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COLLABORATIVE RESEARCH SUPPORT  
PROGRAM REVIEW STUDY

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## Forward

This study consists of three major sections plus an executive summary and a scope of work. The three major sections are: 1) Senior Agriculture Advisor's Report on the CRSP Assessment by Dr. John S. Robins; 2) Research Advisor's Report For the CRSP Management Review by Dr. Kenneth O. Rachie; and 3) the Collaborative Research Support Program Review paper by Dr. Edward B. Hogan. The paper by Hogan draws substantially on the contents of the papers by Robins and Rachie and contains the major findings of the study.

## EXECUTIVE SUMMARY.

### 1. Research Direction and Accomplishment

The research undertaken by the four CRSP reviewed appears to be effectively addressing important research problems in less developed countries. Participation in the CRSP has also expanded the research horizons for U.S. researchers, some of whom had been rather insular in their outlook. This has provided the basis for increasing the technological options available to U.S. agriculture. It is interesting to note that one U.S. growers association has proposed providing funding for a CRSP research activity.

The CRSP are consistent with AID food and agriculture policies and strategies. They are focused on areas which have generally received less than adequate attention, for the most part, by less developed country national research organizations and are only partially addressed by International Agriculture Research Centers. The research addresses commodity and soil problems which are largely associated with farming by small operators in the semi-arid and humid tropics. As the CRSP must undertake research which is potentially beneficial to both less developed country and American agriculture, there are some important constraint areas in tropical agriculture needing research which the CRSP cannot address. Because of the collaborative requirements of the CRSP it is sometimes difficult for them to locate field research activities where research needs are great. This has been true with respect to Africa south of the Sahara but the CRSP are using various methods of coping with this situation.

The quality of the research undertaken has been judged by the Research Advisor to "with few exceptions, appear to be of excellent quality and quantity." Other members of the review team concur in this assessment as do the International Agriculture Research Center scientists and administrators interviewed. The research advisor's report attached contains a listing of some of the considerable accomplishments of the CRSP to date. The CRSP research programs appear to be of high priority in terms of importance to the development of

agriculture in less developed countries. Some improvement in the process for assuring the development priority of individual projects needs to be undertaken as addressed in the body of this paper.

The intensive review process carried out by BIFAD and AID was effective in identifying priorities, research capability of U.S. universities in priority areas and in developing operationally effective plans. The review mechanism established by each CRSP appears to be operating effectively. Responsibility for reviews varies widely among the CRSP management units and often differs from that envisioned in the Guidelines for the Collaborative Research Program.

## 2. Linkages.

The process of establishing effective linkages with International Agriculture Research Centers and host country institutions has been evolving in a positive manner since establishment of the CRSP. Under pressure of getting CRSP activities started, the collaboration with host country scientific organizations and individuals in the planning and early implementation of programs appears to have been less than desirable. This was less true where the U.S. institution had a history of working in the country where research was sited than was true where new ground was being broken. Over time, collaboration among host countries and U.S. universities has substantially improved and appears to be quite satisfactory. Formal agreements between host countries and U. S. universities exist in all instances and substantive working relations are being appropriately developed.

Collaboration with International Agriculture Research Centers has developed to the point where participating institutions agree that CRSP and Center research is mutually supportive. There are memoranda of understanding between CRSP and a number of appropriate Centers. At the scientist level there is effective exchange of information and materials. Workshops have been useful in enhancing collaboration and in disseminating scientific information though some improvement in the latter function would be desirable.

CRSP collaborative linkages with field Missions has been uneven. Continuing efforts by both parties are needed for each can be of considerable value to the other's program. Both AID and CRSP Management Entities need to devote additional effort to USAID/CRSP linkages.

Collaboration among universities within a CRSP has been excellent but there needs to be developed an effective system for establishing collaborative linkages among the CRSP. Several suggestions for improving CRSP collaboration with host countries, field Missions and the International Agriculture

Research Centers are included in the body of this paper and attached papers. However, each of these has a monetary cost and it is doubtful they can be achieved in a period of budget reduction. Most important of these are the establishment of networks for the dissemination of information, increased communications between field Missions and CRSP and better collaboration among CRSP.

While the CRSP are not intended to be institution building programs, they have made a substantial contribution to increasing research capability in less developed countries. A major contribution to this has been the graduate research program which has provided graduate education for some 525 less developed country students. Another major contribution has been through the collaborative research undertaken by U.S. and host country scientists.

### 3. Management Effectiveness

The four CRSP examined have developed management systems which have demonstrated that they can take the decisions necessary to maintain research standards and to make program changes required by budget reductions according to agreed upon criteria. While all four CRSP have quite similar management structures, they operate differently in achieving objectives. The management systems do operate effectively in maintaining collaboration among the universities.

CRSP costs appear to compare favorably with other international research institutions such as the International Agricultural Research Centers. Overhead costs appear to be somewhat less for the CRSP and capital costs have been substantially less than for the Centers. Overhead costs of the CRSP are established in accordance with U.S. government standards and average a bit more than 20 percent of the AID grant. The subgrant system used by the CRSP does not cause a pyramiding of overhead costs.

The CRSP do an effective job in reviewing the scientific merit of proposed and ongoing research projects. This review is done by the Technical Committee and/or the External Evaluation Panel, often with assistance from the Management Entity. There does not appear to be a formal peer review system for reviewing research but the absence of such a formal system does not appear to have had a negative impact on scientific quality.

The body of this paper, (p.5), provides suggestions on ways in which External Evaluation Panel evaluations could be broadened for each CRSP so that the External Evaluation Panel could make a more substantial contribution to the usefulness of CRSP activities. The recommendation emphasizes the equal importance of scientific quality, operational effectiveness and

development relevance in evaluations by the External Evaluation Panel.

#### 4. Program and Budget Issues

Finally, a word of caution. The CRSP cannot be all things to all people. Yet, it appears that there is a continuing tendency to expect the CRSP to broaden their activities to include such things as extension and institution building. Clearly, in a period of declining budgets, and probably without declining budgets, attempting to expand the scope of CRSP activities beyond collaborative research and the dissemination of research results to less developed countries and other interested parties can only lead to a diminution in the quality of CRSP research.

As AID budgetary resources have declined so have budgetary allocations to the CRSP. Reductions in budgets and uncertainty with respect to future budget allocations have or soon will reach the point where the CRSP can no longer operate effectively. Within the near future AID and the CRSP universities will need to come to grips with this situation.

# COLLABORATIVE RESEARCH SUPPORT PROGRAM REVIEW

## I. Introduction

This review of the Collaborative Research Support Program, (CRSP) will examine the operations and effectiveness of the CRSP focusing on the four oldest ones; Small Ruminants, (SR), Sorghum Millet, (INTSORMIL), Bean Cowpea, (BC), and Soil Management, (TROPSOILS). This review is not intended to evaluate the quality of CRSP science. However, in examining an agricultural research program, the science cannot be ignored. This was recognized by AID when a science advisor was made a part of the review team. It is the judgment of the science advisor, which is concurred in by the two other members of the review team, that the science in the four CRSP reviewed is generally of excellent quality, (see Science Advisor report attached). In those instances where the research by a university and its collaborators on individual projects has been judged to be less than acceptable, CRSP management has both terminated projects and eliminated universities from the program.

Similarly, the team has found, as will be illustrated below, that the CRSP have been operated at reasonable levels of effectiveness. Not surprisingly there were start-up problems and operations have at times encountered difficulties. However, as operational difficulties have occurred, they were identified and rectified within a reasonable time frame. Performance among and within CRSP has been neither perfect nor uniform. But, it is the team's conclusion, at least with respect to the four CRSP examined, that overall performance has been quite satisfactory and that the CRSP merit continuing programmatic and financial support from the Agency for International Development, (AID)

## II. Management Effectiveness

The first issue addressed is whether the management system operates in a manner which provides reasonable assurance that the science being undertaken is qualitatively satisfactory and is concerned with important development problems. AID in collaboration with the Board for International Food and Agriculture Development, (BIFAD), and the CRSP universities has approved the establishment of a fairly complex management system to address these and other issues. The system draws on

resources which are both internal and external to the CRSP.

#### A. Management Structure

Within the CRSP structure there are four management units which are responsible for administering the AID grant, developing and carrying out CRSP policies, programs and projects and evaluating the quality and usefulness of the program. The components of this management system are the Management Entity, (ME), which is responsible for AID grant funds, for making sub-grants and for implementing the CRSP; a Board of Directors, (Board), which is concerned with policies, plans, budgets and progress; A Technical Committee, (TC), which deals with scientific and programmatic issues; and an External Evaluation Panel, (EEP), charged with evaluating status, funding, progress, plans and prospects of research activities. In addition a CRSP may decide to establish an Administrative Council to deal with major policy issues affecting participating universities or other organizations. Individual CRSP have, in some instances, established other units to deal with particular issues. An example is the Ecogeographic Zone Council established by INTSORMIL.

External to the CRSP are AID and BIFAD/JCARD.\* AID's program and budget reviews and evaluation procedures provide oversight and guidance to each grantee both at headquarters and in the field. BIFAD/JCARD assist and advise AID and the various CRSP on program policies and operations.

#### B. AID Management Role

AID maintains continuing relations with and oversight of the CRSP through the Science and Technology Bureau's, (S&T), program managers. They maintain a continuing liaison with the ME and participate with ex officio status in Board and TC meetings. The EEP consults with the program manager to assure AID concerns are addressed during the course of external evaluations. Members of the EEP are approved by AID. AID does not get involved at the operational level except for activities which require AID approval such as international travel and commodity procurement.

The major AID involvement in approving CRSP activities occurs at three stages: planning, budget allocation and the triennial review. AID plays a leading role in all stages of the planning process. This includes such activities as deciding to fund a planning activity, selecting the planning organization, preparation of a scope of work, convening meetings and approval of the CRSP plan, the ME and the budget proposal. During the annual AID budget allocation process the

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\* Joint Committee on Agricultural Research and Development

activities of the CRSP are reviewed using annual reports, evaluations and other documentation. The proposed program for the budget year is also reviewed. Based on this assessment AID, in consultation with BIFAD, approves the program and budget, adjusting both as necessary.

Each CRSP is also subjected to a triennial review by AID. The review consists of a technical evaluation and an administrative/management review. In preparing the scope of work for the triennial review S&T consults with the regional bureaus, overseas Missions, host governments through the Missions, members of the Agriculture Sector Council and BIFAD. The purpose of the triennial review is to determine at the end of the third year of a five year CRSP if it should be extended for an additional three years and to approve forward funding planning amounts.

In addition to the reviews and external evaluations, the CRSP are subject to two other external examinations. When AID considers it desirable, it can undertake an administrative review of a CRSP. This is generally done when a CRSP appears to be encountering operational problems. Two such reviews have been undertaken. The CRSP as a whole or individual CRSP are also subject to AID audits including those of the Inspector General.

It appears that the system currently being employed by AID in providing oversight and guidance to the CRSP is working reasonably well. There seems to be no need to increase AID/W direct involvement in the management of CRSP operations but more periodic oversight, particularly given budget realities by S&T personnel should be provided.

#### C. Management Operations

While the elements of the administration/management system operate under a common set of guidelines developed by the JCARD, recommended by BIFAD and approved by AID, in practice there is a great deal of variability in the roles carried out by the various elements of the system. Different management units play a major role in determining the policies, direction, composition and practices of each CRSP. The attached reports of the Senior Agriculture Advisor and the Research Advisor provide details about the differing ways in which components of the management system function. The essential point is that, by-and-large, the issues identified in the Guidelines for the Collaborative Research Support Program, (Guidelines), do get addressed within the management system in a generally satisfactory manner. Operationally the management structure functions reasonably well, though not always "by the book". Scientific merit does get addressed and decisions about program and budget allocations are affected by the appraisals of scientific merit. In one CRSP it may be the EEP and in another the TC which addresses scientific issues but it does

get done. Often it is a collaborative undertaking in which a Board or a TC may raise questions about scientific merit which are referred to the EEP for examination and guidance on future actions.

That the management system does work and can make the difficult decisions is illustrated by the ways in which the CRSP have made program and project adjustments as budgets have been reduced. With an initial cut of less than 10 percent the four CRSP applied it equally among recipients of project funds. However, when subsequent AID budget constraints resulted in a reduction in the budget of each CRSP in an amount of almost 20 percent, the CRSP took a quite different approach. Reductions were made in accordance with judgments about relative merit and priority. They were not easy decisions to reach or to carry out but they were made and, importantly, they were accepted by the participating organizations.

The management units which took the difficult decisions varied widely among the CRSP. In one instance the ME, in consultation with other management bodies made decisions on where and what reductions were to be made. In other instances it was the Board or the TC which took the lead in addressing the budget crisis, sometimes relying on the EEP for advice and guidance. In no instance did the CRSP management structure take the easy way out by simply reducing all elements of the program without regard to merit. The CRSP did use a variety of ways to reduce costs to meet budget requirements. These included elimination of programs or projects, reducing the number of participating universities, changing methods of operations, etc. It has been and is a difficult situation for CRSP participants to cope with but, to date, they have been willing to do what has been necessary in order to continue the programs. It does need to be recognized that budget discipline can be an effective tool for achieving greater program effectiveness; but it is also true that excessive cuts can destroy a program's usefulness.

The decisions that have been made to terminate activities for unacceptable performance are another illustration of the effectiveness of management operations. For example, two BC projects, one in East Africa and one in Latin America were terminated on recommendations of the EEP. INTSORMIL dropped two universities from the program because of poor performance. In some instances problems might have been avoided if decisions had been reached more expeditiously but the decisions were made and unproductive activities were eliminated from programs.

#### D. Project Development Relevance

One issue which needs continuing attention from the CRSP

management structure is the matter of development relevance at the individual research project level. As will be demonstrated below the team does not have serious questions about the development relevance of the four CRSP examined. Rather, such concern as exists is related to individual research activities within a CRSP. Within any research area there are hundreds if not thousands of researchable topics, a very large number of which will be of intellectual interest to scientist. However, only a much smaller number will have significant development relevance. Given shortages of financial resources and a limited number of scientists available to research development constraints, establishing priorities in terms of development relevance is essential.

Some lack of attention to this issue is probably attributable, at least in part, to the Guidelines not directly addressing this issue in citing the responsibilities of the various management units. However, this issue has not been ignored by the CRSP. It is to some degree addressed by the various Global Plans which are approved both by BIFAD and AID. More importantly, during the review process, the critical nature of development relevance was strongly emphasized to the team by two EEP chairmen. Further, the development of ecogeographical zone concepts by three of the CRSP has included consideration of development priorities. Additionally, all research activities reviewed by the team were considered to be developmentally relevant.

The team believes that after some initial problems the CRSP management system has adequately addressed the development relevance question in the four CRSP reviewed. However, the team also believes that this issue is so important for research financed by AID that continuing attention is essential. It should be one of the criteria used by the EEP in addressing performance of a CRSP. That is, the EEP should consider development relevance of individual research projects to be as important as operational effectiveness and scientific quality.

Greater emphasis on the importance of and responsibility for establishing development priorities should be included in the Guidelines and it should be a major element in the Global Plan. This would largely be a matter of incorporating in the guidelines systems for all CRSP to follow that are now part of the practices of some CRSP. AID should take the lead in getting guidance on development relevance of projects incorporated in the Guidelines.

#### E. Management Complexity and Costs

The complexity of the management structure has raised questions about possible conflicts and/or overlapping of

responsibility among the management units. It also raises questions about management costs, particularly in relation to other international research activities.

First, it appears highly likely that the complex CRSP management structure has been of critical importance in fostering necessary cooperation and coordination among CRSP universities. It is a system which makes it possible for scientists and administrators to participate satisfactorily in the planning and decision making process. This collective participation in management has provided an environment within which universities not only accept but actively support the concept of a university Management Entity which is first among equals and legally responsible for managing the program and accounting for all funds.

Second, there does not appear to be any unnecessary duplication of functions among the various management units. As indicated above a division of labor among the various management units has emerged over time which is not necessarily consistent with the allocation of functions as set forth in the Guidelines. It is also true that some management units are relatively passive. This is certainly true of at least one Board and one T C. However, in both instances other management units have taken up the slack so that operational effectiveness has not been adversely affected.

Third, although the evidence that has been developed is less complete than that which would be required for an audit, the management costs for the CRSP do not appear to be excessive. An earlier study by Fred L. Mann in 1982 concluded that total administrative/management costs for three CRSP ranged between 17.6 and 24.5 percent of total AID program costs for the CRSP. On the average, about 21.5 percent of AID funds were utilized for administrative costs but this was only about 12 percent of total costs taking into consideration financial contributions from other sources. CRSP administration /management costs were a smaller percentage of total costs than was the case for the International Agriculture Research Centers, (IARC), where administration/management costs were nearly 30 percent of total costs. It is also true that capital costs for the CRSP were a much smaller percent of total costs than was true for the IARC, 8.4 percent compared to 28.1 percent. An examination of data through part of fiscal year 1986 shows that CRSP expenditures on administration/management vary from 19 to 23 percent and average about 21 percent for the three CRSP examined earlier. Thus administrative/management costs appear to continue at a reasonable level and to compare favorably with those of the IARC. It should be noted, however, that reductions in CRSP budgets because of budget stringencies

increase the share of administration/management costs in CRSP budgets, at least in the short run. Administration/management costs tend to be more lumpy than operating costs and it may be more difficult to make incremental adjustments at the margin for these costs.

### III. Developmental Importance

A major issue which must be of concern to AID is whether the CRSP are undertaking research in subject matter areas which are really critical to the development process within the food and agriculture sector and if the CRSP are effective means for undertaking the research. The discussion here is focused on the four CRSP examined during the review but, hopefully, this will make it possible to make some useful generalizations about CRSP and the CRSP concept.

#### A. Research Priorities

It is the review team's judgment that the four CRSP examined do address critical areas of agricultural development and food production in the tropics and that they are research topics which most professionals engaged in agricultural development would agree are high priority. Further, we believe that the CRSP activities are complementary with and supplementary to research being undertaken by the IARC. Three major crops--wheat, rice and maize--have been excluded from the CRSP because of the work being done on these crops by the IARC and national research programs.

Beans, cowpeas, sorghum and millet are among the principal annual crops produced in the sub-humid and semi-arid tropics by small holders. Small ruminants, essentially sheep and goats are, along with chickens, the most common livestock owned by the small holder. They are also the most common store of value for this farmer, at least in non-paddy rice growing areas. From the nutritional standpoint sorghum and millet provide the basic diet for the small holder and other rural poor throughout much of the semi-arid developing world. For this same group of people legumes and small ruminants, again along with poultry, supply by far the major share of the daily consumption of protein.

These, then, are indeed agricultural products critical to food needs in the developing world. They are also products which appear to be under researched. National research activities in the developing world are largely focused on the major grains--wheat, rice and maize--and those tropical crops which are major items in international trade--coffee, sugar, tea, rubber, etc. An exception would be Indian research on millet, and to a lesser extent, sorghum.

## B. Relationship To IARC Research

Among the IARC, ICRISAT, CIAT, and IITA have as part of their mandates work on sorghum, millet, beans and cowpeas. Their resources--financial and scientific--are, however, inadequate in terms of research needs. They are simply unable to address the plethora of production constraints or the many agroecological areas in the less developed world where these crops are produced due either to financial or mandate constraints. For example ICRISAT is not able to devote core resources to research in Latin America or to devote adequate attention to that scourge of millet, sorghum and cowpeas, striga. IITA's work is largely in the humid and sub-humid tropics, mainly in Africa.

ILRAD and ILCA have limited mandates and simply cannot cover needed research on sheep and goats. ILRAD focuses mainly on two serious animal diseases. ILCA works only on African livestock problems with by far the largest share of its work on cattle. National research programs in livestock, such as they are, also are strongly biased towards cattle. Finally, the IARC simply do not have the resources or the mandate to undertake the basic research needed to form the underpinning for needed technological advances. For this they must rely in large measure on the national research programs in the developed world, including the U.S. agriculture research community.

The situation with respect to TROPSOILS is somewhat different. It is not a commodity specific research activity but, rather, one that is concerned with the management of a basic production input, the soil and its constituent parts. To our knowledge, it is one of only a very few international research activities which have as their major objective solving soil management problems in the tropics. IITA has done some quite useful work on humid tropical soils but the resources available for this work are not large since IITA's research focus is mostly crop oriented. Similarly, most national agriculture research in the less developed countries is directed towards specific crops rather than to soil management. The TROPSOILS CRSP thus supplements and has the potential to enhance research on annual and perennial crops and forages being undertaken by national research organizations, IARC and crop and livestock CRSP.

## C. Related Issues

It appears reasonable to conclude that the CRSP are directed towards important agricultural production constraints. There are, however, related issues which merit consideration.

## 1. Limitations on Research Alternatives

The CRSP are intended not only to assist developing country agriculture but to undertake programs that "take into consideration the value to United States agriculture of such programs, . . . so as to maximize the contribution to development of agriculture in the United States and in developing nations". This provision does limit the number of alternate research activities that fall within the scope of the CRSP. Thus, although plantains are an important crop for small holders and others in the tropics, their limited importance in American agriculture and agricultural research would make it highly unlikely that plantains would be considered for inclusion as a suitable subject for the CRSP. It must also be observed that to some degree millet, goats and hair sheep are near marginal cases, without in any way depreciating the small but high quality research conducted at certain U.S. agricultural universities.

The emphasis in CRSP crop research on annual row crops and on products such as sheep, fish, bean and sorghum rather than on subject matter areas such as soil, water, diseases, insects, etc. is probably also due in large part to the necessity to address research to areas which are beneficial to the U.S. as well as less developed country agriculture. If one looks analytically at tropical humid and semi-arid agriculture a case can be made for the importance of focusing much research on subject matter areas and on crops other than annual row crops. For example, it appears likely that developing high yielding varieties of sorghum, millet or cowpeas for the semi-arid tropics will, for a variety of reasons, be accomplished only over a very long period of time. The reasons include such things as the very small research base that exists for these commodities, the difficulty of dealing with problems such as drought resistance and the complexities of soil management. Rather, increases in usable yield over the near to medium term are likely for the most part to be more dependent on improved soil and water management practices and significantly reduced losses due to disease, insects, weeds, birds and other predators. This does not mean that breeding will not play a role but that it will be directed to a variety of objectives rather than just yield. This should not be taken to imply that the CRSP ignore these problems. They do not. For example, the concern of INTSORMIL and ICRISAT with striga is intense and does affect the allocation of resources. But it is different to research which is focused on striga, per se, and brings together a critical mass of scientists from a variety of disciplines to undertake research on this particular pest problem.

Similarly, given the nature of soil and water constraints to annual crop production in the tropics, cropping of perennial tree and bush crops and roots and tubers may prove to be the preferred cropping patterns under many conditions. Thus, it is reasonable to conclude that while the CRSP are focused on agricultural research topics critical to agricultural development in the tropics, there are other areas in which more research needs to be undertaken, at least some of which falls outside the limits of the CRSP mandate.

## 2. Research Results

Another important aspect which needs to be considered in looking at CRSP research activities is the time factor. It is not likely, despite good results produced by some CRSP, that all projects will achieve objectives in the near to medium term. Rather it can be expected that at least 10 to 20 years will be necessary to achieve some significant results. This was the time span required to achieve breakthroughs on rice and wheat. Further, there was a major scientific base available on which to build for developing improved varieties of these crops. There will be exceptions, of course. The development of a vaccine for contagious caprine pleuropneumonia, (CCPP), by the SR CRSP is a case in point. Such breakthroughs generally produce substantial benefits. Based on evidence developed in Kenya on prevalence and mortality rates of CCPP, it is possible to estimate the magnitude of potential benefits from a breakthrough of this kind. Confining the analysis to Africa south of the Sahara and considering only losses from mortality, the benefit cost ratio from investment in the Kenya health sub-project of the SR CRSP is 16.7 discounting obligations through FY 1987 and anticipated benefits over a 30 year period at a discount rate of 12 percent. Manufacturing and distribution costs are, of course, excluded from the benefit cost calculation. Looked at from another perspective, the gross value of the returns to goat farmers in Africa south of the Sahara over a 30 year period from initiation of the SR CRSP would be equal to about \$48.6 million compared to \$28.4 million obligated for the SR CRSP through FY 1987. Thus, gross returns to African goat farmers south of the Sahara will over a thirty year period substantially exceed SR CRSP obligations to date.

The attached report by the Science Advisor provides a review of progress and accomplishments to date by CRSP research. The accomplishments include a high input system which makes possible continuous cultivation in the humid tropics, a low input system which increases the production potential of small, poor farms in the humid and sub-humid tropics, identification of potential vaccine for goat caseous lymphadenitis, germ plasm collections of beans and cowpeas in

Botswana and Malawi, development of heat tolerant cowpea lines, development of a new sorghum in Sudan which increases yields by 150 percent and the identification of striga resistant varieties of sorghum. The CRSP have achieved successes but it can be expected that most benefits from CRSP research will accrue beyond 1990. Historical evidence, as shown in numerous studies, indicates that it is highly likely that the returns on the total investment in CRSP research will be high. Of course, this does not mean that all research will produce significant breakthroughs but that enough is likely to be achieved to produce substantial returns on the investment.

#### D. Research Effectiveness

An appraisal of the CRSP as an effective mechanism for addressing critical less developed country agricultural research needs is of necessity, a subjective undertaking. As discussed above, the CRSP is not an appropriate instrument for addressing all research needs. However, within those research areas that fall within the programmatic scope of the CRSP, some judgments can be made.

The two attached reports conclude without qualification that the CRSP has been successful in providing a method for bringing much of the best institutional and individual scientific talent of the land grant universities and other research organizations to bear on selected research problems. It should be remembered that where institutions or individuals have been unable to meet CRSP research standards they have been eliminated from the program by their peers. That the CRSP have been effective both in the selection of researchable topics and in the quality of researchers working on these problems has been affirmed by IARC and host country researchers and by most USAID personnel interviewed. This does not imply that this level of effectiveness has existed for each and every CRSP activity. There have been mistakes and considerable growing pains. Initially planning was based on full involvement of the land grant university community with many universities addressing the full range of subject matter at numerous locations in the U.S. and abroad supported by virtually unlimited funding. Over time this concept has been modified toward working on selected problems with simplified institutional involvement. It is also a fair conclusion that collaboration with host country scientists and institutions in the selection of research topics was less than desirable or appropriate during the initial stages of program development and implementation. Again, however, that problem appears to have been largely left behind.

The strength of the CRSP in undertaking research on identified problems has been in the collaborative mode

established as basic operating procedure. Within the university community it has been possible to identify research activities, to establish priorities and to agree on the allocation of tasks and resources to meet commonly agreed upon objectives. Individual and institutional researchers have developed collaborative relations with international and country research individuals and institutions in a manner which has increased the effectiveness of the research of each participant.

It appears reasonable to conclude that the CRSP reviewed address important development problems and supplement and complement IARC research. However, some research topics important to agricultural development in the tropics fall outside the CRSP mandate and will need to be addressed through other activities.

The results of CRSP research to date indicate that investments will produce substantial benefit cost ratios. Finally, the management mechanisms of the CRSP have operated in a manner which has made it possible for the CRSP to attract very good scientists who are producing high quality results.

#### IV. Collaboration and Linkages

The CRSP have as a central premise that U.S. and less developed countries will benefit from collaboration on agriculture research by U.S., international and less developed country research organizations. Such collaboration would also result in research that would complement and support IARC research. Making collaboration work requires establishing effective linkages among institutions and individuals.

##### A. University Linkages

The linkages among the universities and other U.S. research organizations involved in carrying out CRSP activities appear to be excellent. The structure of CRSP management assures that each university and its administration

institutions and scientists and host country institutions and scientists must necessarily be based on assumptions of some degree of institutional and individual scientific and administrative equivalency among the participating parties. Objectively the necessary degree of equivalence was absent in some cases; in others it is a fair conclusion that there was a greater degree of equivalency than the CRSP universities recognized. All of this was complicated by uncertainty on the part of the U.S. universities with respect to which research organization in the country had the necessary administrative and scientific competence and the responsibility for undertaking research. Thus, in the initial stages of the four CRSP reviewed it was generally, though not always, thought necessary to have some permanent representative(s) of the U.S. university on site in the host country to assure that the scientific and administrative activities were carried out at acceptable levels of competence. The situation has gradually changed over time. Currently one CRSP, as a matter of policy, does not have institutional representatives permanently posted overseas. The other three CRSP reviewed have substantially reduced the number of scientists/administrators assigned to host country locations on a long term basis. This trend reflects the increased confidence of U.S. institutions in collaboration with host country institutions and scientists as the relationship among the participating parties has matured. It also reflects the increasing level of competence of host country institutions and individuals, partially due to CRSP utilization of host country graduate students in their research activities. Collaboration in problem identification, planning and implementation is growing and can be expected to continue to increase as CRSP activities continue. It should be noted that where universities still have institutional representatives overseas it is often for purposes of administrative and financial accounting requirements of the AID grant. Similarly it should be recognized that budget reductions have provided an incentive to universities to minimize institutional faculty and staff abroad for long term assignments.

U.S. CRSP institutions have used a variety of different ways to maintain research and administrative competence in host country research activities as long term institutional representatives have been withdrawn. The examples noted here are drawn from Africa where financial, scientific and institutional resources are scarcer than in Latin America or Asia. In Kenya the six person SR CRSP staff of scientists is composed of five East Africans and one American local hire. The site coordinator is an official of the Livestock Ministry.

Kenya Livestock Ministry scientists are assigned to the SR CRSP and work collaboratively with the CRSP scientists at the livestock stations which have been provided by the Ministry to the CRSP. Scientists from U.S. institutions participate through short term site visits, visits of field personnel to U.S. institutions and the conduct of experimental work at locations in the U.S. The CRSP is completely integrated into the Ministry research program. It is difficult to conceive how either the collaboration or the quality and relevance of research could be improved upon.

In Niger INTSORMIL carries out an effective research program without posting permanent staff in country. Scientific resources are thin in Niger and an active graduate research program is used to supplement local research capabilities. U.S. and African graduate students undertake research in Niger during the cropping season under the direction of U.S. and host country scientists. The CRSP also works collaboratively with an USAID financed team providing assistance to research in Niger and with the regional ICRISAT field station located in Niamey. U.S. scientists participate through site visits and by undertaking experimental work in the U.S. to supplement field work in Niger.

In Botswana where local scientists were not available to undertake needed field work, the BC CRSP initiated work in the field with a scientist from the U.S. institution assisted by graduate students. At the same time scientific work in the U.S. went forward with the participation of two Botswana graduate students. With the departure in the summer of 1986 of the U.S. institutional representative in accordance with BC CRSP policy, work was continued pending return of the graduate students with the assistance of a Peace Corps volunteer. The graduate students will return to Botswana prior to January, 1987. They will continue field work under the guidance of the U.S. scientist who will make periodic visits to Botswana. What started as an almost purely U.S. effort is evolving into a collaborative scientific undertaking.

The above should not be taken to imply that real collaborative linkages are not established when scientists from U.S. institutions are located at field sites. This is partially dependent on the quality and operating effectiveness of host country scientists and institutions. For example, in Indonesia two CRSP were reviewed--SR and TROPISOILS-- both of which have scientists from U.S. universities in Indonesia on long term postings. In both cases the degree of scientific collaboration among U.S. and Indonesian scientists and institutions is excellent. CRSP activities are fully integrated into the Indonesian research organizations and

scientific work is planned and carried out jointly by Indonesian and U.S. scientists. The high level of collaborative linkages is in large measure possible because of the existence of highly capable Indonesian scientists and an effective Indonesian research organization.

#### C. CRSP/IARC Linkages

The CRSP guidelines call for collaboration of the CRSP with the IARC. The CRSP have established collaborative linkages with the IARC which are mutually beneficial to the research of both. There do exist written agreements between CRSP and IARC which spell out the areas of cooperation. In addition to CRSP and IARC scientists exchanging information other collaborative initiatives have been undertaken. CRSP and IARC undertake joint workshops and participate in each others workshops. One interesting aspect of collaboration is with respect to research on sorghum in Latin America. Because ICRISAT is unable to include research on sorghum in Latin America in its program, the INTSORMIL CRSP is, in agreement with ICRISAT, filling this gap. ICRISAT scientists consult with INTSORMIL scientists working in Latin America and provide backstopping materials and information as necessary. Furthermore, CIAT, in Columbia, is providing facilities to INTSORMIL for scientific work on sorghum in Latin America. Thus two IARC and one CRSP have joined together to make possible needed research in Latin America on a crop important to poor and disadvantaged farmers in the drier parts of that area.

Bean and cowpea germ plasm collections by the BC CRSP in Southern Africa have led to the establishment of large collections which substantially increase available genetic diversity. These collections are being made available to IARC scientists for use by them in their breeding work. These same collections will also be used in breeding programs in the U.S. to benefit American farm production of these two commodities.

As the Senior Agriculture Advisor has pointed out in his paper, attached, the degree of collaboration with IARC varies among the CRSP. While written collaborative agreements exist, it appears to be a fair conclusion that much of the collaborative linkages depend significantly on personal and scientific relationships among scientists of the respective organizations. In some cases these relationships between scientists existed prior to the formation of the CRSP. These kinds of professional relationships are necessary if institutional collaborative linkages are to be fully successful. However, they do not substitute for the formal institutional relationships which are essential if each organization is going to be able to allocate resources for

collaborative research on commonly agreed upon priorities. As noted above this kind of institutional collaboration has been achieved through jointly sponsored workshops. This, however, does not appear to have been extended in any significant degree to agreements to undertake joint research. In some instances this may be because a scientific basis does not appear to have been developed which would make this kind of collaboration useful. A more important constraint may be CRSP funding constraints which limit ability to enter into the long term commitments necessary for such joint research activities. For example, one CRSP and one IARC met in 1986 to discuss future collaborative linkages. During the meeting possibilities for joint research activities were discussed. However, the CRSP was unable to make commitments because of uncertainties with respect to future funding availabilities.

It may well be that current budgetary constraints will limit institutional linkages to shorter term activities. This does not, however, detract from the importance of the scientist to scientist linkages which do exist. Without exception, discussions with CRSP and IARC administrators and scientists elicited strong support for existing collaborative undertakings and for strengthening them in the future. While in a few instances collaboration among CRSP and IARC has had some rough spots, these appear to have been worked out satisfactorily. It is clear that CRSP and IARC scientists do believe that continuing research by both is critical to achieving needed scientific progress. Both CRSP and IARC scientists were highly complimentary about the scientific work being undertaken by the other. All agreed that collaboration was essential and that it should continue. What is needed is development of a modus operandi which will foster increased collaboration.

One initiative that AID might want to consider as a means for strengthening CRSP/IARC collaboration is the inclusion of an IARC representative on one or more of the CRSP management units. Some CRSP follow this practice now. IARC memberships on the Board, TC and/or EEP are all possible. Inclusion of an IARC representative on one or more of these units would provide an excellent means for continuing review of the degree of complimentary of IARC and CRSP activities. It would also be a means of identifying potential areas of cooperation and support. Additionally, it would appear useful to include representatives from less developed countries on one or more of the CRSP management units as a standard practice. The major limiting factor is likely to be the additional costs that would be associated with using IARC or host country representation on various management units.

#### D. Linkages Among CRSP

One area in which there appears to be substantial opportunity to increase collaborative linkages is among CRSP. Within each CRSP appropriate mechanisms exist to assure collaborative linkages among programs and projects. These mechanisms do produce satisfactory collaboration of scientific work within individual CRSP. However, there does not appear to be adequate attention to or systematic mechanisms for developing and maintaining collaborative linkages among CRSP. An organization of CRSP leadership has recently been established but collaborative linkages do not appear, as yet, to be part of its responsibility.

It appears to the reviewers that establishment of linkages among the CRSP has the potential for making a significant contribution to scientific achievements. Some limited collaboration among CRSP does exist. There are cooperative undertakings by INTSORMIL and TROPSILS on Latin America acid and aluminum soil problems. However, it is difficult to find other evidence of this kind of collaboration. Clearly the work on acid soils being undertaken in the humid and semi-arid tropics by TROPSOILS is of concern to INTSORMIL work in Africa and SR research on forages in the Asian and African humid tropics. Yet there is little evidence even of exchange of information among the CRSP on such critical problems. The establishment of effective linkages among the CRSP would appear to be an issue that should be receiving attention from CRSP leadership and AID. AID should take the lead in working with CRSP ME to establish an effective system for the exchange of information among CRSP.

#### E. CRSP/USAID Linkages

The collaborative linkages between the CRSP and USAID Missions appear to be somewhat less than desirable. Despite the considerable attention given to CRSP/USAID collaborative linkages in the Guidelines, these linkages vary widely among CRSP and Missions and over time within the same units. They range from negative through neutral or nonexistent to highly positive. For example, in one country the agriculture officer expended a great deal of effort to attract two CRSP to work in his host country in order to augment scarce USAID resources available for agriculture research assistance. At a later date a subsequent agriculture officer has taken a negative stance towards CRSP participation in the host country. In another country one CRSP works very closely with the host country Mission and has its program fully integrated with the USAID program while another CRSP appears to make a practice of ignoring the USAID.

The Senior Agriculture Advisor devoted a considerable

portion of his time to this issue and concluded "that the fault is many sided and that there is enough to go around". The problem in CRSP USAID collaboration appears, in large part, to be related to the existence or absence of communication between CRSP administrators and scientists and AID managers and staff. This is not a situation in which finger pointing or assessing blame is called for. What is required is a cooperative effort by the ME and the AID program managers to assure that the spirit of the guidelines is followed by all parties. An initial step in this direction would be agreement that all travel approval requests would include a paragraph asking the USAID to set appointment times for entrance and exit meetings between CRSP travelers and appropriate USAID staff.

#### 1. Territorial Issues

There are other elements which merit some discussion. Historically, locating centrally funded AID activities physically in countries where there are USAID programs and Missions has raised problems of territoriality and ownership. In most instances it can be expected that the USAID will want the CRSP activity to be carried out in accordance with Mission ground rules and that the USAID will want to make programmatic decisions about centrally funded activities. The CRSP institutions which are operating under a grant from a central AID bureau located and managed in Washington D.C. are often confused by this attitude. There does not appear to be any simple way of eliminating this problem as long as AID continues to locate centrally funded research activities in AID countries and AID maintains its current and historical governance structure. However, open, frank and continuing communications among the three parties--USAID, AID/W and CRSP--can and have made a high degree of collaboration between the USAID and the CRSP possible and fruitful.

#### 2. CDSS and CRSP Research

Another issue, related to the discussion above, is consistency of the CRSP with the Mission Country Development Strategy Statement, (CDSS). The Guidelines suggest that the CRSP should be consistent with the CDSS and a review of documents and discussions with USAID officers indicates that most Missions believe such consistency is important. However, this raises a difficult problem. CRSP are by definition long term research activities requiring continuing experimentation and analysis on well defined agriculture constraints. On the other hand, it is not likely that USAID strategies will remain constant over long periods of time. Changes in AID administrations every four to eight years and more frequent turnovers in senior Mission management mitigate against maintaining an assistance strategy for extended periods of

time. Thus, it may not be realistic to expect that CRSP and CDSS will remain consistent with each other over time.

### 3. Extension

Another area of potential conflict between the CRSP and the USAID which surfaced during interviews by the review team concerns the matter of extension. A comment often heard from USAID personnel was that the CRSP was deficient because it did not get down to the farm level. The research was all right but the CRSP did not follow through and get the information to the farmer. It appears that this reflects a misunderstanding of the CRSP function as well as an admirable concern that farmers benefit from AID financed activities. The CRSP are, by the language incorporated in the Title XII amendment to the Foreign Assistance Act, authorized to undertake "long-term collaborative university research". Extension activities are not included as part of their responsibility. This does not mean that getting research results to farmers in usable form is not important; it does mean the CRSP are not the appropriate instruments for this important task. This is an issue that needs to be put to rest in the interest of increasing USAID CRSP collaborative linkages. It is an area in which CRSP USAID collaboration could be highly beneficial. Missions can both assist the CRSP in establishing relations with organizations which provide information to farmers and in keeping appropriate host country agriculturalists informed of CRSP activities.

The CRSP, however, should recognize that it is important that research results do get put into a system which will deliver them to farmers. Thus, in establishing collaborative working relations with host country research organizations an important consideration should be the linkages that the host country organization has to the agriculture information systems within the country. The kinds of organizations that have these linkages will vary among countries. In some countries the research units of Agriculture or Livestock Ministries may be the appropriate organizations. In other countries Universities or other agriculture organizations may have the best linkages to farm information distribution systems. It would appear useful to include guidance on this matter in the Guidelines.

### 4. Logistic Support

One other matter that is apt to cause USAID concern is the provision of logistic support to CRSP personnel. In periods of budgetary constraints and staff shortages, providing logistic support for CRSP personnel assigned as resident scientists or administrators in host countries and eligible for the usual perquisites due AID financed personnel can be a burden on USAID management. It is generally a much less difficult problem when U.S. university scientists or

administrators are only periodic visitors to the host country. Use of local personnel or graduate students usually substantially reduces the burden on the USAID. It ought to be incumbent on the CRSP ME to seek to minimize claims on the USAID for logistic support.

While the issues discussed above do impinge on collaboration between Missions and CRSP, they do not, in most instances, prevent the development of useful collaborative relationships between the CRSP and the Mission. Some conflicts and disagreements have surfaced and some continue to exist. By-and-large Mission personnel interviewed were supportive of CRSP activities. And, in some instances, an USAID has provided financial or in kind support to the CRSP and encouraged collaboration between the CRSP and components of the USAID program.

#### F. Distribution of Research Findings

Related to the collaborative linkages issue is the matter of establishing systems to disseminate research results beyond the host country on a regional or worldwide basis. During the early years of the CRSP this was not an important issue. But, as the CRSP mature and usable research results are generated it becomes an item of concern. Most efforts to spread research findings to date have been through scientific journals, special CRSP publications and workshops. The number of scientific publications that have resulted from CRSP activities is impressive. Yet there is some question about this as an effective means of transmitting information to the less developed world, although, of course, they are quite useful to the U. S. research community. Many scientists and scientific organizations in less developed countries are unable to obtain scientific journals and similar publications because of budgetary or language constraints. Workshops appear to be an effective means of transmitting research results to a broad segment of the scientific community in the underdeveloped world. An excellent example is the recent soils workshop in Peru at which the initial steps were taken to establish five permanent subject matter groups involving scientists from eleven countries to pool their scientific efforts and exchange information on research results. Clearly more efforts of this kind are required; but workshops are expensive and adequate financial resources are needed.

The publication and distribution of workshop papers and discussions can be an effective means of providing information to less developed countries. Performance in this area by the CRSP has been uneven. The proceedings of some workshops have been published and distributed as a product of the workshop. In other instances, publication has been limited to mimeographs

of individual papers with limited distribution. The publication and distribution of a comprehensive volume of workshop proceedings should be an end product of each workshop. Unfortunately, the major limiting factor has been financial resources and these do not appear likely to increase given current AID budget constraints .

Exchange of information with IARC is also helpful in disseminating information to less developed countries as the information can be provided through the IARC networks with less developed countries. Continuing efforts will be required to develop CRSP networks with a broad spectrum of developing countries, often in collaboration with IARC. To do this will not only require imaginative approaches by AID and the CRSP but also the provision of adequate financial resources for this purpose.

#### V. Cost Effectiveness

The cost effectiveness of CRSP activities is a matter of concern to AID. This issue becomes even more important as budgetary resources for development assistance decline. One concern centers around overhead costs and whether or not passing funds through the ME to other universities means that overhead costs are pyramided one on another.

##### A. Overhead

Overhead rates for the CRSP are standard rates established for federally sponsored research performed by universities as determined by a cognizant federal agency, usually the Department of Health and Human Services. While rates vary somewhat among universities, they average a bit over 40 percent for on-campus research and 20 to 22 percent for off campus research on specified expenditure categories. The specified allowable expenditures subject to overhead include salaries and wages, fringe benefits, materials, supplies and services, travel and the first \$25,000 of all subgrants and subcontracts. Ineligible items are purchases and improvements to land, sites or buildings, scholarships, fellowships, equipment and amounts exceeding \$25,000 on each subgrant and subcontract. For the four CRSP examined, overhead costs averaged 20.2 percent of the AID grant, ranging from 18.2 percent to 22 percent.

##### B. Subgrant Overhead

As noted above the overhead accruing to the ME university for funds subgranted or subcontracted is strictly limited. It is limited to the first 25,000 dollars per subgrant or subcontract in accordance with standard policies of the federal government. The overhead cost on a subgrant of 150,000 dollars made using the approved rates for on campus overhead at Michigan State University, the BC ME, would be

10,500 dollars or seven percent of the value of the subgrant. For a smaller grant of, say 50,000 dollars the overhead allocated to the ME university would be 21 percent. Overhead is calculated to reimburse the ME university for the management functions performed in making the grant and in no instance do overhead costs pyramid one on another.

#### C. Cost Sharing

Matching funds provided by universities are about 30 percent of the AID grant for the four CRSP reviewed, ranging from 24 to 37 percent. These amounts exceed the requirement of the grant agreements which is 25 percent of direct costs excluding ME costs, funds committed under a formal CRSP host country agreement to procure goods and services and training costs. For example, the 24 percent of total match provided by one CRSP is 27 percent of the funds for which matching is required. In all instances examined matching funds exceed overhead costs.

In addition to university or other domestic organizations matching funds, host countries also make a contribution in cash or in kind to the CRSP. Because most host country contributions are usually in kind, as is common with AID bilateral projects, it is often necessary to estimate the value of the contribution. This means that the data for host country contributions are apt to be less precise than is true for AID or university grant or matching amounts.

Available data indicate that for the four CRSP reviewed host country contributions ranged from about 18 percent to over 21 percent and averaged about 20 percent of the AID grant. Assuming a subproject with an annual cost of 200,000 dollars this would mean, on the average, an AID grant amount of 133,000 dollars, a university matching amount of 40,000 dollars and a host country contribution equal to 27,000 dollars, (probably mostly is kind). Thus the AID grant would fund about two-thirds of subproject costs, the university about one-fifth and the host country a little over one-eighth.

#### D. Education Costs

One operational area of the CRSP appears to be carried out at costs to AID which are significantly less than would be the case if normal AID practices and procedures were utilized. A large amount of graduate education is carried out under CRSP auspices. For the most part this graduate work can be considered a by-product of CRSP research. Graduate students are used by CRSP scientists to carry out, under competent supervision, much of the research in accordance with the normal procedure at U.S. universities. These graduate students--host country, other LDC, U.S. and other developed country--are partially employed, usually half time, by the university as

graduate research assistants. About three-quarters, roughly 525 individuals, of the graduate students employed part time under the four CRSP have been or are from less developed countries. Again, in accordance with normal university practice these graduate research assistants attend classes and attain either a Ph.D. or M.S. degree.

Of the 525 graduate students who have received degrees or are still working for them about one half were Ph.D. and one half were M S degree candidates. Conservatively assuming two years for a M S and three years for a Ph.D. candidate, this means that LDC students have been or are being financed for 1,312 years of graduate education while they are doing CRSP research. The average cost of this graduate education to AID is about 10 to 11,000 dollars per annum. However, in the few instances where universities operate on a full cost budget system, annual costs to AID may run substantially higher than the average. The total cost for the 1,312 years of graduate education to the AID grant is about 13 3/4 million dollars. Under AID participant training procedures the cost of this same amount of graduate training to AID, calculated at a cost of 20,000 dollars per annum, would be almost 26 1/4 million dollars. Thus, the cost of providing education for the 525 LDC graduate students under the CRSP would cost AID about 52 percent as much as it would cost AID using standard participant training procedures. The difference in cost is largely due to the waiver of out-of-state tuition and fees. CRSP also students end to receive fewer perquisites than is true for AID participants. Waiver of tuition and fees by universities is a cost to the universities and a contribution to the CRSP.

It should be noted that it does not follow that AID participant training costs in general could be substantially reduced by adopting the CRSP system. The total cost of CRSP graduate education is roughly comparable to AID participant training costs. The difference is that under the CRSP a part of that cost is absorbed by the university because of the status of CRSP graduate students as graduate assistants. The difference is, for the most part, not in the cost of the education but in how payment of the costs is distributed.

One other aspect of graduate student involvement in CRSP research deserves a brief mention. CRSP scientists utilize graduate students funded from other sources to undertake CRSP research. For example, some 307 graduate students--250 LDC, 95 U.S. and 12 other developed country-- have undertaken INTSORMIL research but were funded from sources other than INTSORMIL. There have also been some 52 graduate students doing research for the SR CRSP who were either wholly or partially supported by funds from other sources. The utilization of graduate

students funded wholly or partially from other sources indicates the extent to which CRSP research is integrated into the regular activities of the university. It also represents another informal university contribution to the CRSP.

## VI. The Planning Process

The process for selecting research topics for the CRSP was long and involved. Principal actors were AID and BIFAD. The Joint Research Committee was the operational unit for BIFAD. The selection of a priority listing of research programs spanned two years, 1977/78. Very early in the process AID and BIFAD selected four programs as top priority--sorghum millet, small ruminants, nutrition and aquaculture. Work was initiated early on to develop these programs by identifying research constraints and designing research on an interdisciplinary basis.

At the same time the JRC initiated work to identify and list in priority order additional areas for research. A list of ten topics was originally planned but this was later increased to 20. The initial general criteria used were relevance of research to less developed countries and the U. S., competence of U.S. universities in the research area and the need to be complementary and supplementary to the work of the IARC. This last criterion resulted in the early elimination of wheat, rice and maize from consideration as possible research topics.

The JRC formed two work groups for the purpose of developing a prioritized listing of additional research topics; one to develop a broad list of topics from which a prioritized list could be selected and one to develop criteria for selecting research topics.

In developing a list of potential areas of research the first group relied on consulting with AID agriculturists and the results of several recent studies. Major reliance was placed on the NAS-NRC World Food and Nutrition Study of 1977. Three other studies were also used; the National Science Foundation, Cornell study, Increased Production from Animal Agriculture, the NAS-NRC BARR Report on Enhancement of Food Production for the United States and the USDA Kansas Center Conference's Condensation to Ten Priority Areas. This led to the development of five research categories containing thirty-five possible research programs. Meanwhile the second group had established four criteria for ranking proposed research activities--social demand, technical feasibility, economic justification and institutional preparedness. The JRC through a process of successive appraisals reduced the list of

35 to 20 candidates. The JRC then used three additional criteria--time for payoff, benefit to the poor majority and potential for university support--to prioritize the list of 20. This list was then submitted to the AID regional bureaus for review. Based on this review, programs were selected for planning or exploratory studies and a list was approved by the BIFAD in April, 1978. This list has served as the basis for selecting CRSP financed by AID grants.

## II. Peer Review

There has been some concern about the effectiveness of peer review of CRSP research activities. The roles and responsibilities for a peer review process for ongoing CRSP are unclear. The Guidelines mention peer review only in connection with planning where the words "peer process", "peer group", "peer panel" and "peer advisory group" are included. In these instances a peer process is to be used in selecting candidates for the ME, a peer group to visit, perhaps, potential sites and discuss potential programs, a peer panel to participate in confirming interests, resources and scientific functions, peer panel members to assist and advise the ME, etc. All of these functions appear to be the responsibility of the peer group or panel during the selection and planning processes. No continuing peer review function following the planning process is indicated in the Guidelines nor is there any clear indication in the Guidelines that the scientific merits of proposed research activities should be submitted for a formal peer review. The guidelines do not assign peer review functions to the Board, the ME, the TC or the EEP. Neither are there references to a peer review process for ongoing CRSP programs in sections of the Guidelines concerned with review and evaluation.

Never-the-less, in practice, it appears that peer review functions are carried out in the four CRSP reviewed. The management units carrying out peer review functions vary among CRSP. In all instances the units doing the peer review is the TC and/or the EEP, often with the assistance of the ME. Generally, the TC provides the technical direction for research activities, establishing project objectives in relation to overall program goals. The EEP reviews the research activities in progress and provides advice and guidance on how research should be modified, if necessary, to accomplish goals. Such review usually takes place in conjunction with appraisal of the contribution of institutions or individual projects to a CRSP program, the decision making process on budget allocations or in the conduct of external evaluations. It seems that these

reviews do focus on the issue of scientific quality and that decisions affecting CRSP activities are in part based on these reviews. AID does not participate in the review process except as program managers do through attendance at TC meetings.

In addition to reviews of scientific merit by CRSP management units there are within the university community some peer reviews made of CRSP science. Articles submitted for publication are subject to the normal peer review process and CRSP research activities are subject to departmental review for merit as are other research projects within the university. Additionally, the CRSP format does foster interdepartmental reviews of research merit. Thus, while the peer reviews that are undertaken do have an effect on the CRSP program and contribute substantially to the maintenance of quality, there is not a formal structure or system for appraising scientific merit in accordance with an established formal peer review system. This does not imply that the scientific quality of CRSP is in some way less than it might be. It is not. Available evidence, including the appraisal in the report by the Science Advisor, indicates it is, for the most part, of high quality. Never-the-less, AID might want to consider if it would be advisable for CRSP to establish a system that assures formal peer reviews will be undertaken on a regular and systematic basis with responsibility assigned to a management unit. It would appear reasonable for the ME to be charged with responsibility for seeing that peer reviews are carried out. However, it should be noted that this would increase CRSP costs and initiation of such a system would require elimination of some other CRSP activities unless budgets could be increased. As the absence of a formal peer review system has apparently not adversely affected CRSP scientific merit, there would need to be other overriding considerations in order to justify the diversion of scarce resources to this purpose..

#### VIII. Budget Constraints

One issue not included in the scope of work for this study but which was raised again and again during the course of the study was the matter of financial resources for CRSP activities. This study contains a number of suggestions for increasing the effectiveness of the CRSP. Nearly all of them have a financial cost and, given current and proposed CRSP budgets, they could be carried out only by eliminating some other CRSP activity. Even without attempting to finance possible improvements in operations the current level of funding is forcing CRSP to consider eliminating programs and projects. The level of proposed funding for one CRSP has forced it to undertake an assessment to determine which one of four major programs should be eliminated.

Budget allocations for the four CRSP reviewed have reached the point where further reductions are likely to destroy much of the CRSP effectiveness. At current budget levels, funds would not be available to carry out changes recommended in this study. Decreases in funding would necessitate elimination of projects, changes in program structure, or an across the board reduction in all program activities. Any or all of these would, in the team's judgement impact negatively on potential program benefits. Additionally, uncertainty about future funding availabilities is limiting the ability of the CRSP to do essential medium term, let alone long term, planning of research activities and resource allocations. The budgetary issue is one with which AID will need to come to grips with in the very near future. The issue is whether or not AID believes the work of the CRSP is of sufficient priority for AID to make a commitment which assures forward funding of CRSP at levels which permit them to maintain long term research programs and projects.

## XI. Summary of Conclusions

### A. Research Direction and Accomplishment

1. The performance of the four CRSP reviewed has been satisfactory. Under the CRSP concept the land grant universities and associated organizations have provided much of the best individual and institutional scientific talent available in the U.S. to work on the selected research topics. Progress to date, as illustrated in the Science Advisor's report and the main body of this study, clearly indicates that the CRSP are and will continue to produce useful research results. It appears that returns to investment in the CRSP will be satisfactory.

2. There is no doubt that the subject matter areas being researched under the four CRSP examined are high priority tropical agriculture research subject matter areas. While projects examined during the study were considered by the team to be developmentally relevant, the team believes that the importance of development relevance needs to be explicitly recognized in the CRSP Guidelines.

AID should take the lead in assuring that the Guidelines contain guidance on the inclusion of development relevance as a major part of each Global Plan. The Guidelines should also specify that EEP evaluations should include consideration of the development relevance of research activities.

3. The CRSP are limited to undertaking research that will contribute to agriculture development in the United States and in the developing countries. Because of this, there are some research areas important to tropical agriculture that cannot be undertaken by the CRSP. If AID wishes to fund research in these areas this will need to be done outside the CRSP framework.

4. The CRSP have done an excellent job in publishing research results in scientific journals. However, this is not an effective way of getting research results disseminated in less developed countries. More effort is required to develop methods of assuring that CRSP results are effectively disseminated throughout the less developed world. AID, BIFAD and the CRSP should collaborate in developing effective means for disseminating research results.

5. It is the judgment of the review team, based on performance to date, that the CRSP merit continuing programmatic and financial support from AID.

#### B. Linkages

There are five areas in which the establishment of effective collaborative linkages are important to CRSP success.

1. Collaboration within a CRSP among participating universities is very good.

2. There were some deficiencies in collaboration between CRSP U.S. universities and host country entities particularly during the period when CRSP projects were being established. Most of these problems have been overcome and continued improvement of linkages between U. S. and host country entities appears likely.

3. The CRSP have established effective linkages with the IARC and collaboration appears to be good. If the CRSP were able to enter into longer term agreements on joint research activities this would improve the effectiveness of collaboration. The inclusion of IARC representatives in CRSP management units such as EEP, Boards or TC would be a positive contribution to improving CRSP-IARC linkages. This practice is now followed by some CRSP. However, it would appear useful to provide guidance on this matter in the Guidelines.

4. Few linkages have been established among the CRSP. Increased collaboration among CRSP should lead to an improvement in the effectiveness of CRSP research. AID program managers and CRSP ME should take the lead in establishing means for continuing collaboration among CRSP.

5. In general, collaborative linkages between CRSP and field Missions have been less than desirable. In some instances collaboration has been quite good, but, in others, it has not. There have been strong disagreements between USAID and CRSP on such issues as consistency with CDSS, involvement of CRSP in extension and requirements for logistic support. In many instances communications between a USAID and CRSP representatives has been much less than is desirable.

AID program managers and the CRSP ME should give continuing attention to improving USAID-CRSP communications. A start on this would be to require that all cables to a USAID

requesting approval of travel include a request for the USAID to set times for entrance and exit meetings between CRSP and USAID representatives

The Science and Technology Bureau should clarify for Missions the role of the CRSP and the nature of CRSP responsibilities. This should include the responsibility of the CRSP for collaborating with the USAID in assuring that research results are made available to host country research and extension organizations. The reasons why CRSP activities do not include extension should also be explained to USAID officials. It would be helpful if guidance on CRSP-USAID responsibilities for assuring that research results are provided to organizations performing research and extension functions were included in the Guidelines. Another area that needs clarification is the relationship between CRSP and the CDSS including the reasons why they are apt to diverge over time. Finally, the ME should seek to minimize CRSP claims on Missions for logistic support.

#### C. Management Effectiveness

1. The CRSP management systems examined operate at reasonable levels of effectiveness. There is considerable difference among the CRSP in how functions are performed but the systems of each CRSP operate in a manner which assures important issues are effectively addressed. There is no reason to believe that increased AID involvement in program oversight would contribute to more effective management. It is possible that increased AID participation in day to day operations would have a negative effect.

2. Administration-management costs for each program average about 12 percent of total program costs. On the average, about 21 percent of AID grant funds are expended for administration-management costs. In view of current budgetary constraints, it might be useful for AID and BIFAD to seek to determine if it would be possible to reduce these costs. In so doing, very careful attention would need to be given to potential negative effects on a system which is currently operating at very acceptable levels of effectiveness.

3. Overhead costs compare favorable with other research activities. Overhead rates are standard government rates and the CRSP management system does not result in a pyramiding of overhead costs. University matching funds consistently exceed the minimum required in the Guidelines and overhead costs.

4. The CRSP do not have a formal system of peer review established as a part of the management system. Peer reviews do occur as a part of university department reviews of proposed research, EEP evaluations, T C operations and the publications process. This system appears to have assured that the CRSP research is of high quality. However, AID may, for other

reasons with to examine whether or not a formal peer review process would be desirable and cost effective.

5. The current tight budget situation has the potential for adversely affecting CRSP effectiveness. Virtually all of the recommendations made in this report would, if carried out, place additional demands on CRSP financial resources. Continuing budget reductions would adversely impact on CRSP effectiveness. Unless cuts can be made in program administration-management costs that do not decrease operational and scientific effectiveness, and this appears unlikely, continuing reduction in CRSP financial resources will require the elimination of program components, reduction of research activities across the board or changes in program structure that may well unfortunately reduce the quality of CRSP science and scientists. This would, of course, diminish potential benefits.

## SENIOR AGRICULTURE ADVISORS REPORT ON THE CRSP ASSESSMENT

J. S. ROBINS

## INTRODUCTION

In response to a request by the Agency for International Development (AID), Winrock International contracted two advisors to assist a review team leader and the joint PPC/S&T Steering Committee in making an assessment of the CRSP's. The assessment is in response to a request by the administrator during the 1985 review of the Science and Technology Bureau Annual Budget Submittal. This report is respectfully submitted by the Senior Agriculture Advisor and will provide observations and conclusions relating to research direction and accomplishments and to linkages developed within the CRSP programs. Observations and conclusions are based on an historic involvement with Title XII programs including CRSP's since 1975 and on recent travels and discussions as described in the appended report. The report will attempt to deal with the several questions posed in the scope of work provided, but it will not systematically and categorically respond on a question by question basis.

## BACKGROUND

The Collaborative Research Support Program (CRSP) concept evolved from activities and discussions leading to the passage of the Title XII Amendment to the Foreign Assistance Act and was loosely described in that document. It was conceived that the U.S. agricultural university community did indeed have a contribution to make to the U.S. Foreign Assistance Program through a collaborative involvement in agricultural research with developing country scientists and institutions.

It was further envisioned that the design and the development of this program should be a joint enterprise of the U.S. university community, developing country research interests and the Agency for International Development. This U.S. university/AID collaboration in evolution of the program was implemented through a Joint Research Committee (JRC) composed of

representatives of U.S. universities, AID and certain other organizations. The engagement of developing country interests came at a somewhat later stage in the process.

The JRC was organized under auspices of the Board for International Food and Agricultural Development. It proceeded over a substantial period of time to identify research areas that might be amenable to this approach, to develop guidelines for the organization and development of such programs and in decision-making on how to plan and implement such programs. Areas selected for such work had to meet certain qualitative standards with respect to subject matter, level of U.S. university competence and prospects for impact both in developing countries and in the United States from research that might be implemented. Included in the criteria were the potential contribution of research to the food supply and to nutrition of poor people in developing countries.

The guidelines also suggested that the research should be additive and complementary to research conducted under mandates of International Agricultural Research Centers (IARC's) and other on-going research activities. As a result, rice, wheat, and maize were excluded since there were heavy investments and "global coverage" by on-going international center work in these commodities. It is interesting to note that research on mandate commodities of several other international centers was apparently considered to be either inadequate or not sufficiently global in scope.

The planning process called for contracting with a Planning Entity (PE) to develop a "global" plan. It was originally believed that there would be a conflict of interest if a PE were to later be a participant in the program. This was later relaxed to permit participation of the PE in the planned research, a move that made good sense in terms of a technical base for planning. In fact, in all CRSPs planned after the first two (small ruminants and sorghum/millet) the planning entity has had a major role in implementation, often becoming the Management Entity (ME).

In the first CRSPs (small ruminants, beans and cowpeas, and sorghum/millet) a concept of "full involvement" of the U.S. university community

prevailed. Thus the early CRSPs engaged a large number of U.S. universities, and visualized working in several host institutions and engaging the full range of subject matter that would contribute to alleviation of constraints in the subject matter area under consideration. Thus, the early CRSPs were quite complex in terms of institutional and disciplinary involvement in contrast to those developed later. The concept also (probably not be coincidence) visualized an open-ended budget.

Conceptually, the planning process was to have first identified in a global context the constraints within the subject matter areas and to engage a wide array of both developed and developing country experts in the planning process. It turned out, of course, that the identification of work sites (i.e., collaborating institutions and scientists) had to await the identification of constraints and prospective research. This made it appear that the programs were designed in a vacuum in the United States and then, at a later time, taken to potential host institutions without their engagement in the basic decision making process. My observations suggest that there was more than a grain of truth to that contention. That circumstance, though in the main unavoidable has been a continuing problem in terms of perceptions of the CRSP model.

The second stage in the planning process was dealt with after selection of a Management Entity (ME) that would have responsibility for overall management and coordination of the CRSP. The ME was to design and implement a process for identifying and engaging host institutions and scientists in developing countries to collaborate in particular lines of work. At least theoretically, this would engage AID field missions, international centers and other on-going project leadership in those selection processes. The extent to which those processes went forward in a thorough and harmonious set of interactions varied from one CRSP to another. In some cases it was done quite effectively. In others important linkage points were missed. Where those points of contact were missed in the initial detailed planning and negotiation, there were often serious follow-on problems, some persisting to the present time. I would hasten to add that, in most instances, in our observation, these early problems appeared to be largely history. It is

important, however, to remember these problems as guidance for the future. If there is one most important necessity in design and implementation of such programs, its surely full and continuing communications.

## RESEARCH DIRECTION AND ACCOMPLISHMENT

### Response to AID Policies, Strategies and Priorities

It seems quite clear that the CRSP's respond in a very positive way to AID's food and agricultural development policies and strategies, to its strategic plan and to general agency priorities. As indicated earlier, the program likewise responds to the Title XII legislation relating to relationships with U.S. universities and the use of U.S. universities in a strategic way to achieve AID goals and objectives. Clearly agriculture is a centerpiece in AID's development assistance, and research to remove constraints to agricultural production, food utilization and nutrition is clearly important in achieving agency goals.

### Target Audiences and Clientele

The CRSP activities undertaken target on poor people in developing countries through improvement in food supplies and/or economies in the acquisition of food and in improved nutrition. They also target on U.S. agriculture as it might benefit from such global research. In my observation, most of the research being undertaken is likely to produce results relevant to those target populations and thus I conclude that the research is generally on target.

Another set of clients that needs to be recognized is the scientific person power in both the developing countries and in the U.S. universities. It is quite evident from a review of the training activities of the on-going CRSPs that one of the large contributions they will make is in adding to the scientific manpower pool in the developing world — a pool that will have a better chance of resolving developing countries' agricultural problems in the future. At the same time, the involvement of U.S. scientists in

globally conceived and implemented research clearly broadens their horizons and makes for stronger competence in dealing with their several functions within the university community — classroom and graduate teaching and outreach activities as well as research.

### Features and Their Purposes

Selection of the title of this program was deliberate and well conceived. The programs are to be collaborative which means that there will be active participation by both U.S. and developing country scientists and collaboration with other elements of the international research system. The programs will be research, which means that they will not be technical assistance or outreach programs nor will they have as a central focus, the building of institutions. The programs will be supported from multiple sources including AID, the U.S. university and the host institution, the latter's support being either in funds or in kind. In general, the host institutions have provided work space, land and counterpart personnel and in some cases local currency resources to support the programs. Finally the CRSP was to be a program — in effect encompassing several disciplines coming to bear on constraints within the general matter area. Each of these elements was deliberately conceived in the program and each has a purpose flowing from the specific words in the title.

In my observation, the features described and their purposes have in large measure been met, although in some cases more clearly than others. It is also quite clear that as professionals are trained in the programs and return to their home institutions to continue the CRSP research, those purposes will be more fully met and the features more clearly documentable.

### Scope and Importance of the Research

In my observation, the four CRSPs reviewed are indeed concentrating on important and needed research that is likely to contribute to improved food crop and livestock production. They fill many niches not otherwise covered by IARC's or national research programs. Thus they generally complement and

supplement rather than duplicate on-going research of IARC's or national programs. Even where there might appear at the surface to be duplication, when one gets underneath that apparent duplication one finds generally that the research is in fact additive and not duplicative. For example, in Honduras there is a continuing interaction and exchange of materials and information between the CRSP scientist in Honduras and the bean breeders at CIAT. Similarly, the sorghum and millet work in Latin America is clearly supplementary and additive to the work of ICRISAT and engages in a collaborative way the research in developing countries within the region.

On the other hand, I would not want to judge how much bean breeding or sorghum/millet breeding and site-specific testing is enough, i.e. when there might be redundancy. That I must leave to those better able to judge. But I do challenge the contention by some that breeding work on any commodity currently within the mandate of an international center should be out-of-bounds for CRSPs. I believe that to be a gross oversimplification. The goal should be one of complementing each others activities because there certainly is plenty of work to go around. Energies should be expended on development of collaboration to take advantage of complementarities rather than in contesting who should be in the drivers seat. At the same time, I think there would be advantages to the CRSPs in strengthened relationships with the international centers in collaborating with developing country national programs. International centers have a history and a continuity in working with developing country institutions. CRSPs could well piggyback on that capability whenever possible.

In terms of the CRSP's current or potential future contributions to increased food production and consumption, there is, of course, variance as one goes from one CRSP to another and from one location to another in a given CRSP. In the relatively limited opportunity for specific observations on that score, I was deeply impressed with the apparent relevance of most of the work. Real constraints had been identified and the individual scientists were hard at work, attempting to devise avenues around those constraints. This ranged from work on the highly aluminum saturated soils in Peru to the semi-arid, water-limiting environment in Botswana. A most

striking example was observed in western Kenya, where the small ruminant CRSP had identified a major problem in the densely populated but more productive environment there. Household intake of animal protein was found to be between 80 and 90 percent derived from milk. The problem was that the traditional source of milk — the large ruminant — was highly inefficient in milk production. The cattle consumed an inordinate amount of the output (forage) from the very small farms on which people were confined with minimal output of milk. An obvious potential answer would be the milk goat provided that one could devise systems that would produce excess milk for local consumption.

A well conceived and designed program is underway. It has already demonstrated that substantial increases (at least a doubling and perhaps as much as 6 or 8 fold) beyond that from large ruminants is possible using improved goats and feeding systems. In six to eight years (1992-94) the hypothesis will have been fully tested. If proven, the findings will have a major impact on the quality of life in many areas where goat production is practiced. The impact will extend far beyond western Kenya. There is no question but that the same principles can be applied anywhere. Thus the impact from that small investment has truly far-reaching implications across the developing world.

As to the value placed on CRSP research by host countries and USAID missions, again one finds a great deal of variation. In general the host countries are quite highly enthused and the response of missions varies from very strong support to at best indifference.

#### Peer Group Impact

Although a principle assignment of the research advisor, I would just comment briefly on the effectiveness of CRSP reviews through the established technical peer group operations. I believe, as a general rule, the external evaluation panels have been a useful device, bringing objective and effective guidance to the CRSPs. From what I have read, seen and heard, they

clearly are not bashful about insisting on high standards, on relevance to development and on the need for better collaboration and multi- and interdisciplinary efforts. The CRSPs have captured some very superior outside talent to serve on panels. Those "volunteers" have devoted a very large amount of time and effort on behalf of the programs. It would be hoped that such input would continue to be utilized and recognized. The rest of the management machinery has sometimes been a bit slow to take cognizance of those admonitions but I believe there is improvement in intra-CRSP communication as time goes on.

## LINKAGES

Given the fact that the team visited only selected U.S. universities, host country sites and international research centers, this report may not fully reflect the linkages that have developed or are developing. I will, nevertheless attempt to interpret from the limited visits what I perceive to be the status of linkages in four general categories: 1) linkages among U.S. universities and scientists; 2) linkages between U.S. universities and host country institutions and scientists; 3) linkages of CRSP programs with relevant international agricultural research centers; and 4) linkages of the CRSPs with AID missions and other AID-sponsored activities in developing countries.

### 1. LINKAGES AMONG U.S. PARTICIPANTS

It seems to be quite clear that in each of the CRSPs, strong linkages have developed among U.S. scientists and institutions engaged in the CRSPs. Although linkages in some instances such as among the soils researchers existed prior to the organization of CRSPs, the existence of the CRSPs provided opportunity and incentive for development of a close working relationship among the several institutions and scientists engaged in the programs. This is clearly evident in the case of small ruminants, beans and cowpeas, and sorghum and millet where the CRSP organization has forced and forged new working relationships that were not present prior to their inception. This has done a great deal to coalesce the expertise in the subject matter areas in both a disciplinary and an interdisciplinary framework.

### 2. LINKAGES BETWEEN U.S. PARTICIPANTS AND HOST COUNTRY INSTITUTIONS AND SCIENTISTS

My observations on the linkages between U.S. universities and developing country institutions suggest quite a variance both within and among the CRSPs. In some instances, these linkages got off to a delayed start and in many cases efforts to forge linkages have been thwarted by personnel changes, changes in emphasis in the work, and even changes in host country

institutions with which the CRSPs have been able to work. But it appears that in most instances, these early difficulties have been overcome and the CRSPs from the U.S. side have developed a much more comfortable and effective working relationship with host institutions and scientists. Part of this is due to the involvement of host country personnel in the on-going research activities particularly where people trained in the CRSPs have returned to take up CRSP research in their home institution.

One difficulty has emerged in terms of which institutions in host countries have been engaged. In some cases, the collaborating institution is a university which often has no direct working relationship and in fact sometimes a competitive relationship with the research agency in the national government. Since CRSPs are research programs and not technical assistance or outreach programs, the utility of their output is dependent upon having some kind of a pipeline from the research activity to the farmer. This relationship is most often effected from the national research organization to the extension system. Thus when a university is involved, this linkage is more difficult than when the host institution is the national research system. It is my observation that the CRSPs have generally moved in the direction of closer working relations with national research systems and somewhat away from the universities. Important to this working relationship is the infusion of research results and new science into the international research system. Thus the working relationships with the international agricultural research centers and institutes becomes increasingly critical.

Finally, the CRSPs are just now beginning to worry about extension of their findings across developing country lines. The sorghum/millet CRSP has dealt with this matter through a prime site/secondary site approach to its research in the several ecosystems under study. The Tropsoils CRSP has begun to concern itself with networking within the environments within which they work. A recent intensive workshop was held in Peru bringing together 30 soil scientists from 11 Latin American countries to review in depth and plan evaluative activities through a networking model. With a modest amount of assistance, both financial and technical, this mode promises to bridge the gap quite effectively. If this form of networking can be promoted and supported in a continuing program, then it is quite clear that the linkages

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being developed and extended will endure. Should support not be continued, then there is serious question as to whether the linkages can be institutionalized. And it is quite clear that leadership from national scientists must emerge if such networking is to last.

In my observation, an important spinoff from the CRSPs has been in strengthening national research capacity. This has been done by the direct collaborative working relationship in the planning and conduct of research and through training of national scientists, both degree and nondegree. There is no question but what the M.S. and Ph.D. scientists who are returning to host institutions will have a major and lasting impact on the effectiveness of those institutions. Beyond that the linkage between those scientists and the U.S. universities will persist through the professional relationships that develop during training and in the planning, conduct and reporting of research results.

### 3. LINKAGES WITH INTERNATIONAL AGRICULTURAL RESEARCH CENTERS AND INSTITUTES

As in the case of the national research systems, the CRSPs have dealt with this subject in different ways with varying results. In the case of sorghum and millet, there had been a standing working relationship among certain of the participants prior to development of the CRSP. These relationships carried forward into the CRSP as the programs were developed. Although communications were not always what they might have been, there has been forged a good working relationship within the sorghum/millet program.

Likewise with the soils CRSP, there was a professional relationship between certain of the participants and two of the international centers with which that CRSP is engaged. Thus, it was fairly straightforward to move with good linkages and collaboration in certain of the Tropsoils work. Further, there exists some networking activities from other programs such as the Benchmark Soils Network, the International Board for Soil Research and Management, etc., in which the key actors from U.S. universities, international centers and national programs found a commonality of interest. Thus, in general the working relationships in Tropsoils are fairly extensive and, although informal, are functioning quite well. Resources are indeed being shared.

In the case of beans and cowpeas, there was not a legacy of such collaboration between U.S. universities and the two international centers involved with these commodities. Those linkages by and large had to be forged in the implementation process. Thus there were some difficulties in sorting out and agreeing on roles. Some of that difficulty continues although both sides have worked diligently to avoid conflict. There is a free flow of information and materials as appropriate to the objectives of individual programs. The relationship has been helped by the presence of leadership in bean research at CIAT and cowpea research at IITA serving as continuing members of the technical committee of the bean cowpea CRSP. This has greatly facilitated keeping the communication channels open which was extremely important to development of these working relationships.

In the case of the small ruminants CRSP, we found quite a different situation. There is clearly a scientist tie between the veterinarians working in the small ruminants CRSPs and the animal health program at ILRAD. There is somewhat less of a professional tie between either the animal or the forage scientists in the CRSPs and those at ILCA. We found the interaction there to be quite casual, in part because there has not yet emerged a base of science in either the international center or the CRSP where there is commonality of interest and thus utility in substantial sharing of resources. I would expect that to begin to emerge over the next three to five years as related technologies emerge from the two programs. Since ILCA is confined in its research to the African continent, and more specifically to sub-Saharan Africa, the Kenya CRSP site is the only one where there is a felt need for collaboration although the Morocco site should also be of interest and concern to ILCA as that work relates to the semi-arid and arid environments where sheep and goats are important in sub-Saharan Africa.

#### 4. LINKAGES WITH AID MISSIONS AND COUNTRY PROGRAMS

These linkages are by all odds the most variable both among CRSPs and among AID missions and personnel. They vary from non-existent to negative to neutral to very positive. Not surprisingly, personalities sometimes get involved as does the philosophy of AID leadership. And the relationship

varies over time depending on individual circumstances. A program may be well received at one point in time and the linkage then dissolves at another. And interestingly, the converse can also occur.

A major problem in the agency's dealing with CRSPs is that mission programs by and large are technical assistance and institutional development whereas the CRSPs are research and do not have those functions as a particular thrust. Thus there is an inherent arena for conflict in attempting to fit a CRSP into a USAID strategy. There clearly are exceptions where CRSPs have been embraced fully by AID missions in a collaborative relationship with the host country research establishment. But there are, unfortunately, other instances in which the relationship is casual at best. It is my considered judgement that the fault is many sided and that there is enough to go around. I think it incumbent on both those engaged in the CRSPs and on missions to work at better communications and see if they can't get on the same team. The communications problem varies considerably among the CRSPs and USAID. Where there has not been free and regular flow of information, the programs have suffered. I believe on the CRSP side that they must do a better job of keeping missions informed, providing them copies of reports and in general work at keeping missions abreast of developments. Where that has been done, the relationships generally are good.

ATTACHMENT

Date: 31 October 1986

Report of Observations on Visits to Management Entity Universities and Field Sites of Tropsoils, Bean/Cowpea, Intsormil and Small Ruminants CRSPs.

J. S. Robins

Washington, D.C.: 27-29 August 1986

After entry meetings of the team with Winrock International Staff, met with:

- o BIFAD staff
- o PPC/S&T steering committee
- o S&T/FA staff
- o Regional Bureau Agriculture Officers
- o Don Plucknett, CGIAR staff
- o S&T/Agriculture staff (Project managers)

North Carolina State University: 2-4 September 1986

Detailed discussions with:

- o Charles McCants, ME/O Director
- o Lawrence Apple, Director of International Programs and Studies
- o Ed Oyer, Chmn., Board of Directors, Tropsoils; Member, Board of Directors, Bean/Cowpea CRSP.
- o Bob Miller, Chmn. of Soils Dept., NCSU rep. to Board of Directors
- o Pedro Sanchez, NCSU Program Coordinator for Tropsoils CRSP.
- o Charles Lassiter, NCSU representative to Small Ruminant CRSP, Board of Directors.
- o Several staff and graduate students.

Washington, D.C.: 5 September 1986

Lengthy visits with:

- o John Coulter, Chmn., Tropsoils EEP

- o Clarence Gray, Chmn., Bean/Cowpea EEP  
Vice-Chair, Sorghum/Millet EEP
- o PFC/S&T Steering Committee
- o S&T/Agr. staff (project managers)

Michigan State University: 8-10 September 1986.

Met with wide array of people:

- o Don Isleib, Director International Agriculture Programs
- o Kim Wilson, Deputy Director International Agriculture Program
- o Ralph Smuchler, Dean for International Programs & Studies
- o Pat Barnes-McConnell, Director MO/ME
- o Russ Freed, Deputy Director MO/ME
- o Ann Ferguson, WID, MO/ME
- o Jim Anderson, Dean of Agriculture
- o Eldor Paul, Chair-Crops and Soils Dept.
- o George Hosfield, Crops and Soils Dept.
- o Mark Uebersax, Food Scientist
- o Wayne Adams, Crops and Soils Dept.
- o Jerry Jacobs. Contract & Grant Admin.
- o Sue Bengry, Sect. - MO/ME
- o Carolyn Snow, Acct. - MO/ME
- o George Arinn - Resource Devel. Dept.
- o Robert Gast - Expt. Sta. Director
- o Paul Magee - Chair - Microbiologist

University of Nebraska - 10-12 September 1986

Met with:

- o Glenn Vollmar, Dir., MO/ME International
- o John Yohe, Rep. Dir. MO/ME
- o D. Woods Thomas, Chmn., Board of Directors
- o Bill Miller, Agricultural Economist - Department Head
- o Darnell Anderson, Agronomy - Head
- o Roy Arnold, V. Chancellor for Agriculture
- o Several scientists and graduate students
- o Roger Uhlinger, Head of Horticulture Dept. and Chmn. Bean/Cowpea CRSP Board of Directors.

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University of California, Davis: 15-16 September 1986

- o David Robertshaw, Director, MO/ME Small Ruminants CRSP
- o Bill Weir, Dep. Dir., MO/ME
- o A. G. Marr, Dean of Graduate Divisions, Member Board of Directors, Small Ruminants CRSP
- o Eric Bradford, Animal Sciences, TC representative
- o Harvey Olander, Veterinary Sciences, former TC representative
- o D. Osburn, Veterinary Science

Lima, Peru: 17-20 September 1986

Met briefly with AID staff:

- o David Flood, Deputy ADO
  - o Tim Miller, Project Officer, Tropsoils
  - o Adolfo Jurado, Project Officer, Small Ruminants
- With Small Ruminants collaborators:
- o Enrique Nolte, Site Coordinator
  - o Chela Prado, Admin. Asst.
  - o Ben Onijandria, INIPA counterpart and former Director of INIPA
  - o Several cooperators from IVITA and from universities (UNA, UNIA) whose names were not provided.

and with:

- o Dale Bandy, NCSU Country Program Office Director
- o Hugo Villachica, Co-Leader of the Selva program, INIPA

Visited field work of Tropsoils at Yurimaguas: 18-19 September 1986

NCSU personnel:

- o Pedro Sanchez, Program Coordinator, NCSU, Raleigh
- o Jose Benites, Team leader
- o Julio Allegro - Crop Mgmt. Specialist
- o Miguel Ayarza - Grad. Student (Pastures)
- o Cheryl Palm - Grad. Student (Agroforestry)
- o Cesar Tepe - Grad. Student (Rice)
- o Bob Scholes - Grad. Student (Rooting characteristics)
- o Mary Scholes - Grad Student (N. Cycle)

and the following counterpart INIPA staff:

- o Manuel Villavicencio - Station Director
- o Jorge Perez - Crop Management Specialist
- o Luis Arevalo - Rice Research

On 9/20/86, I had an exit meeting with Dr. Nolte since the planned meetings with Small Ruminants staff on 19-20 September 1986 aborted due to travel problems.

CIAT, Cali, Colombia: 22-23 September 1986

Had extensive discussions with:

- o Gustavo Nores, Acting Director General
- o Aart van Schoonhoven, Bean Program Leader
- o Carlos Lascona, Acting Pastures Program Leader
- o Jeff White, Bean Breeder
- o Jose Salinas, Plant Nutrition - Pastures
- o Catalino Flores - Intsormil Site Coordinator

Tegucigalpa, Honduras: 25-26 September 1986

Had extended interactions with:

- o Dick Owens - AID Ag. Officer
- o Dan Mechenstock - Intsormil Site Coordinator
- o J. Silvio Zuluaga - CRSP Bean Scientist at Zamorano School

Brief visits with:

- o Gordon Straub - ADO, AID
- o Marco Castro - Intsormil Graduate Student
- o Keith Andrews - Leader of IPM project at Zamorano School,  
Head of Plant Protection
- o Jorge Roman - Dean of Zamorano School
- o Leonardo Corral - Head of Agronomy, Zamorano School

Washington, D.C.: 29 September - 3 October 1986

Follow-up visits with:

- o S&T/FA and Agr. staff
- o LAC Agr. Officer
- o PPC/S&T Steering Committee
- o SAA/S&T, N.C. Brady

Gaborone, Botswana: 9-13 October 1986

Had discussions with:

- o Paul Daly - AID Agriculture Development Officer
- o Mr. Larson - Consultant to Min. Ag. - USDA, PASA
- o Bill Stewart - Jones; Dir., Crops Research, Botswana Ag. Research Service.
- o Jim Paterson - Peace Corps, Bean/Cowpea CRSP
- o Miranda Mortlock - Grad. Student, Intsormil
- o Mary Molefe - Botswana ARS counterpart, Intsormil
- o Doug Carter - Intsormil PI
- o David Gollifer, Director General, GOB/ARS
- o John Hummon, Mission Director, USAID

Nairobi and Kisumu, Kenya: 14-18 October 1981.

Very good discussions with:

- o David Lundberg - ADO, USAID
- o Bob McCulloch - Redso Agricultural Officer
- o Bob Armstrong - Redso Agricultural Officer
- o Bill Faught - Redso Agricultural Officer
- o Adrian Mukhebi - Site Coordinator, SR CRSP
- o Sam Chema - Kenya Min. Ag. - Counterpart to CRSP PI

Five CRSP scientists and counterparts in GOK Agricultural Research Program

- o Ross Gray - Director General, ILRAD
- o Roger Rowe - Assistant Director General, ILRAD
- o Don Mukunya - Former B/C Scientist at University of Nairobi
- o Solomon Bekune - ILCA rep. at ILRAD

cfB

IITA, Ibadan, Nigeria: 20-22 October 1986

Had discussions with:

- o Larry Stiefel - Director General, IITA
- o John Pendleton - Director of Research, IITA
- o Tony Juo - Soil Scientist, FS Program
- o Eugene Terry - Director of Training
- o S. R. Singh - Leader of Cowpea program, IITA
- o Len Reynolds - ILCA Program leader
- o B. T. Kang - Alley Cropping specialist, IITA
- o Paul Lippold - USAID representative at IITA

Washington, D.C.: 23-31 October 1986

Report writing and follow-up meetings in AID

#### GENERAL OBSERVATIONS

I. The distinguishing characteristics of the four CRSPs that we reviewed are:

- A. How very different they are in organization and management, and
- B. How similar they are in concept, i.e. "collaborative", "research", "support", "programs".

Although each "follows" the guidelines, i.e. operates through a Management Office (MO) at a University that acts as Management Entity (ME), has a Board of Directors (BD), a Technical Committee (TC), and an External Evaluation Panel (EEP), the similarity pretty much ends there. The roles performed by the several elements vary a great deal. And in some cases, different actors in a given CRSP even perceive that given roles are performed by different elements of the structure. In one case, the MO plays a strong role in decision making whereas in another the role is quite passive. One TC is very influential in decisions about programs and budgets while another carefully avoids substance in their interactions. Similar differences in behavior and in influence exist among the EEPs. Intsomil has invented a fifth entity - a council of "Ecological Zone Coordinators" which appears to have some significant clout.

The organization of the research likewise varies. Bean/Cowpeas deals with many small, highly targeted projects whereas the other three deal more programmatically with selected environments. Tropsoils operations in a given environment are largely done by one participating U.S. university with some collaborating host country institution whereas Small Ruminants and Intsomil engage researchers from several U.S. and often several host institutions in a given environment. Intsomil engages several countries in a given eco-geographic region but Tropsoils and Small Ruminants confine operations to a single country. Some collaborate intimately with International Agricultural Research Centers (IARCs) by posting scientist at Centers while others maintain a more "arms length" relationship.

But with all those differences, the similarities show through. There is substantial collaboration between U.S. and Developing Country scientists. Generally the collaboration extends to institutions, i.e. U.S. university (ies) and host country research organizations and/or universities. Often there is collaboration among U.S. institutions or scientists. Generally, but not always, AID Missions are parties to the collaboration through participation in funding and interaction in planning and evaluation.

There is "support" from a variety of sources and in a variety of forms. Sometimes it is money, but often it is "things" or people - many times it is technical or moral.

Each of the 4 CRSPs is (or perhaps was) a well-rounded program engaging the several relevant disciplines in a global context. I say, "perhaps was", because with recent funding reductions, what may prove to be key elements of programs, notably in the social sciences, have been terminated.

Finally, each of the 4 programs is engaged in substantive and, by all appearances, quality research. And as scientists trained in the CRSPs return to their home countries, the quality and quantity of research and collaboration goes up significantly.

II. Each of the 4 CRSPs has done remarkably well in attracting quality scientists from the U.S. side. And the participants from the U.S. side have pretty much "stuck with it". There has been less stability on the host country side where frequent personnel changes and ups and downs in support have occurred in several cases.

III. Though perhaps not visualized at the outset, graduate degree training has become a major feature of the 4 CRSPs examined. Through June 1986, 430 host nation students had completed MS or PhD degrees with CRSP support, and a large number of students funded from other sources have done their thesis research in the CRSP's. There is little doubt that this feature may be the most important and enduring output of the CRSPs. The impact of these professionals in government, in universities and in business and industry in developing countries will surely be large and positive.

IV. A parallel contribution in which trained personnel play an important part is in the development and maturation of institutions in the host nation. The presence of the U.S. institution generally, but not always impacts the hosting institution in a positive way. And the impact is accelerated as trained professionals return to the host nation institutions. The developing "alumni associations" of the CRSP's will have a continuing positive influence on U.S./host nation relations in addition to the impact on the institutions in which the alumni work.

## SPECIFIC OBSERVATIONS

### I. TROPISOILS - THE TROPICAL SOILS CRSP

Tropsoils engages four strong US university soil science groups working in four developing countries. In only one case does more than one university work in a given country. This is in contrast to the small ruminants and sorghum/millet CRSPs where several universities may engage in a particular host country site. Although this model greatly simplifies management, it appears to lessen inter-institutional collaboration.

The greatest attribute of this CRSP is that it has brought to bear a critical mass of resources on some of the developing worlds most serious problems. A CRSP didn't have to exist to do that, of course, but it is indeed fortunate that Tropsoils does exist. Only in a very few cases outside the CRSP is the tropical soils problem being engaged in a significant way. There is a great deal of excellent and much needed work underway. It will have a large impact in the long run, provided mechanisms can be found to network the research in environments similar to those in which the CRSP is engaged.

The management office in this particular CRSP plays a very significant role in decision-making. The technical committee plays a lesser role than in the other three programs visited and the Board of Directors appears to lean on the management office to take the lead in both proposing program changes and in their implementation. I was impressed with the stature and impact of the external evaluation panel. It is a small one but nonetheless exercises substantial influence. In recent times it has extended its technical competence by bringing on board for particular reviews, short-term consultants who advise on particular activities.

Concern with how to outreach the technical findings of the CRSP has been addressed, particularly by the North Carolina State University researchers

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working in Peru. A three-week long workshop was recently held bringing together about 30 soil scientists from 10 or 11 Latin American countries. The work in Peru was thoroughly reviewed and ways in which findings could be tested, evaluated and refined in other countries in Central and South America was discussed. It seems likely that there will be four or five mini networks emerge from that workshop. With a modest amount of assistance, particularly with respect to support of the mini network coordinator and in payment of travel costs across the region, there would seem to be good prospects for development of strong linkages among participating countries in evaluating and refining technologies.

Tropsoils feels under some pressure to engage itself on the African continent in the humid/subhumid tropics. Some have gone so far as to suggest that the Peru and Brazil locations be abandoned in favor of a move to one or more sites in Africa. I believe this to be a dangerous suggestion and one which would involve a very large opportunity cost. First, the work would be much more expensive in Africa. Second, the abandonment of the Peru and Brazil sites would incur a five- to ten-year hiatus in program development and a commensurate loss of impetus in the programs. This is not to say that the CRSP should ignore humid and subhumid tropical soils problems in Africa. But it seems to me that the way to do that is to link with IITA in developing and backstopping networking activities in countries such as Zaire, Cameroon, Nigeria, Ghana, Liberia, etc. A good linkage already exists, although an informal one, with researchers at IITA. Those linkages need to be continued and strengthened and, perhaps at some point, a bit more formality developed and implemented in the cooperative relationship.

In summary, I was very pleased with what I saw in Peru and what I heard about the work in Brazil and Indonesia. Findings from that work are already having impact. The activities in Indonesia and in Niger are somewhat less mature than the work in Peru and Brazil so it will require a bit more time before much information for networking becomes available.

## II. INTSORMIL - THE SORGHUM/MILLET CRSP

In contrast to the site specific, programmatic involvement of single institutions in the tropical soils CRSP, the sorghum/millet CRSP employs a multi-institutional prime site/secondary programmatic site approach. Prime and secondary site selection is based on agro-ecologies and at present five zones are under study. The approach does promote inter-institutional collaboration where there is in fact more than one university engaged and it promotes and facilitates collaboration among researchers in more than one country within an ecological zone. The matter of how to retrench in declining budget situations such as presently faced presents a problem in this approach in contrast to the tropical soils activities where an individual institution makes the primary decisions on what to discontinue when there is a funding shortfall. I wonder whether prospective resources can support the range of subject matter currently being pursued in this CRSP. I suspect that some hard decisions will need to be made as to where to place continuing emphasis.

I noted good cooperation between Intsormil and Tropsoils in Latin America where Tropsoils is evaluating acid and aluminum tolerant sorghum lines identified by Intsormil at CIAT headquarters. Some very interesting and promising materials have been identified. I saw no evidence of collaboration with ICRISAT in the Latin America work except as ICRISAT germplasm is used in the programs. Given the potential and interest in sorghum and millet in Central and South America, ICRISAT should perhaps rethink its involvement in that region.

Coming now to southern Africa, the program is really quite different from those in Central and South America. The emphasis is clearly on a relevant set of problems, namely the soil and water conservation problems in the semi-arid/arid environments of southern Africa but with only casual consideration of the commodities dealt with in this CRSP. One wonders whether this work is best done within a commodity CRSP or whether other mechanisms might be more effective. For example, one could visualize an expansion of Tropsoils to take on these kinds of problems or perhaps even the development

of a new CRSP dealing with the relationship between soils and climate and the management and conservation of water. I await observations on the Tropsoils work in Niger which may shed a different light on the range of considerations dealt with by Tropsoils. Finally in the Botswana case, we found little indication of prime site/secondary site collaboration or cooperation. The scientist was cognizant of work being done at Bulowayo, Zimbabwe but was only very marginally involved with some collaborative work between a Botswana Agricultural Research Service scientist and the scientists at Bulowayo.

In summary, I found the sorghum millet research to be moving along rather well even though as indicated above, having some question about the breadth of subject matter encompassed. It may behoove the management elements of this CRSP to do a bit of rethinking and perhaps identify two or three major constraints on which to concentrate efforts.

### III. THE BEAN/COWPEA CRSP

I visited bean work at the Zamorano School in Honduras and cowpea work in Botswana. I also had opportunity to visit with the bean researchers at CIAT and the cowpea researchers at IITA. We also talked to the previous principal investigator in the Kenya program which is now terminated. I also talked with a CIAT staff member posted in Ecuador about that terminated project.

The bean/cowpea work is structured somewhat differently than any of the other CRSPs that we reviewed. It uses a small project approach rather than a programmatic one. This appears to stretch the capacity of its management and the communications capability of the participants.

This CRSP seems to have more troubled projects than the others we visited although it may have been coincidence that the locations we visited happened to have the troubled projects. My impression is that communications were not always what they might have been, which perhaps should be no surprise in an activity as complex as this CRSP. And hopefully most of the



trouble is now history. In the early going there were similar difficulties with both small ruminants and Intsornil but those seem to have been dealt with.

Interesting views were expressed by the leadership of the bean and cowpea research at the two collaborating international centers. Both felt that the engagement of U.S. universities in bean and cowpea work might be more effective if more emphasis were directed to "upstream" rather than "downstream" problems. They also expressed a view that the IARC's could be "exploited" in fostering working relationships with developing country scientists. This raises the larger question of how one structures a CRSP that engages research areas that are within the mandates of international centers. Is there a way to structure a more mutually supportive relationship? Perhaps those involved with the CRSP's and IARC's should do some brainstorming on this question. A case in point exists presently as the networking approach in Africa is fleshed out and the roles of IARC's and CRSP's in that networking worked out.

As to working relationships within the management structure of this CRSP, the rotation of membership on both the Board of Directors and the Technical Committee has perhaps left a vacuum at times, but I feel that problem is pretty well resolved at this point. Working relations now seem to be much better than at certain times in the past. A trust relationship has developed between principal investigators working in the program and the several management elements. As these relationships mature, the past problems are not likely to recur.

In summary, I would observe that this CRSP, due to its complexity and to lack of international experience among U.S. bean and cowpea researchers had considerable start-up problems. I think most of these have been dealt with. A very great deal of excellent and useful research has been and is being done. Even at locations that have been or are being closed or redirected, some of the research has been productive and useful results obtained. Still I would observe that the program has not yet coalesced into a fully collaborative program although a great deal of progress along that line has been made.

#### IV. THE SMALL RUMINANTS CRSPS

Finally we come to the oldest CRSP — small ruminants. As in the case of other CRSPs, this one had growing pains in the beginning. A large number of universities, a very complex inter-institutional working relationship and a large number of individual scientists with a comparable counterpart scientific cadre contributed to the early difficulties. Beyond that, at least in the case of Kenya, the use of graduate students and later junior scientists to perform the work simply did not prove to be a viable option. In Peru, it was evident that there was quite substantial and effective inter-institutional working relationships among the governmental agricultural research establishment and at least two universities in that country. I would suspect that engagement of graduate student and post-doctoral fellows in that instance might work better than apparently it did in Kenya.

The early going notwithstanding, it is apparent that both in the Latin America and Kenya instances, this CRSP has matured to a very effective programmatic activity. Mature scientists are engaged and the host institutions are providing first rate counterparts in pursuit of relevant research whose objectives are quite clear and well defined. It is evident that a great deal has been accomplished and that given another five to ten years, a very great deal more will be.

The technical committee in this CRSP is quite strong and in general has pretty much called the shots. It appears that the management office has been subservient and responsive to the technical committee and to the Board of Directors. This perhaps has lessened the decisiveness with which the management office has been able to deal with problems in host countries and at participating U.S. university levels.

In summary, I observed this to be a well-matured functional and effective program which has done and is doing relevant and useful work in the interest of poor people in developing countries. I believe that more cognizance might be taken of opportunities to collaborate with ILCA, particularly

in the sheep and goat work being done at IITA. It was not evident that either the CRSP or the ILCA scientists were really cognizant of the others' work on quite similar problems.

## V. LINKAGES

Several sets of linkages will be considered here.

### A. U.S. Institutional Linkages

It is quite apparent that at least three of the CRSPs have made great strides in improving inter-institutional linkages within the United States. The soils CRSP participants of course has a long history of collaboration among the four involved universities as a result of earlier 211-D and other institutional grants such as the benchmark soils project. In the case of small ruminants and beans and cowpeas, in particular, and to a considerable extent the institutions in INTSORMIL, such early collaboration was less evident. The CRSP program has forged strong working relationships among the several participating universities. These linkages will be a major positive force deriving from the CRSPs.

### B. U.S. University/Host Country Institutional Linkages

The degree of development and effectiveness of U.S. universities/host government institutions linkage is variable both among and within CRSPs. In some instances, it is a scientist to scientist relationship as prevails somewhat generally within the bean/cowpea CRSP. In others there is a multi-institutional linkage among several host country institutions and several U.S. universities as in the case of small ruminants in Peru. In still others, there is a single or a multiple U.S. institutional involvement with a single institution in a developing country as in the case of small ruminants in Kenya. Again, this variety and level of linkage will have major continuing impact where such linkages are now succeeding and continue to, receive the nourishment to persist.

On the other side of the coin, there have been negative linkages generated where lack of communication and misunderstandings have resulted in some serious conflicts in inter-institutional or inter-scientists relationships. In general the CRSPs need to take cognizance of and deal on a timely basis with the interpersonal and inter-institutional conflicts as changes in the CRSPs are negotiated and implemented.

### C. CRSP/AID Linkages and Relationships

As in the case of other linkages and working relationships, the CRSP/AID relationships vary markedly. In some cases, missions have been highly supportive and have taken in the CRSP as a long-term component of their development programs. In other cases, there have been serious conflicts and disagreements with respect to the CRSP presence and activities in the country.

These differences in relationships generate from several underlying causes. Not the least of these is personality conflicts between one or more of the actors involved with the relationship. Secondly, the AID propensity to redesign rather than to implement programs sometimes has been a factor. Thirdly, on occasion there has been a negative bias toward research. Fourthly, there has been a competition for control of resources. And finally, and most importantly, has been the differences in level and effectiveness of communications between CRSP managers and scientists and AID Washington and Mission staff.

Some of these problems are more amenable to solution than others. It is difficult to overcome biases but less difficult to improve communications. But above all, it is incumbent upon both AID and the CRSP management to recognize two important facts: 1) research is a long-term enterprise that is highly supportive of the developmental process. Maintaining continuity of programs is extremely important. 2) CRSP leadership must recognize the importance of involving missions in these programs. Maintaining communications and interactions that can lead to mission "ownership" of programs is critical.

Further to the question of CRSP/AID relationships is in the area of continuity and assurance of funding. In particular is the need to have assured funding for much longer time horizons than currently is the case. For example, the small ruminants CRSP is extended currently to the end of fiscal 1987 without even tentative assurance of continuation. Beyond that the level of funding for the last year of the project is in some uncertainty. In the soils and certain other CRSPs there is an apparent problem in terms of pipeline requirements. AID clearly needs to recognize that funding assurances must be extended and adequate funds made available for CRSPs to meet normal commitments to faculty, students and host governments if CRSPs are to remain a viable on-going enterprise.

Beyond the need for assured and stable longer-term funding, it would appear that the CRSPs have been subjected to repeated reviews and critiques. This has contributed to a feeling of insecurity which has been and continues to be a penalty to the effectiveness of the program. They simply should not be subjected to the kind of uncertainties that go along with such frequent and pervasive reviews. AID should have faith in the management processes that were jointly evolved and be prepared to let them work.

**RESEARCH ADVISOR'S REPORT FOR THE CRSP MANAGEMENT REVIEW**

**by**

**K. O. Rachie**

**August 27-September 26, 1986**

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RESEARCH ADVISOR'S REPORT FOR THE CRSP MANAGEMENT REVIEW

August 27-September 26, 1986

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## BACKGROUND

Following the 1985 review of the USAID Division S&T-ABS the Administrator requested that S&T and PPC undertake a review of the CRSP Program and determine its effectiveness as a long-term investment. The purpose of this review was not to evaluate the technical quality of the research effort nor to second guess their technical judgements. Rather it was intended to assess the effectiveness of the peer group process and to assure that the peer groups are independent, composed of proven talent in appropriate areas, and asking the right questions. By this means it should be possible for AID to effectively measure technical progress and determine from a technical standpoint whether the CRSPs are on target and whether their research is conducted according to internationally accepted standards.

### Review Activities

The review itself was conducted during the period August 27 through December 31, 1986 of which the research advisor participated in domestic travel to Washington, D.C., four participating lead universities and Winrock International Headquarters in Arkansas during the period August 27 through September 26, 1986.

The review panel, comprised of three members, assembled in Washington on August 27 and began a round of consultations and discussions with USAID personnel, resources people in the World Bank and other Washington agencies; and then commenced a series of visits to the four lead universities of the following CRSPs:

- Tropical Soils -- NCSU, Raleigh, North Carolina
- Small Ruminants -- UCD, Davis, California
- Beans and Cowpeas -- MSU, East Lansing, Michigan
- Intsormil -- UN, Lincoln, Nebraska

From Davis the research advisor proceeded on to Winrock International Headquarters at Morrilton, Arkansas for further study, review of field

notes, and writing up of his report. His assignment was terminated on September 27, 1986.

### Consultations

The review team met with a large number of resource persons on the several aspects of program management, planning, operations, evaluations, and organizational matters. While all consultations are judged to be very useful to the team's overall assignment, those meetings considered most relevant to the research aspects of the four CRSP programs included sessions with the following:

1. J. Malcolm and T. S. Gill -- AID/W on the Trop-Soils CRSP
2. H. Hortick -- AID/W on the Bean, Cowpea, Intsormil, and Small Ruminants
3. D. Plunkett -- The World Bank, Washington on all CRSP programs
4. J. Coulter -- The World Bank, Washington on the Trop-Soils CRSP
5. C. G. Gray -- Member EEP for Beans, Cowpeas, and Intsormil.
6. C. B. McCants -- Program Director for Trop-Soils at NCSU, Raleigh, NC
7. R. Miller -- Head of the Soils Department at NCSU, Raleigh, NC
8. P. A. Sanchez -- PI for the Trop-Soils CRSP in Peru
9. E. Oyer -- Chmn. Trop-Soils Board and Member-Bean/Cowpea Board
10. C. A. Lassiter -- PI for Small Ruminants Nutrition at NCSU, Raleigh, NC
11. P. Barnes McConnell -- Program Director for Bean/Cowpeas -- MSU, East Lansing, Michigan
12. R. Freed -- Associate Program Director, Bean/Cowpea CRSP, MSU, East Lansing, Michigan
13. M. W. Adams -- PI for bean breeding, MSU, East Lansing, Michigan
14. M. A. Uebersax -- PI for bean quality studies, MSU, East Lansing, Michigan
15. A. Ferguson -- PI for social science investigator, Bean/Cowpea CRSP, MSU, East Lansing, Michigan
16. G. Vollmar -- Program Director, Intsormil, UN, Lincoln, Nebraska

17. J. Yohe -- Assistant Program Director, Intsormil, UN, Lincoln, Nebraska
18. R. Uhelinger -- Chairman of the Bean/Cowpea CRSP Board
19. M. Clegg -- PI for sorghum agronomy, UN, Lincoln, Nebraska
20. J. Maranville -- PI for mineral nutrition of sorghum and millet, UN, Lincoln, Nebraska
21. J. Eastin -- PI for sorghum millet physiology, UN, Lincoln, Nebraska
22. W. Nelson -- PI for Intsormil economics, UN, Lincoln, Nebraska
23. D. Nelson -- Head of Agronomy and Soils, UN, Lincoln, Nebraska
24. W. Weir -- Former Program Director for Small Ruminants, UCD, Davis, California
25. E. Bradford -- PI for animal genetics-Small Ruminants, UCD, Davis, California
26. D. Osborne and H. Olander -- PIs for Small Ruminant health, UCD, Davis, California
27. B. Webster -- PI for Bean/Cowpea CRSP, investigations in Kenya -- UCD, Davis, California
28. I. Buddenhagen -- Coordinator for Food Legume Investigations, UCD, Davis, California
29. C. Qualset -- Director of the Genetic Resources Conservation Program, UCD, Davis, California
30. S. R. Temple -- Former Bean Breeder at CIAT; now Extensionist, UCD, Davis, California
31. B. Swanson -- PI for bean quality investigations at WSU, Pullman, WA

### Graduate Students

Graduate students have a particularly important role in the trop-soils program both at their home university and in host countries. At present the NCSU program has 18 graduate students, nine of whom are supported by the Trop-Soils CRSP. Not only do these graduate students contribute to the research program, they also serve as representatives of the Trop-Soils CRSP abroad. In such assignments, carefully-selected, mature, and internationally-oriented graduate students serve as junior scientists and key elements of the Trop-Soils CRSP in the host country. In some

cases, the student may be the only expatriate representative of this CRSP at some locations in target countries (Peru, Brazil, Niger, Indonesia).

At MSU we met with ten graduate students representing a very wide range of agro-ecological zones from Iraq to East Africa, West Africa, and Mexico. They are completing their Master's and Ph.D. degrees in such highly relevant topics as bean quality -- especially cooking time and starch characteristics; epidemiology studies of bean bruchids; genetic diversity including electrophoretic patterns of isozymes in beans from Malawi; the occurrence and nature of anti-nutritional elements in cowpeas; combining drought resistance and nitrogen fixation in beans; and intercropping studies of beans with maize and other associations.

The graduate students working on sorghum and millet at Lincoln were likewise very interesting, representing host countries like India, the Philippines, and Colombia. Their projects include investigations on phosphorus uptake efficiency utilizing the vesicular-arbuscular mycorrhiza and the effect of aluminum on P uptake in sorghum. Other students were studying nitrogen metabolism in sorghum, the physiology of drought resistance in sorghum, and development of an effective screening technique for evaluating drought tolerance. All of these students indicated plans to return to their home country on completing their degrees.

Although time was too short to meet with students of the Small Ruminants CRSP, that program has been particularly productive in training 77 M.S. and 48 Ph.D. students in the U.S.; and 56 M.S. and 5 Ph.D. students in their home country. In addition, a large number of students and young researchers have received various kinds of technical training under the auspices of these CRSP programs. The quantity and quality of graduate and technical training resulting from CRSP program activities are judged to be excellent and will undoubtedly represent the most significant and enduring contributions of this and the other CRSP programs.

#### RELEVANCE OF THE RESEARCH

The technical programs of the four CRSPs reviewed, with few exceptions, appear to be of excellent quality and quantity. In general, the

research appears to be highly relevant in addressing the major constraints to increased production and utilization of the target commodities and to improved management of some tropical soils. However, it is not entirely clear how priorities are established nor whether the current mechanism for allocation of resources is appropriate to the magnitude of need as viewed by the potential users and consumers of the respective commodities in targeted regions abroad. Undoubtedly, the PIs of domestic institutions in the U.S. exert a strong influence on both the disciplinary and problem focus of the programs underway. While it may be assumed that most of the directions and resource allocations are efficiently used by the different programs, it does not necessarily hold that these are always appropriate to the situation and need.

#### The Four CRSP Programs

The four CRSPs have developed programs that are clearly beneficial to both domestic and host country goals and activities. There may be instances where investigators tend to compromise development priorities somewhat in favor of their own interests. However, the different managerial strata have attempted to rectify such aberrations and it appears they have been largely successful in this function (when given enough time).

There is a limit to how much supporting research can be carried out in domestic institutions. For example, most U.S. institutions are located in temperate or sub-temperate climates where only one field crop a year can be grown under long-day lengths. This limits the possibilities for field research on crops like cowpeas, pearl millet, and other associated tropical plant species.

**Trop-Soils.** The CRSP program appears to have the highest immediate relevance and impact on tropical agriculture development Trop-Soils. This CRSP has built on a long history of activity, mainly in the low humid tropics of Latin America, and has a cadre of highly qualified professionals involved in the program. Most of their PIs, especially at NCSU, have extensive field experience and have produced a large body of knowledge and expertise in soil research in the low humid tropics.

However, their expertise in the semi-arid tropics is more recent and less extensive.

The Trop-Soils CRSP is distinct from the other three CRSPs in that it is focused on the management of a basic resource rather than a commodity. For this reason, the application of tropical soils technology must be linked with a commodity -- plants or animals -- to be useful to the primary client. Since much of the applied knowledge about soils of the humid tropics is already reasonably well understood, it may be desirable to include other basic resource studies (e.g. rainfall, temperatures, humidities, and wind) and native or otherwise useful plants -- both domestic and wild.

**Small Ruminants.** The Small Ruminants program was found to be both highly relevant and to have potential for making a significant impact on some of the World's 700 million sheep, goats, and camelids. This program is the oldest of all CRSPs, being established in 1978, has had exceptionally good leadership from the outset, has mobilized outstanding talent in both domestic and host country scientific communities, and has made excellent progress in understanding animal responses to a wide range of ecological and management conditions across the three continents (Peru, Brazil, Morocco, Kenya, and Indonesia). Much information on socioeconomic factors and interactions has been collected, analyzed, and used in planning research activities and strategies. Rapid strides have been made on understanding the nutritional aspects of animal production involving a range of forage, browse, and crop residues.

Small ruminants are an integral and ubiquitous enterprise among small farmers of the developing world. The SR-CRSP has in the past eight years assembled an impressive body of knowledge regarding the production of small ruminants in their target regions. Moreover, animal technology is more universally applicable across environment and management systems than it is for plants and crops. This means that good technology and management practices are widely applicable; but it may also imply that future breakthroughs in research findings are likely to be more incremental than the major breakthroughs achieved in the past. Essentially

then, current and future needs will increasingly become problems of adapting and extending the knowledge already available.

Two areas are exceptions to this thesis. The fundamental problem of small ruminant production in LDCs centers on animal nutrition. This involves increasing the total availability of balanced feedstuffs and providing for seasonal fluctuations in both quality and quantity of forage in sub-humid to semi-arid regions. Unfortunately, the supply of animal feedstuffs is another dimension requiring the attention of a separate CRSP comprised mainly of range and forage specialists.

The second aspect of animal production where further investigations of both a substantial and fundamental nature are required is that of animal health. It will be essential to continue the development of practical control measures for the major endemic diseases and parasites of animals in small farming systems.

**Beans/Cowpeas.** This program focuses on two important yet largely neglected crops that contribute widely to the quality of human nutrition and life in the developing tropics. In comparison with other subsistence crops like maize, wheat, and rice, the number of bean and cowpea researchers and production specialists is very small both relatively and absolutely. In fact, most of these scientists and specialists, at least in Latin America and Africa, are associated with CIAT (beans), IITA (cowpeas), and the Bean/Cowpea CRSP. Although the two IARCs have made considerable progress on improving these two crops, the level of work underway is not commensurate with worldwide needs. Since constraints in the technical domains relating to the production of these crops are very great and complex, they will require the application of sustained efforts by the world's most knowledgeable scientists over many years to come.

The Bean/Cowpea CRSP has not yet had a measurable impact on the production of beans or cowpeas, but it has produced valuable, useful additions to knowledge and production technology. In certain areas of bean and cowpea research -- biological nitrogen fixation; breeding for resistance to drought and soil stresses; socioeconomic studies and gender issues;

processing procedures to improve nutritional and taste qualities; and certain aspects of crop evolution, biological control of insects, epidemiological studies and seriological diagnostic screening -- the CRSP is the most significant and sometimes the only contributor. This program appears determined to integrate its efforts with that of the earlier established IARCs and to carry out the project both in regions and disciplines complimentary to that of the two IARCs.

The short-term impact of the Bean/Cowpea CRSP is not yet significant due to the shortness of time it has been operating. However, the long-term impact of this program given wise and effective management is likely to be very great since the need and the demand for these two commodities in terms of upgrading human diet and quality of life is practically unlimited. Therefore, this program should rapidly increase in effectiveness over the next three to five years.

**Intsormil.** The Intsormil program is very similar to that of the Bean/Cowpea CRSP in relevance and impact. However, Intsormil does build on a somewhat larger base of knowledge and pool of scientists particularly in the case of sorghum which has been worked on more extensively than beans or cowpeas, both in the United States and abroad. The opposite is true for pearl millet, which might be compared with cowpeas in respect of the base of knowledge and prior work done on this crop. Nevertheless, some profound and revolutionary developments have occurred in both these crops as a consequence of sustained efforts by a small cadre of highly competent and dedicated scientists both in the U.S. and abroad, particularly in India. A fundamental constraint to the production of both sorghum and millet (as well as cowpeas) is that they are almost universally rainfed commodities and subject to other soil stresses, especially pH extremes, depleted soil fertility, and poor physical characteristics; and are susceptible to a host of insect and disease pests throughout the major growing regions.

In addition to applied biological advances, considerable progress has been made on socioeconomic studies, institution building, strengthening CRSP relationships with country missions and national programs, effecting interdisciplinary collaboration, and training young scientists

from host countries. In general, the relevance of the Intsormil is likewise rated very highly as it seeks to address those constraints not covered well by ICRISAT. Therefore, the future for this CRSP appears very promising.

Further details on CRSP research accomplishments are included in Annex 1 of this report.

### Potenital Impact

The CRSP programs have attracted some of the best scientific talent available in the U.S. and, often, in the world; but some programs are likely to have more immediate impact on tropical agriculture than the others. For example, the Trop-Soils CRSP will probably have the greatest short-term impact on targeted area LDCs. The Small Ruminant CRSP is likewise expected to make some early contributions in regions where sheep and goats are important. On the other hand, the Beans/Cowpeas and Intsormil programs have not yet had time to make any meaningful contributions on a sustained basis. However, their potential for longer-term impact could be greater than that of the other two CRSPs.

In order to continue its present high standard of productivity, the Trop-Soils CRSP may need to expand its scope to include the acid savannas and stepland; and(or) broaden its studies of the resource base -- e.g. climate, water, and adapted plants (as well as soils). In any event, Trop-Soils can only measure its contributions through commodities produced -- e.g. plants and animals. Therefore, this CRSP needs particularly close linkages with the commodity programs.

### Participant Benefits

The CRSP appears to be the best ever multi-lateral research program aimed at applied problems in LDC smallholder systems. It is highly potent in bringing to bear some of the best domestic scientific expertise on major production constraints on a partnership basis with host-country scientists. From AID's perspective it buys three dollar's worth

of program for each two invested. The operative word for the CRSP concept is "collaboration", implying not only international partnership, but also close cooperation with researchers in partner institutions, and even within the same university -- an approach frequently neglected in modern, sophisticated institutions.

The CRSP program has become very popular with participating institutions -- at least in the USA. Without exception all respondents were highly enthused about the way these programs are structured and operated. Investigators welcome the opportunities created and are greatly inspired by their participation in solving important problems in LDCs. It is obvious they have been broadened by the experience; begun to appreciate different approaches to their domestic programs; gained access to a much broader range of germplasm; and discovered the several benefits from a team effort on difficult biological problems. In addition, they realize some additional research support and have greater opportunities for travel, which contribute directly or indirectly to their domestic responsibilities.

The CRSPs have some obvious advantages for collaborating host countries. Perhaps for the first time they become full-fledged partners in a global mission of critical importance to the poorest segment of their populations. Moreover, they receive significant operational support that supplements national budgets that are all too frequently inadequate or delayed.

Perhaps the biggest attraction to HC collaborators is the unique opportunity of working closely with eminent international scientists -- professionals who can contribute directly to their national programs and to their international status as productive researchers.

The CRSPs have also become prime sources of training in target regions - - 558 Masters and Doctorates and 1,255 technically-trained students were completed by 1986. This does not include the benefits derived by some 550 LDC scientists in their CRSP associations with U.S. campus-based scientists. Over the long term, this training will have the greatest impact on national development.

## CRSP MANAGEMENT

The role of management in CRSP programs will be subject to more extensive scrutiny by other review team members. However, the ways in which the CRSP are managed do have an immediate and direct impact on research planning and execution. Therefore, it is appropriate to include some observations and impressions on the management process in this section. A study of only four CRSPs revealed that despite a set of common guidelines, the management process was astonishingly different between CRSPs.

All respondents to our queries about the value and efficiency of CRSPs in furthering improvement work on major food commodities and on Trop-Soils were uniformly highly favorable -- at least amongst the universities involved. The concept is brilliant in terms of getting diverse institutions to work closely together. It has tapped a fantastic resource base involving a true partnership in which AID contributes 67 percent of the resources, and the participant universities, together with their host countries, invest the remaining third in cash or in kind. The projects underway involve the leading researchers in their field, both in this country and abroad. However, according to several respondents, the real genius of the CRSP concept is collaboration. This collaboration brings both university and their host country participants together with IARCs and other scientists on a truly partnership basis. Engineering this combined effort on investigating a common set of problems is necessarily complex, requiring a high degree of tact and diplomacy as well as hard work. It involves a multi-layered management structure that includes the services of a full-time director and associate director for the execution of programs, and a stratification of boards and committees to carry out the necessary joint planning, provide institutional approval and commitment, and render impartial oversight on the program. In fact, one CRSP, Intsormil, added an additional committee called the Eco-geographic Zone Consul (EZC), comprised of six members with special knowledge and familiarity of the six major regions where that CRSP operates.

## Contrasting Management Styles

Management roles differ markedly amongst the four CRSP programs despite a common set of guidelines prepared for Collaborative Research Support Programs under Title XII by USAID (June 21, 1985). Most interesting were the differences between the different CRSP programs and the functions of their Boards of Directors (BD), External Evaluation Panels (EEP), and Technical Committees (TC). The guidelines state that the Board operates under a defined charter to deal with policy issues, to review and pass on plans and proposed budgets, to assess progress, and to advise the Management Entity (ME) on these and other matters. The EEP's responsibility is to evaluate the status, funding, progress, plans, and prospects of the program and to make recommendations thereon. The TC is established with membership drawn primarily from the principal scientists to develop work plans and budgets, review the technical progress of the total research program or components thereof, propose modifications in the technical approach, and make recommendations on allocation of funds. These recommendations are reported to the ME and shared with the BD. However, the real functions of the three management activities vary from program to program as summarized below:

**Trop-Soils.** In the case of Trop-Soils the Board is considered as advisory to the management entity and may be overruled if the ME does not agree with the Board's recommendations. The EEP is also advisory to the ME and appears important in assessing balance and relevance particularly on the international side. However, the TC is very weak, has little influence or impact, and in fact, hardly ever meets. Therefore, the Program Director (PD) and ME are exceptionally powerful, but have established a reputation for being highly efficient and impartial.

**Small Ruminants.** This was the first CRSP to be established. By all accounts the first Program Director, D. Robinson, who developed and guided the program from the beginning, did a superb job. Unfortunately, his untimely demise in 1985 necessitated the appointment of interim directors, the most recent of whom has served less than a month. However, the present acting director will continue this position if conditions are favorable. He appears to have excellent qualifications for this important responsibility.

The SR Board includes nine members, five of whom are from host countries, and it meets once a year; but the Executive Committee (Excom), comprised of five members including one HC representative, meets more frequently as necessary. Although the Board and its Excom are considered to have functioned effectively and as intended, they were unable to allocate the recent budget cuts on a rational basis. Instead, the Board decided to reduce all projects on an equivalent basis.

The EEP is held to be very important in reshaping programs, especially in relation to development and outreach. The TC also carries much weight in the small ruminant program. In terms of planning, recommending of budgets, and making other policy decisions it is concluded that the SR-CRSP has been highly effective in developing its programs, in establishing linkages with host countries, and in promoting intra-institutional projects. This is attributed mainly to the effectiveness and excellent direction of the former program director. However, prospects are good for this CRSP to continue its high standard of operation if the current director designee assumes this position on a continuing basis.

**Beans/Cowpeas.** This CRSP is characterized by a much less influential Program Director, possibly because the director is a social scientist managing a high proportion (about 90 percent) of biological research programs. Moreover, the TC plays a critical role in assessing the rationality of the program, reviewing projects for technical quality and recommending resource allocation. Here the Board is the prime decision maker on matters of policy and budget. The EEP is considered to have performed its functions very well, but is somewhat overweighted on administration. However, there is a move to shift the EEP's emphasis to the technical side and international development. Thus, the Bean/Cowpea CRSP is characterized by a strong TC and Board.

**Intsormil.** This program developed rapidly under the first PD who exercised a high level of direction and control on the evolving program. However, this initial advantage was offset by serious management deficiencies later on and it became necessary to change the Director in 1984. Intsormil board is considered to have functioned very well, to

have acted decisively and impartially in changing directors, modifying programs, and phasing out less productive activities. The TC has also been very effective in carrying out its functions and responsibilities, the most important of which include developing plans and strategies for the program. However, the functions of the TC have been modified with the establishment of the Eco-geographical Zone Committee (EZC) with which it interacts and consults on the problems and needs of the different regions in which Intsormil operates.

The EEP, on the other hand, appears to be much less effective than is the case with Trop-Soils and Bean/Cowpea CRSPs. In fact, one respondent suggested that Intsormil EEP could be phased out without any diminution of program functioning and effectiveness. Moreover, the chairman of the Intsormil Board felt the EEP had not been effectively used, but it was essential to the program in terms of legitimizing the program with AID and other external participants. However, the present program directorship is rated very highly by the Board, the TC, the EEP, and other participating researchers. In fact, most of the early criticisms and recommendations made in previous reviews have been systematically addressed by new management. Therefore, Intsormil is considered to be one of the most effectively managed programs among the four CRSPs.

#### Overall Management Effectiveness

The four CRSPs studied, though ostensibly based on the same management formula, have evolved quite differently in the way each of them functions. Although the boards function similarly, the contrast between the EEPs and TCs are much greater across the programs. In particular, the TC is most variable -- in the case of Trop-Soils it has little function or purpose as currently structured. In other programs with more compliant management (e.g. Small Ruminants and Bean/Cowpea) the TC yields much more influence and power in the planning and execution of their work programs. It is also apparent that the EEP is utilized at different levels of effectiveness amongst the four CRSPs. This may reflect conditions of early program development, attitudes of the ME and MO, and the personalities of the panel members themselves. The Bean/Cowpea and Trop-Soils EEPs appear to have been more effective and

influential than those respective panels in Intsormil and Small Ruminants. Perhaps new management in the latter two programs will attempt to make better use of their EEPs in future.

Despite differences and contrasts in management, all four CRSPs appear to function very well in terms of program execution -- at least in the context of the domestic institution. However, this observation does not consider the efficiency of budgetary allocation and resource use which would be analyzed in another section of this report.

### Improving Management

The several obvious benefits of the CRSP program should not imply that further improvement is unnecessary. In fact, there are some aspects which may merit further attention:

**Budgeting process.** In general, the Board of Directors, comprised mainly of administrators from participating institutions (largely controlled by the recipient university Excom) cut the budget pie. This arrangement is simply too cozy and prone to distortion in various ways. Perhaps the budgeting exercise should be carried out with more balance by including at least one or two strong HC representatives and(or) other external, impartial (nonrecipient) members in the process.

**Top-heavy management.** The stratification of management at three or four levels besides two full-time professional directors appears somewhat excessive. Intsormil has even added an "Eco-geographical Zone Council" (EZC). On the other hand, the EEP may not be used very effectively by some CRSPs. Perhaps the EEP could become more effective by reducing the standing committee to two or three members and co-opting external experts for special reviews of program activities at less frequent intervals (when notable progress or lack thereof is apparent). In the case of Intsormil, an effective EEP might even partially fulfill the role of the EZC.

**Setting priorities.** It appears that participating domestic institutions play a dominant role in setting program priorities with obvious implications for cutting the budget pie. Moreover, there seems to be

relatively little input from the ultimate users and consumers of the proposed technologies. To some extent, the socioeconomists should assume a protagonist role for LDC interests; but active participation by HC members of the Board and other management committees should be both encouraged and ensured. Some CRSPs have only nominal HC membership, and Boards often bypass their voices through Excoms or other devices.

**Regional focus.** There is a general consensus that tropical humid and semi-arid Africa is in greatest need and is also a major producer of cowpeas, millet, sorghum, and small ruminants. Yet, there appears to be some reluctance among the CRSPs to develop projects on that continent. This is understandable, given the difficulties of travel and posting staff there, lack of even minimal facilities, and dearth of trained researchers to collaborate with. Yet, there are many important ecological producing zones where meaningful research is virtually impossible.

Perhaps one longer term solution would be to encourage an organization like the CGIAR or the World Bank to establish some low-profile, regional centers based on eco-geographical definitions and needs (similar to the ICRISAT centers at Niamey and Bulawayo). These could provide modest facilities to a wide range of interested institutions from the U.S., other developed countries working on a range of related agricultural problems, LDC researchers, and IARC scientists.

**Flexibility.** Present management lacks flexibility to make needed changes, particularly with regard to key personnel, phasing out of less productive or relevant projects, and diverting resources to more profitable activities. Although changes are made, they are often too late to avoid undesirable consequences or allow a graceful changing of directions. Since priorities change as advance and development programs, some mechanism must be found to ensure management moves more expeditiously, particularly in making hard decisions. There may be two keys to this problem -- ensure that the EEP is used effectively, and include strong HC participation in the decision-making process.

**The peer review process.** The peer review process works well in the CRSP context when applied to identifying major constraints, planning a course

of action, critiquing proposals, and evaluating the quality of research done. However, it does not work so well in making hard, major decisions (such as key personnel changes or phasing out less productive projects and activities). Moreover, it is unrealistic to expect the TC or Board to make important decisions affecting one of their own members. Therefore, other means are needed to trigger major changes and actions (see No. "flexibility" above).

## CONCLUSIONS

The CRSP concept is a magnificent idea whose time has come. The first five to eight years have been largely exploratory, but this initial period is also marked by some solid accomplishments both in terms of research progress and institution building. USAID will reap much credit in the future for the many promising developments underway. The domestic institutions (US) are highly enthused by this new program, but some further fine-tuning of management may be beneficial. However, the greatest danger at this stage would be to impose any further cutbacks in budget. This will inevitable result in loss of interest and the compromising of several important program goals. This program is necessarily a long-term endeavor and cannot tolerate threats of declining resources -- especially when imposed abruptly. If further cuts are necessary, then entire programs should probably go first. Another solution might be to seek outside sources of funding (e.g. from industry, international bodies, philanthropic institutions, other). This would allow continuing the present high-priority projects and even expanding into some urgently-needed new areas and activities.

The CRSP programs have great potential to contribute to food production and agricultural development in the poorest-of-the-poor LDCs. Although they represent a step in the right direction, their collective efforts do not begin to address the total problem. For example, it is highly doubtful whether the major constraints, like animal breeding, plant improvement, integrated pest control, and crop/animal management can really succeed without long-term (10 to 20 years) commitment by highly qualified and dedicated researchers adequately supported and working in target eco-geographic regions. Up to the present neither CRSP or

national programs (in most LDCs) have yet demonstrated the commitment and staying power necessary to address these longer term issues.

There is general agreement on the need for better cooperation and collaboration between institutions working on the same commodity. In some cases a start has been made to do this but in other instances only lip service has been paid to this concept. The most obvious linkup is between the CRSPs and the IARCs which have sometimes viewed each other with suspicion and distrust. However, this less than ideal situation may be a symptom of early program development when both institutions are trying to establish and defend their own "turf." Hopefully, closer collaboration between the two parties will grow as they become more familiar with each other's goals and capabilities and begin to discover the mutual advantages of working together. Certainly, there is more than enough work and challenges for all parties concerned for the next several decades.

There are other participants involved in different aspects of CRSP commodity improvement. These include several international agencies like IDRC, EEC, ODM, GTZ, World Bank, IADB, IFAD, PVO's, and others. Moreover, there are scores of smaller donors often "standing in line" to support worthy causes in some of the neediest countries, particularly in Africa. The problem is there are all too few LDC national institutions, researchers, and programs that are able to utilize effectively the resources that might be made available.

One solution to improving the efficiency of international research and mobilizing needed support for these neglected commodities would be to create impartial, apolitical global networks to serve as a protagonist for each commodity. These might consist of small boards or standing committees of two to four widely respected, senior researchers or development specialists with many years of experience abroad. It should be their responsibility to serve as "honest brokers" for commodity needs, determine global priorities, solicit support for national, regional, and international activities, and actively encourage cooperation between the several different agencies participating in the common

improvement effort. Above all, the commodity network must represent the real needs of both the users and consumers of the commodity.

To be effective, the network must not represent a single donor or political agency (such as USAID), but would be best constituted by an international agency like the CGIAR or the World Bank. It should also be empowered to co-opt scientists or development experts on the "cutting edge" of technology generation and diffusion to advise on specific areas and determining priorities.

A second problem is the urgent need for eco-geographical zone centers in regions and countries where facilities and national program do not exist or cannot function on a sustained basis (especially in Africa). One solution referred to previously would be the establishment of strategically-located, low-profile regional centers (e.g. similar to the ICRISAT centers at Niamey and Bulawayo) that would provide basic facilities for several international agencies and institutions working on a range of commodities and problem areas. These regional centers should be closely linked to the global commodity network boards and encourage long-term projects meeting established criteria for targeted commodities and problem areas.

## ANNEX 1

### SOME INITIAL ACCOMPLISHMENTS OF CRSP RESEARCH

Some observations and impressions on the research programs underway in each of the four CRSPs reviewed will be briefly summarized in the sections to follow.

#### TROPICAL SOILS CRSP

Four domestic universities participate in this program: Cornell, North Carolina State, Texas A&M, and Hawaii. The lead institution is North Carolina State University and projects are carried out in Brazil, Indonesia, Mali, Niger, and Peru. Thirty-one U.S. and 21 host country scientists participate in these studies.

The Trop-Soils program is off to a running start having the advantage of building on previous soils work (also supported by USAID), especially in Peru, Brazil, and elsewhere. Consequently, the Trop-Soils program is both more mature and advanced, and enjoys the participation of professionals with long experience in the field. Initially the program focused on four ecological zones including:

- The humid tropics where the dry season is not more than 3 months and where soil acidity and infertility are common constraints to production.
- The semiarid tropics where a dry season of 6 to 9 months, wind and water erosion, desertification and nutrient deficiencies are serious constraints.
- The acid savannahs, characterized by a dry season of 4 to 6 months, savannah vegetation, and soils that are commonly acid and low in nutrients, but physically favorable to cultivation.
- The steep lands, where the terrain makes erosion a serious environmental and agronomic concern.

Two domestic institutions have field operations in the humid tropics -- North Carolina State and the University of Hawaii -- on a primary site

at Manaus, Brazil. The University of Hawaii (with NCSU collaboration) has a primary research site in the humid tropics of West Sumatra, Indonesia. The lead institution for semiarid tropics is Texas A&M University with a primary site at Niamey, Niger and a secondary site in Mali. The Niger site is closely linked to the ICRISAT center recently established in Niamey.

Some work is carried out in the acid savannahs by Cornell University with support provided by NCSU. The primary research site is located near Brasilia, Brazil. However, the acid savannahs and steep lands ecologies are accorded second priority and those projects may even be postponed during the current budgetary crunch.

Research activities of the Trop-Soils program focuses on the primary soil constraints to crop production in the different agroecological zones where they work. Many of the results have been found consistent from site to site even across continents and ecological conditions. The major constraints in tropical soils have been clearly identified and are described below.

### Acidity

Soil acidity and closely related aluminum toxicity occurs in many areas of the humid tropics from the humid tropics from the Amazon basin to central Africa and southeastern Asia. The main strategies adopted include applications of lime and testing of aluminum-tolerant crop varieties. The aim is to develop a system based on growing lime-requiring crops with moderate levels of the mineral.

### Soil Fertility

Research continues on possibilities of sustaining production through correcting fertility limitations. New studies focus on the rates and times of fertilizer applications, sources of fertilizers, the role of micronutrients, and cycling of major elements, particularly phosphorus and potassium.

## **Nitrogen**

Nitrogen is often the first limiting major nutrient in the humid tropics. Current and future study will focus on greater use of biologically-fixed nitrogen obtainable from green manures and crop residues.

## **Water**

Water is often deficient at certain periods, even in the humid tropics, but there are possibilities for retaining rain water by improving the physical condition of the soil surface through tillage, plant cover, and catchments. Moreover, timely applications of lime and other major nutrients can increase the efficiency of water use. Allied studies are carried out to develop predictive models to aid in planning the cropping system and use of inputs.

## **Low Input System**

Most small subsistence farmers in the lowland tropics cannot afford the investment nor risks inherent in use of inputs such as intensive use of fertilizers, lime, or mechanization. Therefore, a range of low input options is being examined including the use of moderate levels of fertilizers and herbicides in a range of tropical farming systems.

## **Land Clearing**

The object of these studies are to develop a strategy for land clearing research and a network of land clearing projects to provide important new information on this critical aspect of tropical farming.

## **Land Reclamation**

These projects will focus on reclaiming barren, eroded, or otherwise degraded land through the use of plant residues, cropping systems, and tillage.

## **Agroforestry**

The strategic combination of trees and annual crops is particularly appropriate in tropical production systems. Therefore, opportunities for both low- and medium-input production systems using trees for wood and food production, in alley cropping, and in improved fallows will be examined.

## **Conservation**

Sustained production in the tropics cannot be obtained without developing practices aimed at alleviating loss of top soil through water and wind erosion. Here, various tillage practices combined with vegetative cover and use of various conservation practices will be designed to fit the different agroecological zones and local needs.

## **Soil Characterization**

Studies on the characterization, classification, and interpretation of soils is designed to provide a better understanding of the adaptive basis on which soil management recommendations are developed.

## **Extrapolation**

The Trop-Soils CRSP aims to develop technology transferable beyond the primary research site. It is believed that soil management techniques can be predicted through systems analysis, and by simulating the soil, plant and atmosphere continuum.

## **Socioeconomics**

The soil management practices need to be tailored to the needs and resources of the farmers and to their culture. Trop-Soils projects are studying such factors as seasonal patterns of work, nutrition, diet, income, and division of labor by age and sex. This information is very useful in the design of experiments.

Among the significant accomplishments of the Trop-Soils CRSP are the formulation of practical, inexpensive ways of managing nitrogen to hike crop yields on acid savannah soils. The use of green manures like Mucuna and other legumes appear promising as a low-cost alternative to expensive fertilizers.

Research over a number of years in Peru have found that with careful management, adequate fertilization, and lime that continuous cultivation of food crops on acid and infertile soils of the Amazon Basin is possible. Given such information and adequate inputs these tests indicate that more than 200 million hectares of the Amazon Basin can be successfully developed. An alternate strategy involving the use of low cost, low input technology will enable poor farmers to increase production without relying on expensive technology and chemicals. Through careful husbanding of crop residues and organic wastes, and the growing of nitrogen-fixing plants and organisms (like azolla and blue-green algae), poor tropical farmers can sustain yields several times those realized with normal practices.

The practice of mulching has been shown to have several benefits in tropical systems including those in the semiarid ecology. For example, woody residues remaining from wood cutting were shown to increase soil moisture and porosity and to promote the natural reseeding of key forest species. Another promising development studied in Niger was the adapting of animal power to an appropriately-sized and engineered "sand fighter," a machine which helps protect young millet crops from blowing sand and thereby reduces loss of stand.

#### SMALL RUMINANTS CRSP

The Small Ruminants CRSP is a collaborative program involving nine U.S. universities (Colorado State, Montana State, North Carolina State, Texas A&M, Texas Tech, California-Davis, Missouri, Utah State, and Washington State) and Winrock International Institute in Arkansas. Host nations include Brazil, Indonesia, Kenya, Morocco, and Peru. The disciplines involved in this program are:

- animal breeding and genetics
- animal nutrition

- forages and by-products
- range management and nutrition
- reproduction
- animal health
- management production systems
- economics
- sociology
- systems analysis

Altogether, some 72 U.S. scientists and 155 host nation researchers are involved. Among the notable accomplishments of this program are the development of a vaccine to immunize goats against caprine contagious pneumonia (CCP). The development of a diagnostic test for this disease should contribute to improving health of about 50 million goats in West Africa and Asia. In other work, the treatment of lambs with selenium and Vitamin E was effective in lowering mortality by 50% in Morocco; while dietary supplements of a particular kind of foliage in Indonesia increased weight gains by 120% and feed efficiency by more than 80%. Similarly, the improvement of pasture and range conditions in Peru were shown to increase yields of fiber from camelids (llama, alpaca) from 6 to 17 pounds annually.

It is too early to assess the contributions from upgrading of local breeds with exotics, but some projects like the introduction of dual-purpose goats into Kenya have met with both enthusiasm and success among the farmers of that country. Similarly, much has been learned about improved management systems in both the semiarid and humid tropics and about the current practices and economics of raising small ruminants in these regions. Studies in sociology, economics, and systems analysis are providing useful diagnostic information for research planning and developing program activities.

A promising new development in animal health has occurred in Brazil with the participation of investigators from UCD. This grew out of an epidemiological survey and subsequent focus on the "dry country diseases" of goats caused by Caseous lymphadenitis. This disease causes abscesses, boils, and skin lesions; but can also infect internal organs

with consequences to health of goats and the quality of their carcasses. Current strategy is to utilize a toxin of the Billed organism to stimulate antibodies to be used as a vaccine. If successful, this will mark a major breakthrough in goat rearing in dry countries and regions.

#### BEAN/COWPEAS CRSP

The Bean/Cowpeas CRSP managed by Michigan State University includes 13 U.S. university participants including Colorado State, Cornell, Kansas State, Michigan State, California at Riverside, Georgia, Illinois, Minnesota, Nebraska, Puerto Rico, Wisconsin, Washington State, and the Boyce Thompson Institute. Host nations include Botswana, Brazil, Camerons, Dominican Republic, Ecuador, Guatemala, Honduras, Mali, Mexico, Nigeria, Senegal, and Tanzania. However, projects have been phased out in Ecuador, Kenya, and Nigeria (2 projects). The Nigerian projects were phased out for "technical reasons" and the other two sites for variety of reasons.

Among the accomplishments by the Bean/Cowpeas CRSP are several useful and valuable additions to knowledge about those crops and production technology including:

- breeding for drought and disease resistance
- biological nitrogen fixation
- collection and study of land races
- biological control of insects
- epidemiological studies and serological diagnostic screening of pests
- processing procedures to improve quality
- socioeconomic and gender issues

In some cases and certain areas, this CRSP is the most significant and sometimes the only contributor to this knowledge.

Among the more spectacular developments was the importation of about 650 tons of California Blackeye-5 (CB-5) as a source of seed for drought-stricken northern Senegal. Two other elite strains developed by IITA made up an additional 200 tons of seed stock but were insufficient to

meet the total seed requirement. CB-5 is an old line California variety with high-yielding potential and acceptable seed quality for semiarid West Africa, but it is highly susceptible to the complex of pests and diseases occurring there under normal conditions. Nevertheless, this available stock of seeds made a significant contribution to food needs during a very difficult period.

Another important development was achieved in Botswana where a researcher from Colorado State identified some very early cowpeas (ER-7 originally from IITA) with the ability to produce "near-normal" yields under extreme drought conditions when other cowpeas and food crops (including millet) failed.

Considerable work has been done on several insect pests of both cowpeas and beans to learn about their life cycles and effective, safe means of controlling them. These findings are being incorporated into pest management programs and are expected to reduce the use of chemicals in commercial fields. Concurrently, some interesting developments have been made on controlling insects during storage which have the potential of causing overall losses of 10 to 20% or more.

Other research with a less immediate effect on commercial production include the possible use of insect pathogens as biological pest management tools, development of insect and disease resistant beans and cowpeas, use of appropriate cropping systems and practices to reduce pest damage, breeding for pest resistance, studies on biological nitrogen fixation under stressful conditions, improved plant architecture in both cowpeas and beans, development of early and heat-tolerant cowpea lines for Africa, development of interspecific crosses between tepary beans (Ph. acutifolius) and common beans (Ph. vulgaris) for better drought and heat tolerance, and studies on cooking qualities of beans and cowpeas, especially the hard seeded types.

Allied studies on farming systems, production-consumption economics, and socio-cultural factors have revealed considerable information useful to biological scientists in designing plant types for different regions and purposes, and in planning future research.

## INTSORMIL CRSP

Intsormil involves five domestic universities including Kansas State, Mississippi State, Purdue, Texas A&M, and Nebraska (lead institution). Host countries include Botswana, Brazil, Burkina Faso, Colombia, Dominican Republic, Honduras, India, Kenya, Mali, Mexico, Niger, and Senegal. Scientists participating include 51 U.S. and 41 host nation researchers. Approximately 89% of resources are applied to sorghum and 11% to pearl millet. Future goals are to increase support for millet research to about 30% of the total.

Among the major accomplishments of Intsormil are the identification of germplasm that combines high-yielding ability with tolerance of striga, a phanerogamic parasite common throughout the semiarid regions of Africa and Asia. Use of striga-resistant varieties could boost African sorghum production by at least 10%.

Another notable accomplishment is the identification of germplasm with significant tolerance to aluminum and acid soils. This would allow expanding of sorghum production in the vast humid soil regions of the Amazon basin of South America, coastal west and central Africa, and parts of southeastern Asia. Other studies on sorghum have quantified the important contribution of rotation cropping of grain legumes like soybeans, cowpeas, and beans with sorghum. This can add significant amounts of nitrogen (50 kg per hectare) thereby reducing fertilizer requirements for sorghum crops. A new sorghum hybrid developed for the Sudan utilizing parental lines for Texas and ICRISAT, has boosted yields by 152% above local improved strains. Concurrently, efforts on millet improvement using Indian materials and lines developed at Kansas State have shown increases of 26% over local strains.

In Central America, new strains of sorghum suitable for making local breads have been developed. In other studies (at Purdue) on seed tannins, it has been found possible to obtain resistance to the prime bird pests (e.g. *Quelea* spp.) while eliminating those constituents reducing protein assimilation in children. Progress has also been made in combining yield improvement with drought, insect, and disease

resistance; and in the development of improved cultural practices such as sowing, fertilizing, inter-cropping with legumes, and weeding.

Future efforts will continue as they have in the past but with slightly less emphasis on breeding (28% versus 36%), with increased support for cultural practices (18% versus 13%); but continuing at about the same levels in entomology (10%); plant pathology (10%); socioeconomics (12%); quality and utilization (12%); and physiology (10%). Regionwise, it is aimed to increase work in Africa to 65% versus 55% at present, in Asia to 10% from about 8%, and to reduce resources allocated to tropical America to 25% from about 37%.

SCOPE OF WORK

The CRSP Review should address the following questions:

A. Research Direction and Accomplishments

1. What are the distinctive features of the CRSP collaborative research mechanism? What is the purpose of each feature? To what extent is its purpose being accomplished in the four CRSPs reviewed?
2. What is the role of CRSPs research in relation to the Agency's Food and Agricultural Policy, Strategic Plan, Agency priorities; legislated relationships with U.S. universities and USAID strategies?
3. Describe the "process" by which individual CRSPs were identified and designed. What criteria/standards were used in the process? How were the mandate activities and needs of IARCs considered in the process of creating a CRSP?
4. Who are the target groups for which the CRSP research activities are being undertaken? Are the research results appropriate or likely to be appropriate to the target population.
5. Are the CRSPs providing the types of research direction and technical progress most needed for priority agriculture food crops and livestock not now being provided through IARCs or National Research Centers? Do they compliment, supplement or duplicate ongoing research of IARC's or national programs?
6. What have been the CRSPs contributions (or the likely contributions that can be anticipated in the future) to increased food production? How do participating host countries and USAID missions value the country specific work of the CRSPs?
7. How effective are the periodic review of CRSP programs through the established mechanism of technical group reviews?

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Do these reviews objectively and effectively answer the questions:

a. Are the CRSFs supporting realistic strategies and agenda developed through a functioning network process that insures realistic and effective research efforts?

b. Were the research programs designed to address significant multi-sectoral, biological, physical, social and economic questions?

c. Are the multi-disciplinary team efforts successful in producing significant results?

d. How effective have CRSFs been (or likely to be) in developing new knowledge through collaborative research?

### 3. Linkages

What host country and international research center linkages have been established. How have international research linkage been established as a result of CRSF programs and what actions, if any, can be done to improve international agricultural research linkages? How have linkages between the U.S. collaborators, host country institutions and international centers been established? Will these linkages continue following the period of AID support?

1. How effective have the CRSFs been at networking with IARCs and National Research Centers to avoid duplication of experiments and/or effort?

2. How effective have CRSFs been in strengthening LDC national research institutions?

3. How effective have the CRSF been at providing the type of network input that will establish long lasting institutionalized networks with National Research Scientists taking the lead role?

4. Have the CRSFs provided the type of linkage impact that has developed or is strengthening the capabilities of the National Research Centers to identify plan, conduct, analyze and extend research results?

5. How have CRSF objectives become integrated with USAIDs CDSS? How are CRSF research programs related to USAIDs technical assistance programs?

6. How effective have the CRSPs disseminated and shared research information with their research collaborators and USAID to insure that results or technical recommendations are available to extension programs?

7. How effectively have the CRSPs been in the process of identifying and resolving priority constraints jointly with USAID, BIFAD, U.S. Universities and host country institutions?

8. What has been the experience of host country institutions with CRSPs management?

9. How effective have CRSPs been in improving the level of competence of LDC and U.S. scientists and their receptive institutions through collaborative research and training?

### C. Management Effectiveness

The effectiveness of CRSPs management is another major focus of this review. CRSPs, themselves, involve several universities, participating host countries, USAID Missions as well as the Science and Technology Bureau in Washington. Management effectiveness is often the most difficult and challenging aspect of collaborative efforts. Hence, the importance to this review of the decision framework under which the CRSPs operate and the cost effectiveness of A.I.D.'s investment in long-term collaborative research.

1. How effective are the CRSPs management and peer group reviews?

2. What types of management or technical adjustments have the CRSPs made to improve the research programs.

3. Are the peer group review panels objective and represented by the appropriate technical specialist. How are their groups established?

4. What do peer group reviews contribute? Do the peer group reviews ask the right questions? From a technical standpoint, are the CRSPs on target and is the research being conducted according to internationally accepted standards?

5. How do overhead cost compare with those of other research programs?

6. How effective is the networking among home office field programs, A.I.D., the participating entities and USAIDs?