developing country scientists, AID mission directors, ICRISAT scientists and INTSORMIL scientists should be conducted to sharpen our perspective on how to collectively better serve the needs of world agriculture.

QUESTIONNAIRE

Questions and research categories listed below are only to facilitate your response. Please comment additionally or differently in any way you wish. Respondents should feel free to comment on all the suggested categories or restrict their comments to those categories they feel comfortable with.

1. What kinds of research should U.S. Experiment Station scientists with international interests be doing? Thoughts on both basic and applied research and training activities needed to complement ICRISAT and third world countries would be especially useful. Your categorization as basic or applied is optional.

Category	Research Category		Research Description
	Basic	Applied	
1. Entomology			
2. Farming Systems			
3. Food Science			
4. Pathology			
5. Plant Breeding			
6. Production and Physiology			
7. Other			

enable and encourage greater numbers of the poor to help themselves toward a better life. Not less than $20,000,000 of such funds shall be used during the fiscal years 1976 and 1977, including the period from July 1, 1976, through September 30, 1976, only for technical assistance to carry out the purposes of this section.".

INTEGRATING WOMEN INTO NATIONAL ECONOMIES

22 USC 2151k. SEC. 309. Section 113 of the Foreign Assistance Act of 1961 is amended by striking out "Sections 103 through 107" and inserting in lieu thereof "Part I".

HUMAN RIGHTS AND DEVELOPMENT ASSISTANCE

SEC. 310. Part I of the Foreign Assistance Act of 1961 is amended by inserting immediately after section 115 the following new section:

22 USC 2151n. "SEC. 116. HUMAN RIGHTS.—(a) No assistance may be provided under this part to the government of any country which engages in a consistent pattern of gross violations of internationally recognized human rights, including torture or cruel, inhuman, or degrading treatment or punishment, prolonged detention without charges, or other flagrant denial of the right to life, liberty, and the security of person, unless such assistance will directly benefit the needy people in such country.

"(b) In determining whether this standard is being met with regard to funds allocated under this part, the Committee on Foreign Relations of the Senate or the Committee on International Relations of the House of Representatives may require the Administrator primarily responsible for administering part I of this Act to submit in writing information demonstrating that such assistance will directly benefit the needy people in such country, together with a detailed explanation of the assistance to be provided (including the dollar amounts of such assistance) and an explanation of how such assistance will directly benefit the needy people in such country. If either committee or either House of Congress disagrees with the Administrator's justification it may initiate action to terminate assistance to any country by a concurrent resolution under section 617 of this Act.

22 USC 2367.

"(c) In determining whether or not a government falls within the provisions of subsection (a), consideration shall be given to the extent of cooperation of such government in permitting an unimpeded investigation of alleged violations of internationally recognized human rights by appropriate international organizations, including the International Committee of the Red Cross, or groups or persons acting under the authority of the United Nations or of the Organization of American States.

Report to Speaker of the House and Senate committee.

"(d) The President shall transmit to the Speaker of the House of Representatives and the Committee on Foreign Relations of the Senate, in the annual presentation materials on proposed economic development assistance programs, a full and complete report regarding the steps he has taken to carry out the provisions of this section.".

DEVELOPMENT ASSISTANCE

SEC. 311. Chapter 2 of part I of the Foreign Assistance Act of 1961 is amended—

22 USC 2169. (1) by amending section 209(c) to read as follows:

"(c) It is the sense of the Congress that the President should increase, to the extent practicable, the funds provided by the United States to multilateral lending institutions and multilateral organizations in which the United States participates for use by such institutions and organizations in making loans to foreign countries.";

(2) by amending section 214— 22 USC 21

(A) in subsection (c), by inserting "and for each of the fiscal years 1976 and 1977, $25,000,000," immediately after "$19,000,000,"; and

(B) in subsection (d), by inserting "and for each of the fiscal years 1976 and 1977, $7,000,000," immediately after "$6,500,000";

(3) in section 221, by striking out "$355,000,000" and inserting in lieu thereof "$430,000,000"; 22 USC 21

(4) in section 222(c), by striking out "$550,000,000" and inserting in lieu thereof "$600,000,000"; and 22 USC 21

(5) in section 223— 22 USC 21

(A) by striking out "June 30, 1976" in subsection (i) and inserting in lieu thereof "September 30, 1978"; and

(B) by adding at the end thereof the following new subsection:

"(j) Guaranties shall be issued under sections 221 and 222 only for housing projects which (1) except for regional projects, are in countries which are receiving, or which in the previous two fiscal years have received, development assistance under chapter 1 of part I of this Act, (2) are coordinated with and complementary to such assistance, and (3) are specifically designed to demonstrate the feasibility and suitability of particular kinds of housing or of financial or other institutional arrangements. Of the aggregate face value of housing guaranties hereafter issued under this title, not less than 90 per centum, shall be issued for housing suitable for families with income below the median income (below the median urban income for housing in urban areas) in the country in which the housing is located. The face value of guaranties issued with respect to housing in any country shall not exceed $25,000,000 in any fiscal year, and the average face value of guaranties issued in any fiscal year shall not exceed $15,000,000. Notwithstanding the provisions of the first sentence of this subsection, the President is authorized to issue housing guaranties until September 30, 1977, as follows: In Israel, not exceeding a face amount of $50,000,000, and in Portugal, not exceeding a face amount of $20,000,000.". 22 USC 21

FAMINE PREVENTION

SEC. 312. Chapter 2 of part I of the Foreign Assistance Act of 1961 is amended by adding at the end thereof the following new title:

"TITLE XII—FAMINE PREVENTION AND FREEDOM FROM HUNGER

SEC. 206. GENERAL PROVISIONS.—(a) The Congress declares that, in order to prevent famine and establish freedom from hunger, the United States should strengthen the capacities of the United States land-grant and other eligible universities in program-related agricultural institutional development and research, consistent with sections 103 and 103A, should improve their participation in the United States Government's international efforts to apply more effective agricultural sciences to the goal of increasing world food production, and in general should provide increased and longer term support to the application of science to solving food and nutrition problems of the developing countries. 22 USC 2: 22 USC 21 Ante, p. 8

Land-grant universities.

Congress so declares because it finds—

that the establishment, endowment, and continuing support of land-grant universities in the United States by Federal, State, and county governments has led to agricultural progress in this country;

that land-grant and other universities in the United States have demonstrated over many years their ability to cooperate with foreign agricultural institutions in expanding indigenous food production for both domestic and international markets;

"(3) that, in a world of growing population with rising expectations, increased food production and improved distribution, storage, and marketing in the developing countries is necessary not only to prevent hunger but to build the economic base for growth, and moreover, that the greatest potential for increasing world food supplies is in the developing countries where the gap between food need and food supply is the greatest and current yields are lowest;

"(4) that increasing and making more secure the supply of food is of greatest benefit to the poorest majority in the developing world;

that research, teaching, and extension activities, and appropriate institutional development therefor are prime factors in increasing agricultural production abroad (as well as in the United States) and in improving food distribution, storage, and marketing;

"(6) moreover, that agricultural research abroad has in the past and will continue in the future to provide benefits for agriculture in the United States and that increasing the availability of food of higher nutritional quality is of benefit to all; and

that universities need a dependable source of Federal funding, as well as other financing, in order to expand, or in some cases to continue, their efforts to assist in increasing agricultural production in developing countries.

"(b) Accordingly, the Congress declares that, in order to prevent famine and establish freedom from hunger, various components must be brought together in order to increase world food production, including—

"(1) strengthening the capabilities of universities to assist in increasing agricultural production in developing countries;

"(2) institution-building programs for development of national and regional agricultural research and extension capacities in developing countries which need assistance;

"(3) international agricultural research centers;

"(4) contract research; and

"(5) research program grants.

"(c) The United States should—

"(1) effectively involve the United States land-grant and other eligible universities more extensively in each component;

provide mechanisms for the universities to participate and advise in the planning, development, implementation, and administration of each component; and

assist such universities in cooperative joint efforts with—

agricultural institutions in developing nations, and

regional and international agricultural research centers,

directed to strengthening their joint and respective capabilities and to engage them more effectively in research, teaching, and extension activities for solving problems in food production, distribution, storage, marketing, and consumption in agriculturally underdeveloped nations.

"(d) As used in this title, the term 'universities' means those colleges or universities in each State, territory, or possession of the United States, or the District of Columbia, now receiving, or which may hereafter receive, benefits under the Act of July 2, 1862 (known as the First Morrill Act), or the Act of August 30, 1890 (known as the Second Morrill Act), which are commonly known as 'land-grant' universities; institutions now designated or which may hereafter be designated as sea-grant colleges under the Act of October 15, 1966 (known as the National Sea Grant College and Program Act), which are commonly known as sea-grant colleges; and other United States colleges and universities which— "Universities."

12 Stat. 503.
40 Stat. 417.
33 USC 1121 note.

"(1) have demonstrable capacity in teaching, research, and extension activities in the agricultural sciences; and

"(2) can contribute effectively to the attainment of the objectives of this title.

"(e) As used in this title, the term 'Administrator' means the Administrator of the Agency for International Development. Definitions.

"(f) As used in this title, the term 'agriculture' shall be considered to include aquaculture and fisheries.

"(g) As used in this title, the term 'farmers' shall be considered to include fishermen and other persons employed in cultivating and harvesting food resources from salt and fresh waters.

"Sec. 297. General Authority.—(a) To carry out the purposes of this title, the President is authorized to provide assistance on such terms and conditions as he shall determine— 22 USC 2220b

(1) to strengthen the capabilities of universities in teaching, research, and extension work to enable them to implement current programs authorized by paragraphs (2), (3), (4), and (5) of this subsection, and those proposed in the report required by section 300 of this title;

to build and strengthen the institutional capacity and human resource skills of agriculturally developing countries so that these countries may participate more fully in the international agricultural problem-solving effort and to introduce and adapt new solutions to local circumstances;

(3) to provide program support for long-term collaborative university research on food production, distribution, storage, marketing, and consumption;

(4) to involve universities more fully in the international network of agricultural science, including the international research centers, the activities of international organizations such as the United Nations Development Program and the Food and Agriculture Organization, and the institutions of agriculturally developing nations; and

to provide program support for international agricultural research centers, to provide support for research projects identified for specific problem-solving needs, and to develop and strengthen national research systems in the developing countries.

Programs under this title shall be carried out so as to—

utilize and strengthen the capabilities of universities in—

developing capacity in the cooperating nation for classroom teaching in agriculture, plant and animal sciences,

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human nutrition, and vocational and domestic arts and other relevant fields appropriate to local needs;

"(B) agricultural research to be conducted in the cooperating nations, at international agricultural research centers, or in the United States;

"(C) the planning, initiation, and development of extension services through which information concerning agriculture and related subjects will be made available directly to farmers and farm families in the agriculturally developing nations by means of education and demonstration; or

"(D) the exchange of educators, scientists, and students for the purpose of assisting in successful development in the cooperating nations;

"(6) take into account the value to United States agriculture of such programs, integrating to the extent practicable the programs and financing authorized under this title with those supported by other Federal or State resources so as to maximize the contribution to the development of agriculture in the United States and in agriculturally developing nations; and

"(7) whenever practicable, build on existing programs and institutions including those of the universities and the United States Department of Agriculture and the United States Department of Commerce.

"(c) To the maximum extent practicable, activities under this section shall (1) be designed to achieve the most effective interrelationship among the teaching of agricultural sciences, research, and extension work, (2) focus primarily on the needs of agricultural producers, (3) be adapted to local circumstances, and (4) be carried out within the developing countries.

"(d) The President shall exercise his authority under this section through the Administrator.

Establishment. 22 USC 2220c.

"SEC. 298. BOARD FOR INTERNATIONAL FOOD AND AGRICULTURAL DEVELOPMENT.—(a) To assist in the administration of the programs authorized by this title, the President shall establish a permanent Board for International Food and Agricultural Development (hereafter in this title referred to as the 'Board') consisting of seven members, not less than four to be selected from the universities. Terms of members shall be set by the President at the time of appointment. Members of the Board shall be entitled to such reimbursement for expenses incurred in the performance of their duties (including per diem in lieu of subsistence while away from their homes or regular place of business) as the President deems appropriate.

"(b) The Board's general areas of responsibility shall include, but not be limited to—

"(1) participating in the planning, development, and implementation of,

"(2) initiating recommendations for, and

"(3) monitoring of,

the activities described in section 297 of this title.

"(c) The Board's duties shall include, but not necessarily be limited to—

"(1) participating in the formulation of basic policy, procedures, and criteria for project proposal review, selection, and monitoring;

"(2) developing and keeping current a roster of universities—

"(A) interested in exploring their potential for collaborative relationships with agricultural institutions, and with

scientists working on significant programs designed to increase food production in developing countries,

"(B) having capacity in the agricultural sciences,

"(C) able to maintain an appropriate balance of teaching, research, and extension functions,

"(D) having capacity, experience, and commitment with respect to international agricultural efforts, and

"(E) able to contribute to solving the problems addressed by this title;

"(3) recommending which developing nations could benefit from programs carried out under this title, and identifying those nations which have an interest in establishing or developing agricultural institutions which engage in teaching, research, or extension activities;

"(4) reviewing and evaluating memorandums of understanding or other documents that detail the terms and conditions between the Administrator and universities participating in programs under this title;

"(5) reviewing and evaluating agreements and activities authorized by this title and undertaken by universities to assure compliance with the purposes of this title;

"(6) recommending to the Administrator the apportionment of funds under section 297 of this title; and

"(7) assessing the impact of programs carried out under this title in solving agricultural problems in the developing nations.

"(d) The President may authorize the Board to create such subordinate units as may be necessary for the performance of its duties, including but not limited to the following:

"(1) a Joint Research Committee to participate in the administration and development of the collaborative activities described in section 297(a)(3) of this title; and

"(2) a Joint Committee on Country Programs which shall assist in the implementation of the bilateral activities described in sections 297(a)(2), 297(a)(4), and 297(a)(5).

"(e) In addition to any other functions assigned to and agreed to by the Board, the Board shall be consulted in the preparation of the annual report required by section 300 of this title and on other agricultural development activities related to programs under this title.

"SEC. 299. AUTHORIZATION.—(a) The President is authorized to use any of the funds hereafter made available under section 103 of this Act to carry out the purposes of this title. Funds made available for such purposes may be used without regard to the provisions of sections 110(b), 211(a), and 211(d) of this Act. 22 USC 2

22 USC 2

22 USC 2

"(b) Foreign currencies owned by the United States and determined by the Secretary of the Treasury to be excess to the needs of the United States shall be used to the maximum extent possible in lieu of dollars in carrying out the provisions of this title. 2171.

"(c) Assistance authorized under this title shall be in addition to any allotments or grants that may be made under other authorizations.

"(d) Universities may accept and expend funds from other sources, public and private, in order to carry out the purposes of this title. All such funds, both prospective and inhand, shall be periodically disclosed to the Administrator as he shall by regulation require, but no less often than in an annual report.

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Presidential report to Congress. 22 USC 2220a.

"SEC. 300. ANNUAL REPORT.—The President shall transmit to the Congress, not later than April 1 of each year, a report detailing the activities carried out pursuant to this title during the preceding fiscal year and containing a projection of programs and activities to be conducted during the subsequent five fiscal years. Each report shall contain a summary of the activities of the Board established pursuant to section 298 of this title and may include the separate views of the Board with respect to any aspect of the programs conducted or proposed to be conducted under this title.".

INTERNATIONAL ORGANIZATIONS AND PROGRAMS

22 USC 2222.

SEC. 313. (a) Section 302 of the Foreign Assistance Act of 1961 is amended—

(1) in subsection (a), by (A) inserting immediately before the period ", and for the fiscal year 1976, $194,500,000 and for the fiscal year 1977, $219,900,000. Of such amounts, not to exceed $250,000 during the fiscal year 1976 shall be available for contribution to the Namibia Institute", (B) inserting "(1)" immediately after "(a)" and (C) adding at the end of the subsection the following new paragraph:

"(2) The Congress reaffirms its support for the work of the Inter-American Commission on Human Rights. To permit such Commission to better fulfill its function of insuring observance and respect for human rights within this hemisphere, not less than $357,000 of the amount appropriated for fiscal year 1976 and $358,000 of the amount appropriated for fiscal year 1977, for contributions to the Organization of American States, shall be used only for budgetary support for the Inter-American Commission on Human Rights.";

(2) in subsection (b)(1), by striking out "$51,220,000" and inserting in lieu thereof "$61,220,000";

(3) in subsection (b)(2), by inserting "and for use beginning in the fiscal year 1976, $27,000,000," immediately after "fiscal year 1975, $14,500,000,"; and

(4) in subsection (d) by striking out "1974 and 1975, $18,000,000" and inserting in lieu thereof "1976 and 1977, $20,000,000".

22 USC 2225.

(b) Section 54 of the Foreign Assistance Act of 1974 is amended by striking out "part III" and inserting in lieu thereof "part I".

22 USC 2221.

(c) Section 301 of the Foreign Assistance Act of 1961 is amended by adding at the end thereof the following new subsection:

"(f) The President is hereby authorized to permit United States participation in the International Fertilizer Development Center and is authorized to use any of the funds made available under this part for the purpose of furnishing assistance to the Center on such terms and conditions as he may determine.".

ASSISTANCE TO FORMER PORTUGUESE COLONIES IN AFRICA

22 USC 2293.

SEC. 314. Section 496 of the Foreign Assistance Act of 1961 is amended—

(1) by inserting "(a)" immediately after the section caption:

(2) by striking out "$5,000,000" and inserting in lieu thereof "$7,750,000";

(3) by striking out "$20,000,000" and inserting in lieu thereof "$17,250,000"; and

(4) by adding at the end thereof the following new subsections:

"(b) Notwithstanding the provisions of section 620(r) of this Act, the United States is authorized to forgive the liability incurred by the Government of the Cape Verde Islands for the repayment of a $3,000,000 loan on June 30, 1975. 22 USC

"(c) The President is authorized to use up to $30,000,000 of the funds made available under this part for the fiscal year 1976, in addition to funds otherwise available for such purposes, to provide development assistance in accordance with chapter 1 or relief and rehabilitation assistance in accordance with chapter 9 (including assistance through international or private voluntary organizations) to countries and colonies in Africa which were, prior to April 25, 1974, colonies of Portugal.". 22 USC et seq. 22 USC et seq.

FURNISHING OF SERVICES AND COMMODITIES

SEC. 315. Section 607(a) of the Foreign Assistance Act is amended by deleting the second full sentence, and inserting in lieu thereof the following: "Such advances or reimbursements may be credited to the currently applicable appropriation, account, or fund of the agency concerned and shall be available for the purposes for which such appropriation, account, or fund is authorized to be used, under the following circumstances: 22 USC

"(1) Advances or reimbursements which are received under this section within one hundred and eighty days after the close of the fiscal year in which such services and commodities are delivered.

"(2) Advances or reimbursements received pursuant to agreements executed under this section in which reimbursement will not be completed within one hundred and eighty days after the close of the fiscal year in which such services and commodities are delivered: *Provided*, That such agreements require the payment of interest at the current rate established pursuant to section 2(b)(1)(B) of the Export-Import Bank Act of 1945 (59 Stat. 526), and repayment of such principal and interest does not exceed a period of three years from the date of signing of the agreement to provide the service: *Provided further*, That funds available for this paragraph in any fiscal year shall not exceed $1,000,000 of the total funds authorized for use in such fiscal year by chapter 1 of part I of this Act, and shall be available only to the extent provided in appropriation Acts. Interest shall accrue as of the date of disbursement to the agency or organization providing such services.". 12 USC note.

SUPPORT OF REIMBURSABLE DEVELOPMENT PROGRAMS

SEC. 316. Section 661 of the Foreign Assistance Act of 1961 is amended by striking out "in each of the fiscal years 1975 and 1976" and inserting in lieu thereof "in the fiscal year 1975, $2,000,000 in the fiscal year 1976, and $2,000,000 in the fiscal year 1977,". 22 USC

TRANSITION PROVISIONS FOR INTERIM QUARTER

SEC. 317. Part III of the Foreign Assistance Act of 1961 is amended by adding at the end thereof the following new section:

"SEC. 665. TRANSITION PROVISIONS FOR INTERIM QUARTER.—There are authorized to be appropriated for the period July 1, 1976, through September 30, 1976, such amounts as may be necessary to conduct programs and activities for which funding was authorized for fiscal year 22 USC

ACCOMPLISHMENTS OF INTSORMIL

EARL R. LENG

I. Introduction

The success of this Investigators' meeting shows clearly one of the main accomplishments of INTSORMIL. We have come from a rather odd mixed group of scientists in various fields to a smoothly working, well-integrated interdisciplinary research team. And this is a team consisting of some 80 researchers at 8 universities, more than 150 graduate students and post-doctorals, and a considerable number of overseas collaborators!

So, we can readily state that the first major accomplishment has been the setting-up of an effective institution. But this in itself is only a beginning. Let's look at specifics of what we have done well and what not so well. Since the latter category is a short list, lets start there.

II. Non-Successes

There are only two significant efforts - both involving LDC's, which we have undertaken without success. They are India and Haiti, both of which were on our initial list of top priority for collaborative efforts.

a. India. We had ambitious plans for collaborative work in India. These included research in apomixis, drouth resistance and human nutrition with sorghum, and general adaptation, water use and food utilization in pearl millet. After an early, encouraging set of contacts, Indian officialdom (ICAR) and U.S. official reluctance to debate the point has resulted in a complete cessation of efforts to set up programs there. The only work we have presently in India is that carried on through ICRISAT. One small socioeconomic study, carried out outside the ICAR framework, has been completed. Prospects do not appear good for any early progress in our relations with India.

b. Haiti. In the Western Hemisphere, Haiti was originally more or less our top priority country. However, when we sent representatives there to begin arrangements for collaborative work, we did not find much enthusiasm either on the part or USAID/Haiti or the Haitian Government. Eventually, our efforts were all frustrated, and we moved to other, more receptive countries. Recently, there are indications that the situation has changed. We may yet develop significant work there, especially in the field of human nutrition.

III. Successes

Stating that we have successfully institutionalized INTSORMIL more or less implies that the discipline accomplishments within the organization have been worthwhile. I think this is generally true, and would merely add that what we have done to integrate socioeconomic studies with biological research is highly praiseworthy, and in some ways, may be unique.

I'd like to concentrate my review of success on six examples of overseas collaborative research which have already given positive results.

a. Honduras. When we began our work in 1979, Honduras was not even on our list of priority areas. However, when we found that our plans for Guatemala were not working out well, we shifted our efforts to Honduras, and this proved to be a really good decision.

Our approach to research in Honduras was made on two fronts, genetic improvement, with Texas A&M leading, and socioeconomic studies, with Kentucky leading and Mississippi State playing a significant role in nutritional aspects.

Several studies have already been completed and published, and we have an ongoing, stable field program of plant improvement in place. Financial support has been received from the local USAID mission, and the pertinent Ministry is solidly supportive of our efforts.

We expect to have a continuing program in Honduras for some years, concentrating on plant improvement for the next three or four years, and re-mounting the social science studies when enough time has passed for the newer materials to have made an impact.

b. CIAT-South America. At the invitation of CIAT, and with concurrence by ICRISAT, we began studies in 1982 aimed at learning if sorghum could be grown successfully on strongly acidic tropical soils. Such soils are found on many millions of acres in Colombia, Venezuela, Bolivia and Brazil, and presently produce little in the way of products useful to mankind.

Preliminary work is promising, and there seems to be good reason to expect that a combination of laboratory studies, field trials, and plant breeding techniques can eventually produce sorghum types and cultural practices which would make sorghum a feasible crop on substantial areas of acid soils. This will need to be, however, a long-term effort; certainly at least 10 years, and probably more, will be required.

A side effect of this work has been the establishment of cordial and effective working relations with CIAT. One result has been that two of our six institutions having winter nursery programs have been able to move these nurseries to CIAT. Also, a good beginning has been made on establishing collaboration with the Colombian national research program (ICA). Eventually, this work is expected to become regional in nature, covering a major portion of South America.

c. Mexico. Less than a year ago, INTSORMIL signed a formal working agreement with INIA, the Mexican national agricultural research agency. In fact, we have had very close and extensive research collaboration with a number of Mexican sorghum researchers since INTSORMIL's early days. Much of the credit for this fine cooperation belongs to the Texas A&M staff and their former students, now research workers in Mexico. But other INTSORMIL institutions have participated effectively, as well.

A special feature of work in Mexico has been the series of annual "short courses", held at CIMMYT, conducted mostly in Spanish, and designed to cover, in rotation, a special facet of sorghum improvement. Three such courses have been held, and a fourth is scheduled for September 1984.

A more recent addition to INTSORMIL's program in Mexico is a major shift of farming systems research focus from Honduras to Mexico. Sorghum is a newcomer to Mexican agriculture, but has spread very quickly. Socioeconomic implications of recent and potential changes are not clear, and offer a unique opportunity for farming systems research.

d. Sudan. In contrast to the three countries just discussed, Sudan was a top-priority choice for INTSORMIL research from the beginning. A very effective, multifaceted collaborative research program has already been carried out there. Despite some

minor administrative problems which recently have arisen, we expect Sudan to remain a major collaborative site for many years.

Our first major effort in Sudan was in northern Kordofan, where a Kentucky team of social anthropologists spent two crop seasons and a winter studying farming systems and village life in the El Obeid area. During the second cropping season, they were joined by a skilled agronomist, who has remained there on a long-term assignment.

Simultaneously, we began collaboration with the ARC (Agricultural Research Corporation) and University of Khartoum, on a variety of research topics. These include sorghum breeding, sorghum physiology, Striga control, seed technology, and grain processing and utilization. An expansion into the area of hybrid seed production is being considered.

Also significant has been a detailed study of the ARC structure itself. This is to be followed in 1984, if all goes well, by a correlated study of extension activities, particularly in the El Obeid area.

e. Mali. This was another early choice as a high-priority area. Our program there has been small in scope, but significant. We are working there in close collaboration with TROPSOILS (the soils CRSP), the ICRISAT/USAID contract team on sorghum improvement, and the Government of Mali.

One special feature of our program in Mali is that the Director of Agronomic Research, Moussa Traore, is currently studying for the Ph.D. at Nebraska, on a combination of support by ICRISAT/USAID and INTSORMIL.

f. ICRISAT. Our first overseas move, after INTSORMIL was funded, was to visit ICRISAT, to establish the closest possible working ties. A detailed list of collaborative efforts since that time would fill several pages. It includes co-sponsorship of four major international symposia, a number of joint publications, extensive interchange of germplasm and trial results, staff exchanges on a significant scale, and virtually day-to-day contact, through correspondence and telex, on many facets of sorghum and millet research. Not the least manifestation of cooperation is reciprocal attendance at in-house and external reviews. Note that Dr. Kanwar and Dave Andrews are representing ICRISAT at this meeting; next month, INTSORMIL representatives will attend the ICRISAT sorghum and millet reviews.

Our collaboration will soon enter a new phase, when INTSORMIL takes up agreed responsibility for degree-level training as part of a new regional sorghum-millet program for 9 southern African nations. Funding for this program, and activities under it, come from regional moneys provided through USAID/Zimbabwe. This is completely in addition to the regular CRSP grant.

IV. Conclusion

My conclusions are quick and positive. INTSORMIL has made significant progress, and has had few failures. The future is bright and much is likely to be achieved -- always assuming, of course, that AID funding of the CRSP continues, at reasonable levels.

AGRONOMY AND PHYSIOLOGY

PI CONFERENCE - JANUARY, 1984 - SCOTTSDALE, ARIZONA
WORK GROUP DISCUSSION - DISCIPLINE RESEARCH

CHAIR CHARLES FRANCIS, UNIVERSITY OF NEBRASKA
REPORTER ART ONKEN, TEXAS A&M UNIVERSITY

This group discussed three principal areas related to their projects: 1) Overall goals; 2) Cooperative activities with other INTSORMIL PI's and 3) Interface with overseas projects and people. The following is a consensus of those present.

A. Current goals

Identify, characterize and quantify environmental stress mechanisms (principally water and temperature) and develop tolerant germ plasm.

Assemble and evaluate climatic data and crop response data in principle sorghum and millet agroclimatic zones.

Develop and evaluate intercropping and rotation patterns in terms of fertility, light and moisture use and potentials for increased productivity.

Characterize the mechanisms of mineral and salt stress tolerance and improve nutrient use efficiency and identify and evaluate germ plasm for stress tolerance.

The following potential additional areas of research are deemed important from experience and information obtained by the PI's since the beginning of the project. To be conducted in cooperation with TROPSOILS, IFDC and other disciplines.

Soil fertility - particularly N and P.

Semi-arid acid soils.

Development of research methodology in agronomic research, including publication of a research manual for field agronomists with social scientist inputs.

Cooperative research on *Striga* and soil microflora.

Integration of technological components into appropriate cropping systems for testing in LDC's.

Training in agricultural experiment station management.

B. Cooperative activities with other INTSORMIL PI's

Research and exchange of germ plasm.

Exchange of ideas and methods for measuring physiological traits.

Exchange of graduate students and cooperative research with graduate students.

C. Interface with Overseas Projects and People

1. Student training - research can be done in U.S. or overseas - if some conducted overseas, it ties us closely to national programs.

2. Scientist training - short and long term exchange of staff - need to identify who in a country and which programs are relevant.

3. Collaborative research - in-country trials designed with counterparts, short or long-term consultancy or technical assistance trips to develop. Follow through visits are essential. Can furnish some financial support as well. Full time staff can also be furnished on a longer term basis, but is more expensive.

4. Information and germ plasm exchange and incorporation into cropping systems.

5. Technical assistance in-country and in the U.S.

PESTS - PLANT PATHOLOGY, ENTOMOLOGY

PI CONFERENCE - JANUARY, 1984 - SCOTTSDALE, ARIZONA
WORK GROUP DISCUSSION - DISCIPLINE RESEARCH

CHAIR STAN JENSEN, UNIVERSITY OF NEBRASKA
REPORTER FRANK GILSTRAP, TEXAS A&M UNIVERSITY

Agenda

1) Are we working on the right problems?
2) Are we using the appropriate approaches to solve these problems?
3) Do we have proper balance?
4) Do we have proper collaboration?

Current Status

We have 6 pathologists and 4 entomologists working on the following world priorities:

A) Pathology - Striga, grain molds, downy mildew, anthracnose, charcoal rot, and seedling disease.

B) Entomology - Stored product pests, pannicle feeders, stemborers, shootfly, and aphids.

The 6 INTSORMIL pathologists are to deal with Z crops (sorghum & millet) with 6 catagories of disease, numerous complications due to races for several diseases, and 3 continents (Africa, South America, North America). The INTSORMIL entomologist includes 1 stored products specialist, 2 integrated pest management specialists, and 1 biological control specialist. These entomologists are to focus on 5 major problem categories on 3 continents and each focus could benefit from input from each INTSORMIL entomologist. In both pathology and entomology, trained LDC collaborators are currently scarce.

Analysis

1) Yes, we are working on the correct problems (except perhaps for Striga) given the current funding levels which affect intensity of research, location of research, and numbers of people involved in the research. We have identified regional problems, are working to solve them in 1 or a few locations, and solutions with regional applications.

2) Yes, we are using the correct approaches, but approaches tend to be unilateral/given problems due to limited INTSORMIL people.

3) Do we have proper input balance? Absolutely not!

*Both pathology and entomology are training their own collaborators because local LDC collaborators are usually not available in the LDC's. The inbalance causes the situation where the too few INTSORMIL pathologist-entomologist have no indigenous collaborators.

*Funding allocation and flexibility is inadequate to meet short-term program expectations and probably not enough to meet long-term expectations either.

*There is insufficient fund allocation flexibility to provide support for local LDC collaborators where these people are available.

*We seem unable to date to identify sufficient numbers of LDC people for training in pathology or entomology.

*Program expectations are out of balance with capabilities AND capabilities are out of balance with funding.

4) Do we have proper collaboration?

*There needs to be more interaction between other disciplines and crop protection scientists with INTSORMIL.

*We must be credited with collaboration via the educational activities we are engaged in. These collaborators will contribute to the LDC's long after INTSORMIL is forgotten as an entity.

UTILIZATION, QUALITY, STORAGE, NUTRITION

PI CONFERENCE - JANUARY, 1984 - SCOTTSDALE, ARIZONA
WORK GROUP DISCUSSION - DISCIPLINE RESEARCH

CHAIR JOHN AXTELL, PURDUE UNIVERSITY
REPORTER LLOYD ROONEY, TEXAS A&M UNIVERSITY

Information on sorghum and millet food quality and utilization is very scarce. Fundamental and applied information is lacking. The identification of the critical factors that affect millet and sorghum food quality is required to enable varieties with acceptable utilization properties. Because of this lack of knowledge, this will require concentrated effort over 10-15 years.

Current Research

Projects on sorghum quality are on track with a good mix of fundamental and applied research that supports and interacts with the overall program. Existing projects are addressing the high priority issues on processing, cooking and nutritional problem of sorghum. Factors addressed include kernel hardness, molds, grain weathering, polyphenols, digestibility and the interaction of these factors. The effects of village processing on sorghum and millet food quality as perceived by sorghum consumers is integrated into these studies. This effort should continue.

Additional Research Needs

Pearl Millet quality and grain storage should be added to the INTSORMIL program. Current Research on pearl millet quality will be terminated at the end of fiscal year 1983-84 (Year 5). Proposal(s) for research on millet quality will be funded in Year 7. The aspects of grain storage that can be addressed in a crop improvement program should be added.

Collaborative Research in the LDC's

Training of scientists is an important part of the INTSORMIL program. These young scientists will provide the key personnel in National programs. INTSORMIL has a unique opportunity to provide modest support ($8-$9000) to carefully selected former students to assist in their development in the National programs. The concept of interacting with former students can apply to most INTSORMIL activities. This concept was a very high priority.

SOCIO-ECONOMICS

PI CONFERENCE - JANUARY, 1984 - SCOTTSDALE, ARIZONA
WORK GROUP DISCUSSION - DISCIPLINE RESEARCH

CHAIR PHIL ABBOTT, PURDUE UNIVERSITY
REPORTER KATHLEEN DEWALT, UNIVERSITY OF KENTUCKY

We discussed a number of issues having to do with socio-economic research component of INTSORMIL. We reached concensus in a number of areas and discussed amiable options in others.

1. Have we addressed the right questions. Agreement that we had.

   Areas that have been addressed.

   A. Farming Systems Research that has provided information on production systems and consumption directly applicable to problems addressed by the agro-biological scientists.

   B. More macro-economic studies which bridge the gap between national policy climate and F.S.R.

   C. Work on structure and organization of national research systems important for understanding the constraints on research scientists in LDC's.

   D. Research on structure and organization of extension systems as well as more informal systems for the communication of research results to farmers.

   E. Basic information on the economics of sorghum production on local levels.

These are areas we will continue to address.

Suggestion that more emphasis be placed 1) on management and administration of experiment station which could be used in training scientists in management and administration and 2) on effects of crop replacement i.e. sorghum for maize or wheat for sorghum on communities.

2. Are we in the right places? Probably yes, given previous need to pre-existing contacts and associates with other projects in order to be effective. More planning and closer coordination of INTSORMIL scientists could improve ability to integrate socio-economic research with other research in specific countries. This is essential in order to make the best use of scarce resources.

3. Areas needing further work-goals.

   A. Improve integration of work of different socio-economic scientists with each other in specific regions and countries.

   B. Improve integration of S-E work into an interdisciplinary approach to problems in which the agrobiological scientists of INTSORMIL are working.

C. Institutionalize process of developing contacts and getting research started in new areas as well as areas in which INTSORMIL scientists are already working.

Note: These 3 areas (A-C) can be addressed in part through strengthening the role of regional and/or country coordinators so that all INTSORMIL work in a region or country can be more well coordinated and integrated.

D. Most effective use of our limited resources.

1) Use training as a means of expanding capacity through improving collaborative research.

2) Find a mix of short-term/long-term commitments of INTSORMIL staff, using short-term research involvement where appropriate.

3) Continue to work in collaboration with other research projects where possible and appropriate.

4) In areas in which a more regional focus is appropriate (i.e. Central America) regionalization may be more efficient.

(In areas such as Sudan, which there are very diverse ecological and cultural zones, a regional approach may not be appropriate).

BREEDING

PI CONFERENCE - JANUARY, 1984 - SCOTTSDALE, ARIZONA
WORK GROUP DISCUSSION - DISCIPLINE RESEARCH

CHAIR FRED MILLER, TEXAS A&M UNIVERSITY
REPORTER BILL STEGMEIER, KANSAS STATE UNIVERSITY

I. Current program

1. Goals and identified limitations.

   A. Identified early known traits (constraints) were fairly well on target productivity, disease and insect resistance, drought and temperature tolerance, grain quality traits, development of random mating populations.

   B. Production of improved higher yielding germ plasm distributions.

   C. Use of elite/interdiscipline nurseries to identify and distribute useful germ plasm, catalogue traits or responses.

2. The primary locations taken from the early USAID contract programs have proven very useful to delineate potentials of 1 A-C.

3. There appear no doubts that early planning give a good basis for a proper tracking.

4. ICRISAT/INTSORMIL involvement is excellent in cooperation and germ plasm infusion.

II. Constraints to the Current or Future Program

1. Striga, as problem reducing yield, needs more attention.
2. Germ plasm access and availability for widespread use.
3. Understanding and uses of photoperiodism in yield improvement in LDC collaboration.
4. Limited program involvement with millet-all aspects except breeding.
5. Understanding of what germ plasm types should be sent to collaborative programs.
6. More complete understanding of mechanisms of resistance, tolerances, etc. of major constraints to production and how best to manage.
7. Lack of a qualified or quantity of national program entomologists, pathologists, physiologists and agronomists etc. to properly identify methods to build use patterns of germ plasm from breeding programs.
8. a. Need for handbook on agronomic procedures etc.
   b. Need for explicit instructions in handling germ plasm nurseries, i.e. for disease or insect resistance screening or for physiological (biotic constraints).
9. Continuing need for elite germ plasm identification for all useful traits.
10. Increasing difficulty to identify larger or regional constraining factors

III. LDC Involvement (Overseas/International)

1. Current breeding programs.

   Honduras, Tanzania, Mexico, CIAT, Sudan, Mali, Niger (ICRISAT) liason-Dominican Republic, Jamaica, El Salvador, Ethiopia, Kenya, Upper Volta, Southern Africa, Senegal, etc.

   a. Need to know each countries needs or limitation to productivity.
   b. Lack of strong USAID Mission support of program, and encouragement of national program.

2. Appears some interest in regionalization of Western Hemisphere in Latin America from Honduras and South America from Brazil or CIAT but maintain strong support core units.
3. For sorghum - INTSORMIL concentrate more strongly in Western World while ICRISAT leads Africa and Asia.
4. Identify strong national program scientists for future graduate training.

IV. Future Goals and Objectives

1. Current objectives on target and need further development and fine tuning.
2. a. Consider stronger germ plasm movement, ICRISAT to Western World and INTSORMIL material to Africa and Asia.
   b. Reduce constraints which reduce flow of germ plasm.
   c. Encourage combining ability studies and application between ICRISAT and LDC vs. INTSORMIL developed materials for potential new hybrids or varieties (population and pools).
3. Develop closer collaborative research between related disciplines in INTSORMIL and ICRISAT to support specific trait enhancement.
4. Strengthen graduate student training potentials and encourage stronger INTSORMIL backup and actual on-site support of new LDC graduates.
5. Strengthen the backup of basic science in breeding methodology and genetic control systems.
6. Develop methodologies to evaluate germ plasm potential prior to conversion to temperate adaptation type for sources of resistances or limitation patterns.

STRIGA

PI CONFERENCE - JANUARY, 1984 - SCOTTSDALE, ARIZONA
WORK GROUP DISCUSSION - SPECIAL PROJECTS, TRAINING AND TECHNICAL ASSISTANCE

CHAIR NAT ZUMMO, MISSISSIPPI STATE UNIVERSITY
REPORTER TAREKE BERHE, KANSAS STATE UNIVERSITY (SUDAN)

The Work Group on Striga discussed and unanimously agreed on the following four important points:

A. Striga hermonthica is a very serious problem in the sorghum and millet growing areas of Africa. Unless something is done to control it, it will remain a serious problem and most likely get worse.

B. There is an urgent need for the following:

(1) Compiling all definitive current information on the extent of total loss brought about by Striga on sorghum and millet yields,

(2) Compiling all available current information on the biology and control of Striga, and

(3) Integrated interdisciplinary approach in Striga research.

C. INTSORMIL faces a big challenge in Striga research because of some constraints.

(1) Striga is not a problem in the United States,
(2) It does not easily fit into one distinct discipline: interdisciplinary approach is a must.
(3) It is an obligate parasite and can develop races easily,
(4) Striga research has to be on a long-term basis and
(5) Presently, there are not enough funds for Striga research (currently $40,000).

D. Based on the preceding facts, the group made two important recommendations:

1. INTSORMIL should take the lead and start supporting coordinated Striga research:
   (a) To start with INTSORMIL can focus on Sudan where several aspects of Striga research have been going on for some time under IDRC support.
   (b) INTSORMIL should set aside some funds for Striga research in the United States. It was also indicated that a Striga research coordinator is necessary.

2. INTSORMIL should take the lead in bringing several donor agencies (ICRISAT, IDRC, ROCKEFELLER, CHEVRON CO., ETC.) together such that a pooled research fund can be created to support a strong Striga research program.

GERM PLASM PROGRAM

PI CONFERENCE - JANUARY, 1984 - SCOTTSDALE, ARIZONA
WORK GROUP DISCUSSION - SPECIAL PROJECTS, TRAINING AND TECHNICAL ASSISTANCE

CHAIR DARRELL ROSENOW, TEXAS A&M UNIVERSITY
REPORTER ORRIN WEBSTER, UNIVERSITY OF ARIZONA

The report of the germ plasm committee prepared by Keith Schertz (copy attached) July 19, 1983 was read by Darrell Rosenow.

It was noted that the Director of Purdue was not interested for his institution to serve as a coordinator. Dr. Axtell suggested that Purdue must know in advance what would be involved, costs, manpower requirements, etc.

Under the item of seed increase APHIS has indicated that no matter what safeguards would be established, it would not permit the introduction of sorhgum and millet seed from restricted countries for increase in Puerto Rico. At present, George White from the plant quarantine office is asking CIMMYT in Mexico to increase seed of introductions. This may be one avenue available for seed increase.

Earl Leng reported that $50,000 has been set aside for the germ plasm program. He also reported that Dr. Melak Mengesha, Director of Germ Plasm from ICRISAT, would be coming to Purdue in September, 1984, to begin to study the germ plasm problem and make recommendations to INTSORMIL for establishing a project that would serve the western hemisphere.

attachment

7-19-83

INTSORMIL Germplasm Committee Report

It is proposed that INTSORMIL establish a germplasm program.

A. PURPOSE

The purpose of the INTSORMIL Germplasm Program shall be to improve the world germplasm system for sorghum and millet by cooperating with ICRISAT and USDA in:

1. Completing an alternate germplasm bank of sorghum and millet world collections.

2. Assembling and disseminating information on germplasm introductions.

3. Establishing working collections for the use of all scientists.

B. KINDS OF MATERIAL

Sorghum and millet materials in the collection shall be made available to anyone who requests seed and should include the following:

1. Germplasm

   a. IS lines to bring in and put into permanent storage at NSSL.

   b. Collections from expeditions.

2. Working collections

   a. Currently useful genotypes including lines from breeding programs.

   b. Lines with proven resistance to insects and diseases and lines needed for the identification of pathogen and insect populations.

   c. Representatives of genotypes from different environments.

   d. Composites of phenotypically similar lines from a local area.

   e. Random mating populations.

   f. Key cultivars and parents of hybrids in adequate supply for rapid increase and distribution in case of an emergency demand for seed in a developing country.

Relative emphasis on the types of materials handled will shift with the development of the program.

C. SITES

There will be a need for more than one site to accomplish coordination, seed storage, and seed increase functions.

1. Coordination

It is proposed that coordination be at Lafayette, Indiana with close coordination with Experiment, Georgia. This program in no way should usurp the role of USDA. Any of these functions which USDA is willing and able to perform will be shared by INTSORMIL. USDA has traditionally not been involved with handling the quantities of seed anticipated for some aspects of the working collection. Specifics of cooperation should be established soon.

2. Seed increase

A tropical site and a temperate site(s) are needed.

a. Tropical

.Puerto Rico is the favored site if agreement can be reached with APHIS and the seed can be produced in a dry area. Puerto Rico would have long-term stability.

.Mexico is the second choice but should be used only if satisfactory arrangements can not be made in Puerto Rico, and then only after careful review of the potential hazard to U.S. crops.

b. Temperate

Two states have the necessary characteristics for a temperate site for seed increase. It is suggested that both Arizona and Texas be used, as the needs are determined and specific agreements are reached. The desired locations in Arizona are Tucson and Maricopa and in Texas are Lubbock, Halfway, and Chillicothe. All of these sites have a dry climate, each state is involved in INTSORMIL, and the scientists in each are actively involved in germplasm work.

3. Seed storage

a. Germplasm introductions should be placed in the NSSL at Fort Collins, Colorado after increase. Coordination should be developed with USDA.

b. Working collections should be stored at Lafayette, Indiana. Cooperation should be sought from USDA to store certain types of collections at Experiment, Georgia. The coordinator at Lafayette, Indiana and the Director at Experiment, Georgia should have ready access to information and materials at both sites.

D. LINKAGES

INTSORMIL should structure the germplasm program so as to fully collaborate with all agencies with similar interests, but should become capable of fulfilling it's main germplasm objectives independently, if necessary. Collaboration of ICRISAT and USDA in this program should be established soon and the roles and responsibilities should be agreed upon.

E. ACTION ITEMS

1. Establish collaboration with ICRISAT.

2. Establish collaboration with USDA.

3. Get commitment from Purdue for storage space and as coordination location.

4. Determine response of APHIS regarding Puerto Rico.

5. Choose a site in Puerto Rico.

6. Review details about Mexico if Puerto Rico is not approved.

7. Choose a coordinator.

Germplasm Committee

R. A. Frederiksen
R. L. Voigt
W. M. Ross
O. J. Webster
K. F. Schertz

STUDENT TRAINING, SADCC TRAINING, STAFF EXCHANGES, WORKSHOPS

PI CONFERENCE - JANUARY, 1984 - SCOTTSDALE, ARIZONA
WORK GROUP DISCUSSION - SPECIAL PROJECTS, TRAINING AND TECHNICAL ASSISTANCE

CHAIR CHARLES FRANCIS, UNIVERSITY OF NEBRASKA
REPORTER DALE ANDERSON, UNIVERSITY OF NEBRASKA

Student Training (General)

Overseas thesis research - option where important. Followthrough on returnees needed.

- Support of previous students
- Short courses (could be INTSORMIL supported).
- Advisers visit, examine LDC situation (even where thesis research is not done in LDC).
- Interchange of graduate students among INTSORMIL school and private companies.
- Curriculum content - too much specialization?
- Choice of adviser - needs to be keyed to mutual interests rather than on who has a lack of students.
- Stipulation that student has home-country obligation on completion of work is important.
- Need to find adviser as part of acceptance process?
- Need for exchange of applications among INTSORMIL schools? Would facilitate sharing of background on applicants. Hard to evaluate foreign applicants.
- Need to recruit actively in certain countries?
- Need for training recruitment/credentials evaluation officer at institution level?
- Small fund for support of selected (highly-qualified) students?

SADCC - South African Consortium

ICRISAT/INTSORMIL to establish center. AID missions in area recently decided they worked one grant through ICRISAT.

$17 million program ($14 million committed) - 5 years.
Degree training component $1.6 million.
  Mostly M.S)
  2.5 yrs. M.S.) 30 total over 5 year period.
  5 yrs. P.h.D.
  $25,000/student year
How to identify students?
  Management entity
  Center staff-through country contacts
  U.S. grad. institutions
Part-time training coordinator - part of management entity (in addition to present management).
Students to be placed primarily in INTSORMIL schools?
Countries - 9, but 3 are not eligible for AID funding at this time.

Staff Exchanges

Several kinds...
- How important (where resources limited)?
- Relatively few going out (all to come in).
- Sabbatical leave - a good available means for us to go overseas (but may not serve basic purpose of sabbatical leave).
- Need definite statement from university administration (department head) endorsing LDC leaves.
- Overseas assignment should be regarded as a prestigious assignment.
- More reciprocal arrangements - transportation to be paid by sending institution, for example.
- Should have general guidelines on administrative procedures. Case-by-case situation at present.
- U.S. has facilities which LDC's lack, expertise.
- Visitors from least developed countries.
  - How long?
  - Special needs?
- Sabbatical could be divided between LDC, other location's.
- One year may or may not be appropriate length.
- Creative funding needs to be pursued by PI's to facilitate LDC visitors.

Workshops (Many by ICRISAT and other Organizations)

Past
- Sorghum in the 80's ('82)
- Sorghum Quality Symposium ('82)
- Annual Pathology/Entomology in South Texas
- Regional Workshops in Mexico for Latin America
  - Diseases ('81)
  - Grain Quality ('82)
  - Breeding ('83)
- Seed Production - Sudan ('83)
- Sorghum Stalk Rots - Bellagio ('83)
- Striga Workshop ('83)

Scheduled
- Millet Workshop ('84)
- Entomology ('84) - Texas
- Latin America-Sorghum/Millet Farming Systems ('84)
- Dominican Republic ('84)
- Philippines ('84)
- International Drough Symposium ('86)
- Acid Soil Complex Problems in Latin America ('84)
- East African ('85 or '86)
- Ag. Research Management (future)

Issues - Seem to be cost effective - reach a lot of people (Good past participation).

Potential - E. African - pathology, breeding - '86? - ICRISAT.
Result is useful proceedings for those who can't attend. Sometimes too many expatriots talking to themselves. Need to provide for direct involve-

ment of country participants.
May be good for local (overseas) reps to do bulk of organizing

Future?
Striga Workshop
ICRISAT Workshop
E. African Workshop on pathology, breeding - ICRISAT.
Research Management? Modeled after those in U.S. sponsored by ESCOP?

Provides basis for early dissemination of results, methology sharing - opportunities not as good in 3rd world countries as in U.S. Provide contact opportunities not otherwise available.

Can be over done if too frequent.

Big or small?
Type? Multidisciplinary - problem focus (rather than on narrower topics).
Mutual benefits for U.S., 3rd world participants.
Scheduling problems.
Better means of evaluation needed?

TECHNICAL ASSISTANCE

PI CONFERENCE - JANUARY, 1984 - SCOTTSDALE, ARIZONA
WORK GROUP DISCUSSION - SPECIAL PROJECTS, TRAINING AND TECHNICAL ASSISTANCE

CHAIR BOB JACKSON, AID/W
REPORTER ED KANEMASU, KANSAS STATE UNIVERSITY

Defined technical assistance as short term consultancy service to the AID missions.

INTSORMIL is one of two CRSP's with a technical assistance component (research activity). We provide 30 person days/calendar year/mission free of cost to the missions (1985 budget has $40K.)

Usually the Mission will contact AID/Washington requesting technical assistance with a scope of work. This is passed to the INTSORMIL ME,then to the country coordinator.

Is this service widely known to the Missions? Probably not, not even known to many INTSORMIL investigators.

Has been used by former INTSORMIL students in getting their research started, developing memoranda of understanding, and project development.

More use can be made of technical assistance.

Need to advertise the technical assistance component in INTSORMIL. Perhaps the ME needs to consider means of advertising technical assistance services. This service can benefit both the Mission and the consultant (e.g. development of collaborative research) and can provide a means to interview prospective students.

Personnel traveling overseas should make the technical assistance component of INTSORMIL known.

Can TA funds be used to bring host country scientists and his research material to the U.S. for analysis? Yes, regardless whether it is here or overseas.

If a country scientist contacts an INTSORMIL researcher and wants him to visit the host country, the INTSORMIL researcher should have the country scientist contact the AID/Mission and ask the AID Mission to request Technical Assistance from INTSORMIL through AID/W.

AFRICA

PI CONFERENCE - JANUARY, 1984 - SCOTTSDALE, ARIZONA
WORK GROUP DISCUSSION - HOST COUNTRY PROGRAMS

CHAIR JOHN AXTELL, PURDUE UNIVERSITY
REPORTER MILT COUGHENOUR, UNIVERSITY OF KENTUCKY

The bulk of the time was devoted to reviewing existing and prospective country programs in West, East, and South Africa. In doing so, host country, ICRISAT, and USAID Mission relations were discussed.

A. West Africa

Mali. Art Onken recalled that our involvement was based on a single, joint agreement of INTSORMIL and TROPSOILS with Malian officials. The language of the agreement has been worked out and an invitation to sign it is the next step. Thus far, there has been a good working relationship among INTSORMIL, ICRISAT (John Scheuring), and USAID personnel. ICRISAT support has been particularly important in facilitating development of essential working relationships and the identification of program objectives.

Upper Volta. Phil Abbott has made use of materials developed by economists in the Purdue Upper Volta project under SAFGRAD to carry out more economic studies with three students. USAID/Mission in Upper Volta has been very supportive of FSR studies and has contributed funds for this purpose. There also are fairly good relations with Upper Voltan Ministry officials.

Niger. John Axtell reported that an INTSORMIL team had made a visit. One of the major constraints is lack of knowledge of the production of sorghum. Consequently, there is need for a production agronomist. Insect pests, *Striga*, and economic policies also are constraining. The bi-lateral agreement between Purdue and Niger provides an institutional basis for support of INTSORMIL work. Nigerian officials are cooperative, but counterparts with which to work are lacking. Consequently, a first step in program development will be the training of counterparts.

B. East Africa

Sudan. Tareke Berhe noted that the effective working relationships among USAID Mission, WSARP, and the Kordofan Regional Ministry of Agriculture has facilitated some very good work starting with the initial socio-economic studies of farming and marketing systems around El Obeid, followed by farm level demonstration - experimental trials, and soon to be initiated work on communication networks among farmers. Major constraints are pests and *Striga*. The lack of counterparts in the socio-economic area also is a big problem. Gebisa Ejeta reviewed the progress of work in developing promising new sorghum varieties as a result of effective cooperative relationships between INTSORMIL, ICRISAT, and the Sudan ARC. The most recent development was a seed production workshop that began establishment of the basis for public and private sector cooperation in seed production. Bill Lacy also noted that good relationships with WSARP and ARC had been both essential and effective in carrying out the investigation of the

Sudanese research system. Although there is currently a problem in finalizing and signing an INTSORMIL - ARC work agreement, which would permit further cooperative work, this seems likely to be resolved satisfactorily in the near future.

C. South Africa

Botswana. Max Clegg reviewed the initiation of work there, which focused on studies to increase fertility through crop rotation. These studies have been complemented with FSR on agricultural technology development. Particularly notable is the readiness of the USAID Mission to provide a substantial support of the research costs of an INTSORMIL scientist to continue the work.

SADCC. Here INTSORMIL is likely to have responsibility with ICRISAT. INTSORMIL's responsibility will be primarily for training of 20 to 29 scientists. Scope of responsibility is for strengthening national research programs in six to nine countries.

Tanzania. Under our Oregon State sub-contract through CID, INTSORMIL will supply a sorghum breeder (John Mann) to work on improvement of sorghum varieties. Major potential problem is failure of the Tanzanian government to resolve difficulties with IMF which has resulted in its being placed on the list of countries with which new USAID agreements are prohibited. So far as INTSORMIL is concerned, working relationships are good, although a problem regarding the location of sorghum breeding work may handicap effective work.

The group briefly addressed the issue of country vs. regional coordinators. The issue has several dimensions. One is the minimization of administrative overhead entailed in having coordinators for every country. Another is the size of the country program and the amount of time entailed in coordinating work in that country, i.e., the problem of minimizing the coordinator's time devoted to management responsibilities. A third dimension (noted in subsequent discussion) is the extension of research results as appropriate to other countries which could be facilitated by a regional coordinator. The group did not develop a recommendation. However, it appears that from a purely administrative standpoint, the limited scope of the country programs in South Africa may make a regional coordinator feasible while the large program in the Sudan needs to be coordinated by someone with that responsibility alone.

Finally, the importance of effective relationships with ICRISAT, USAID Missions, host country ministries, and other groups was stressed repeatedly. These will require continual priority for effective country programs.

LATIN AMERICA

PI CONFERENCE - JANUARY, 1984 - SCOTTSDALE, ARIZONA
WORK GROUP DISCUSSION - HOST COUNTRY PROGRAMS

CHAIR FRED MILLER, TEXAS A&M UNIVERSITY
REPORTER RICHARD FREDERIKSEN, TEXAS A&M UNIVERSITY

Current programs are localized at Mexico, Honduras, CIAT, Brazil, Dominican Republic/Haiti and a memorandum has been signed in Costa Rica. Our programs are clearly targeted with sound objectives and goals. The needs for INTSORMIL in Latin America are immense. There are urgent needs to expand activities to other countries i.e. El Salvador, Guatemala, Peru to mention only a few.

Goals for the next 5 years include:

Expand collaborative work in L.A, including both countries and projects.

Utilize existing or develop new regional programs and projects wherever possible as a means of efficiently using INTSORMIL resources.

Emphasis needs to be given to both disciplinary balance and interdisciplinary approaches along with direct involvement of LDC workers in LA activities.

Identify superior students for training in U.S. institutions

Increase involvement with other private and public institutions in LA.

NEAR EAST AND FAR EAST

PI CONFERENCE - JANUARY, 1984 - SCOTTSDALE, ARIZONA
WORK GROUP DISCUSSION - HOST COUNTRY PROGRAMS

CHAIR EARL LENG, MANAGEMENT ENTITY
REPORTER JERRY MARANVILLE, UNIVERSITY OF NEBRASKA

EGYPT

First country signed memorandum. Large AID contract in existence. EMCIP Project cooperative with INTSORMIL has not worked out to date. Many types of work and collaborative possibilities exist. AID Mission has not been very helpful. What to do? Decision was made not to work with the University of Cairo directly.

Not permitted to work originally because AID would not allow it. At this time, (currently) the atmosphere for cooperation has changed. This came about in part by a change in personnel. In early December, Eastin returned with Maranville and organized preliminary work plans which might potentially put the INTSORMIL link in place. Several of these areas are listed in the Country Reports. From overall appearances, cooperation potentials look good. The fact that INTSORMIL would not have money to put in did not appear to bother the Egyptians.

Noted that it is an AID priority country,so to completely abandon the effort to try linking up is not a good approach. Dr. Eastin pointed out that a lot of germ plasm has been sent along with other types of efforts so there has been some cooperative work.

Decided that efforts would continue to put something definite in place and not be concerned at the slowness with which it appears to be going.

PHILIPPINES

Agreements were signed with both IRRI and PCARRD which allowed working arrangements.

Maranville spent one year putting the link into place. From the very onset everything has been positive for cooperation A separate marketing-production economic project has been put in place under Dr. Dale Anderson's direction. Dr. Jensen also has been able to bring over Dr. Manuel Palomar.

AID Mission can also be very supportive and have good people which can expedite a lot of help.

Sorghum is recognized as a potential crop and needs to be investigated to a broad extent.

Philippines continued

INTSORMIL has found a lot of favor in the Philippines. Some thoughts were given to broadening INTSORMIL inputs into Southeast Asia with Philippines serving as a central focal point.

INDIA

INTSORMIL has been forbidden by the Indian government of doing any formal linkage work. Never had formal approval of the Director of the Indian Council. No more effort by INTSORMIL will be made until the AID Mission gives the approval.

INTSORMIL has indirectly worked in India through ICRISAT. Some germ plasm jointly worked by both institutions looks extremely good in India. Dr. David Andrews has put a report together on those results. Also several Indian studnets are being trained at INTSORMIL institutions, many coming in through ICRISAT's program.

It was pointed out that an INTSORMIL collaborative work in India is quite desirable and would be ideal from many aspects. In this respect, efforts will not be abandoned in the sense that the door is open once the Indian government decides positively.

This paper was distributed at the January 4-6, 1984, INTSORMIL PI Conference.

UTILIZATION OF PEARL MILLET GERMPLASM FROM KSU HAYS KANSAS, THROUGH INTSORMIL IN INDIA BY ICRISAT

D.J. ANDREWS AND K.N. RAI

SUMMARY

Hybrid parents and other germplasm from the KSU millet breeding program at Hays supported by INTSORMIL, have been used in the ICRISAT breeding program since 1981. ICRISAT male steriles, and elite restorer material have been sent to Hays (including a 99 - entry germplasm collection first evaluated at UNL, Lincoln). Through reselection in the downy mildew disease nursery at ICRISAT it has been possible to greatly improve downy mildew resistance in two of the Kansas seed parent lines enabling test hybrids to be made which are proving well adapted to Indian conditions. The best hybrid combinations have been with restorers developed in the ICRISAT Source Material project which utilizes African germplasm stocks.

In test rows in 1982, and in replicated tests in 1983, the best of these hybrids have given 20% or more grain yield than most widely grown standard Indian hybrid BJ104 and are equally early in maturity. Many of the test hybrids have advantages in grain size, standability, and ability to withstand grain weathering damage. The All India Co-ordinated Millet Improvement Project (AICMIP) has invited the entry of several of these hybrids directly into national tests in 1984. The selected seed parent stocks have been sent back to KSU and a joint KSU/INTSORMIL/ICRISAT release of these is proposed.

Breeding has commenced with the other classes of material both to generate new seed parents and to test hybrids made from Kansas restorer lines reselected for DM resistance with ICRISAT seed parents.

REPORT

Male sterile (ms) lines, restorer (R) lines, breeding lines and populations have been introduced from KSU in 1981 and 1982. Most progress has been made in the utilization of reselections from the ms lines in new hybrid combinations, but crosses with ICRISAT breeding stocks are segregating for new early phenotypes.

The main barrier to the utilization of US pearl millet germplasm in the Semi-Arid Tropics is its lack of resistance to one or more of the major tropical diseases, especially millet downy mildew (DM). It was therefore a welcome surprise to find that, though the introduced ms stocks initially showed 12-48% DM incidence, reselection in two of the ms sources (both from PI 185642) for 3 generations against the disease resulted in lines with less than 3% DM. These are known in ICRISAT as 21A&B and 68A&B. Their principal advantages are that they carry the standard dwarf gene (d2), are high tillering, have particularly large seed (9-10 g/1000, which is strongly expressed in hybrids), and are early maturing (± 40-45 days to flower) and show high combining ability.

The first hybrids made on these were evaluated in unreplicated tests in 1982. It was noted from these tests that hybrids made with Kansas restorers (i.e., both parents Kansas type) were too early maturing (± 35 days to bloom

at Patancheru - but possibly useful in western Rajasthan on productive soils in locations with a short growing season) however, combinations with ICRISAT restorers of medium maturity (mostly derived from the Source Material project utilizing African germplasm) gave attractive early maturing hybrids in the 40-45 days to bloom range at Patancheru, (equivalent to 50-55 days in North India).

The best of these, and other new hybrids were grown in three different replicated tests each at Patancheru (ICRISAT Center-17°N) and Hissar (29°N) in 1983, a plant density trial, and a Farming Systems observation - the results are summarized in Tables 1-4 attached.

In Hybrid Trial I (Table 1) a common set of 18 pollinators was used to compare the combining abilities of 21A and 68A at Patancheru and Hissar with 5141A, the most widely used Indian seed parent line (BJ104 is 5141A x J104). Hybrids on 21A and 68A were shorter, lodged less and had larger, more weather tolerant grain than those on 5141A. The yield potential of hybrids on 21A and 68A was as good as or slightly better than 5141A, but since they averaged 9 days earlier in flowering and maturity at Hissar and 5-8 days at Patancheru, 21A and 68A therefore have the basic attribute of making hybrids which produce grain at a higher rate (13 to 22%) per day (on the basis of yield/days to maturity (bloom+30)), than the popular seed parent 5141A.

In Trial II (Table 2) 21A and 68A were compared with S10A, another new male sterile (which produces hybrids like MBH 110), using 8 common pollinators. Mean yields at Hissar were 2330, 2560 and 3030 kg/ha for the hybrids of the three seed parents compared to 3354 and 1764 kg/ha for checks MBH 110 and BJ104 respectively. At Patancheru mean yields were similarly 2790, 2930 and 3660 kg/ha compared to 2850 and 2750 for checks MBH 110 and BJ104. S10A hybrids are high yielding, but a number, including the highest yielding entry at Hissar, have to be rejected because of lodging or excessive plant height. Though a good combiner, S10A has drawbacks as a seed parent, being low yielding and susceptible to poor seed set. (S10B is one of the several ICRISAT maintainers already crossed with 21B and 68B where F3's will be planted in January 1984). Many 21A and 68A hybrids were superior to BJ104 but only 1 hybrid on each seed parent was numerically but not statistically better than MBH 110 at Hissar.

Trial III (Table 3) compared 50 other hybrids each on 21A and 68A with standard checks. The Patancheru trial was damaged by flooding and was not analyzed. At Hissar no hybrid was significantly better than the best of the two checks (MBH 110 - 3650 kg/ha) though 10 out of the 100 21A or 68A hybrids gave numerically higher yields, up to 4370 kg/ha. Hybrids on 21A and 68A averaged 21 and 23% more yield than the BJ104 check.

A further agronomy trial was grown at Patancheru which compared plant density effects between hybrid No. 972 (68A x (GNSxSS-48-40)) and BJ104. The 68A hybrid gave significantly more grain (22%) on average over the population range tested ($\pm$ 50,000 to 250,000 plants/ha), with an indication that it tolerated over-seeding better than BJ104.

Additionally, blocks of hybrids No. 972, and No. 974 (21A x (GNSxSS-48-40)) and BJ104, and two dwarf varieties were planted in an operational scale evaluation in a farming systems field at ICRISAT Center. Mean grain yields determined from 15 or 16 samples in each hybrid (Table 4) were 2990, 2590 and 2360 kg/ha respectively. BJ104 lodged extensively. Seed of No. 972 was sent to Dr. Meckenstock in Honduras and to Dr. Jain (for Dr. Tareke Berhe) in Sudan for observation. Reports are awaited.

FUTURE

Several of the best hybrids on 21A and 68A will be entered into All India Coordinated Millet Project Trials in 1984, following the invitation of the Project Coordinator to do so after he had seen the Hissar trials. These and other hybrids will be more widely tested in ICRISAT trials both in India and elsewhere. The best restorer lines will be supplied to KSU.

Draft descriptions have been made for a joint KSU/INTSORMIL/ICRISAT release notification of 21A and B and 68A and B in India and USA.

DM free reselections have been made in some 60 of the restorer introductions from KSU. The success of ICRISAT pollinators on 21A and 68A affords some expectation that equally good hybrids could be made between early KSU restorers and ICRISAT medium to late maturing male steriles. Such hybrids will be tested in 1984.

21B and 68B have been crossed to other leading ICRISAT B lines and are currently in the F3 stage. We have also commenced backcrossing our best sources of stable DM and smut resistance into 21B and 68B.

Germplasm exchange will continue between ICRISAT and INTSORMIL and the variability arising from crosses between leading stocks from both should contribute to the breeding programs of both Institutions.

CONCLUSION

KSU pearl millet breeding material, particularly reselections in male sterile lines, once the barrier of DM susceptibility was overcome, have given excellent hybrids in 2 years of testing by ICRISAT in India. Crosses between ICRISAT and KSU lines are expected to give progenies which will augment the useful genetic variability in both programs.

DJA.Dec 83

Table 1. TRIAL 1 - Mean grain yields (kg/ha) and days to 50% bloom of 18 hybrids†, and the top hybrid on each of seed parents 21A, 68A and 5141A grown at Patancheru and Hissar, Kharif season 1983

	Patancheru		Hissar	
	kg/ha	50%BL	kg/ha	50%BL
21 A Hybrids				
Mean	2040	44	2240	51
Best	2900	40	3230	54
68A Hybrids				
Mean	2070	41	2140	51
Best	3240	38	2950	59
5141A Hybrids				
Mean	1920	49	2040	60
Best	2410	47	3150	61
Checks				
MBH 110	2080	42	2430	56
BJ 104	1670	41	1480	57
Trial Mean	2005	44	2122	60
S E ±	329	0.7	456	1.2

† same set of pollen parents used on each seed parent

Table 2. TRIAL 2 - Mean grain yields (kg/ha) and days to 50% bloom of 8 hybrids† and the top hybrid on each of seed parents 21A, 68A and S.10A grown at Patancheru and Hissar, kharif season 1983

	Patancheru		Hissar	
	kg/ha	50%BL	kg/ha	50%BL
21A Hybrids				
Mean	2790	44	2330	58
Best	4910	46	4010	54
68A Hybrids				
Mean	2920	41	2570	55
Best	3850	46	3520	58
S.10A Hybrids				
Mean	3660	45	3030	59
Best	4420	45	4560*	56
Checks				
MBH 110	2850	41	1760	55
BJ 104	2750	40	3350	54
Trial Mean	3063	43	2650	57
S E ±	323	0.8	523	1.2

† same set of pollen parents used on each seed parent

* lodged, next best hybrid 3280 kg/ha

Table 3. TRIAL 3 - Mean grain yield (kg/ha) and days to bloom of 49 hybrids† and top hybrid each made on seed parents 21A and 68A grown in kharif season at Hissar 1983

	Hissar	
	kg/ha	50% Bloom
21A Hybrids		
Mean	2770	60
Best	4370	63
68A Hybrids		
Mean	2850	58
Best	4000	56
Checks		
MBH 110	3650	55
BJ 104	2280	56
Trial Mean	2819	59
S E ±	444	2.2

† the same set of 49 pollen parents used on each seed parent

Table 4. Grain yields kg/ha of hybrids # 972 and # 974 (GSA and 21A respectively x GMS-SS-48-40) in Farming Systems field RW3, Patancheru, 1983

	n†	Grain yield
BJ 104(A)	15	2410 ± 124
# 972	16	2990 ± 154
# 974	16	2590 ± 156
ICMS 7938¶	16	1946 ± 135
G73-K77¶	15	1520 ± 112
BJ 104(B)	15	2310 ± 113

† n = Number of 3 m^2 plot samples

¶ Dwarf varieties

A = BJ 104 growing above the strips of exptl.cultivars

B = BJ 104 growing below the strips of exptl.cultivars

This paper was distributed at the January 4-6, 1984, INTSORMIL PI Conference

ACHIEVING THE MOST COMPLEMENTARY ICRISAT AND INTSORMIL SORGHUM AND MILLET RESEARCH RELATIONSHIP

D. J. ANDREWS, ICRISAT

To increase and maintain complementarity of research:

1. Definition of research problems and research strategies should be completed and priorities assigned (for sorghum, the recommendations from sorghum in the '80s made a good start on these).

2. The relative spectrum of expertise of the two organizations and their operational limitations need to be considered against the defined research problem priorities. Involvement of other organizations eg. Soils CRSP, IFDC to be taken into account.

3. Routine information exchange processes need to be established, from the project planning stage through to the execution phase, involving the INTSORMIL Principal Investigators/ICRISAT discipline Scientists and, at the in-country level, Team leaders or in-country Scientists. Also included would be representation at each other's Inhouse reviews, joint sponsorship of workshops and information documents.

4. Leading germplasm/breeding material should be routinely exchanged in addition to the establishment of Working Germplasm Collections in the U.S. The possibility of joint breeding or other research projects should be examined.

5. Training in agricultural research is so fundamental to increasing agricultural production in the LDC's in the long term that it needs top priority and according to the Institutions capability.

A tentative table of priority research problems and related activities is attached to serve as a basis for discussion. This has been developed from Sorghum in the 80's, from ICRISAT's Ten Year projections and from INTSORMIL's current project profile while considering current LDC needs. In the table, research on the same topic is frequently signified under both INTSORMIL and ICRISAT. There may however be differences in priority (xxx = highest priority) or in type (A = Applied), B = with opportunities for a basic research component), or in regional specificity.

The relative spectrum of expertise differs between ICRISAT and INTSORMIL. Sorghum and millet research in ICRISAT is orientated strongly towards genetic improvement, and to the development and operation of relatively simple screening techniques to identify and utilize genetic resistances. When the need exists for more basic or sophisticated research - collaborative research projects are established with Institutions, usually in developed countries, which possess the relevant expertise. Some basic research is being done mostly in Cereal Microbiology. ICRISAT has established on a continuous basis a relatively large number of in-country/regional scientists mostly in Africa. Programs of these scientists are of a highly practical nature and largely but not totally orientated to genetic improvements with rather immediate goals. They need supporting research

of a more basic nature. Much more production oriented research, particularly to ameliorate moisture and nutrient stress and Striga, is required in SAT Africa on sorghum and millet. The backbone of INTSORMIL research capability rests on the expertise in University Departments and Experimental Stations, which have developed in-depth capability of basic as well as applied research. The best application of INTSORMIL's research resources will therefore be a balance between basic and applied. Over past decades products of US agricultural research have had widespread usefulness in LDC agriculture, but have often required modification and genetic manipulation for utilization. There are adaptation barriers of a physical as well as a biotic nature in moving US-bred sorghum and millets into the tropical environments particularly Africa. These barriers need research. However US sorghums may move more rapidly (and there are already instances) into the Central and Southern Americas. Because of this and partly because of logistical considerations, INTSORMIL may consider taking the lead in establishing expanded programs of continuous in-country research in that region. US developed millets are not adapted per se to the major millet producing areas in Africa, but require less modification for use in Asia. This seems to indicate that INTSORMIL should use its strength for basic research to tackle identified environmental problems in the LDC's, such as heat, moisture and mineral stress, and physiological problems connected with adaptation to tropical environments eg. response to daylength or change in diurnal temperature regimes. In-country projects need to identify those critical research problems which can more rapidly be solved using existing basic research expertise in INTSORMIL. To increase the relevance of US germplasm in the future, new germplasm resulting from recent work in the LDC's together with identified sources of resistance to physical problems (and biotic problems if they specifically occur on mainland US) must be sent into the US. This would be additional to or an additional component of the already accepted concept of establishing Working Collections in the US operated by INTSORMIL. INTSORMIL, partly because of logistical considerations and partly because adaptation differences are less extreme between the US and Latin America may consider taking the lead in establishing expanded programs of continuous in-country research in that region.

Complementarity between ICRISAT and INTSORMIL will be improved if each has up-to-date information about the others' results and plans. This applies to scientist to scientist between the two institutions, but more so in the LDC's. Where ICRISAT and INTSORMIL are working in the same country or region a process should be set up for routine interaction and planning between staff of the two institutions in that country. Opportunities of staff exchange should be explored. The possibility of increasing the complementarity in pearl millet research should be considered, possibly by supporting more research in the US? The University of Georgia at Tifton for instance, has a long history of involvement with pearl millet. More needs to be done on almost all aspects of pearl millet research, especially genetics, interspecific crosses, mechanisms of pest, resistance and physiology.

Much progress has already been made by INTSORMIL in developing LDC country programs, and there has been free exchange between INTSORMIL and ICRISAT in the process. This collaboration can be further developed to mutual benefit and to the more effective and rapid realization of research results in the LDC's.

PRIORITY RESEARCH PROBLEMS OF SORGHUM AND MILLET IN LDC's
(Tentative assignment, xxx=highest priority, A=Applied,
B=research with basic components)

	Priority and Type	
	INTSORMIL	ICRISAT
TRAINING	xxx - Ph.D., M.Sc.	xxx - In-service/ Post Doc.
CONFERENCES/EXCHANGE PROGRAMS	xx	xxx
EXPERIMENTAL DATA COLLATION	xx	xxx
ENVIRONMENTAL STRESS		
- Environmental definition	xx	xxx
- Drought/heat stress	xxx(B)	xxx(A)
- Photop/temp. regimes	xx (B)	x A
- Root studies/ nutrient stress	xxx(A+B)	x (also BNF, A+B)
PESTS		
- Insects (incl. post-harvest storage)	xxx (A+B for those present in US)	xxx (A)
- Diseases	xxx - do -	xxx (A)
- Striga	(xxx-B)*	x (A)
- Birds	x (A+B)	-
- Chemical control of pests	xx (A+B)	-
GENETIC RESOURCES		
- Attribute screening/ catalog publishing	xx	xxx
- Use of lines with catalogued valuable attributes	xxx(A+B)	xxx(A)

*(Basic biochemical/herbicide work is required in a top lab. in country where striga will not be a threat)

Contd..

	Priority and Type	
	INTSORMIL	ICRISAT
GENETICS AND BREEDING		
- Exploitation of germplasm	xx (A+B)	xxx (A)
- Genetics of attributes	xxx	x
- Breeding methodology	xx	xx
- Yield and adaptation	xxx (A)	xxx (A)
- Breeding material exchange	xxx (A)	xxx (A)
PRODUCTION TECHNOLOGY		
- Intercropping	x	xx (A)
- Soil fertility maint.	xxx	x
- Cultural techniques	x	xx (Animal)
- Seed production	x	-
- Soil moisture control	xx	x
FOOD QUALITY		
- Quantify preparations and quality parameters	x	xx
- Improve nutritional value (sorghum)	xx	xxx
- Processing	xx	--
SOCIO-ECONOMICS		
- Define research strategies appropriate to LDC utilization constraints	xxx	xx
- Marketing and support policies	xx	xx
- Food production strategies for Governments	xx	x

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PARTICIPANTS AT THE INTSORMIL PRINCIPAL INVESTIGATOR'S CONFERENCE

January 4-6, 1984
Scottsdale, Arizona

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Robert Voight
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