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Prepared by: Peanut CRSP
The University of Georgia
College Experiment Station
Experiment, Georgia 30212
U.S.A.

Executive Summary

Peanut Collaborative Research Support Program

The Peanut CRSP is completing a Triennial Review and presenting a proposal for a Three Year Extension. This Executive Summary includes executive summaries from:

The Peanut CRSP was implemented in July 1982 and is now mid-way through year four. The present program is scheduled for completion in June 1987. A Three Year extension would carry through June 1990.

Plans for the Peanut CRSP extension will be presented to the Agriculture Sector Council and JCARD CRSP Panel on January 15, 1986.

David G. Cummins
Program Director
Peanut CRSP

EXECUTIVE SUMMARY

FOR

FIVE YEAR PROGRAM PLAN

AND

BUDGET

1985-1989

EXECUTIVE SUMMARY

The Peanut Collaborative Research Support Program was based on the perception of constraints that could be addressed through research. The importance of peanut to assist in the fulfillment of the goals of "Title XII-Famine Prevention and Freedom from Hunger" had been established. The implementation order was issued 1 July 1982. The Peanut CRSP featured a targeted effort on identified constraints and collaborators at the time of implementation, an efficient design of four universities to maximize program expenditure, and a global impact in three regions and eight countries.

Features of the Peanut CRSP:

Goals: Are focused on mobilization of resources

1. Develop and expand the research base and technological capability in both the U.S. and host countries for peanut.

2. Focus the resources of both developing country and U.S. research institutions into a long term collaborative research program to relieve constraints to peanut production and utilization.

Objectives: (Common to all projects) Are focused on constraints

1. Enhance research programs in the U.S. and host country institutions through

   - Development of cultivars, management practices, and utilization processes that would improve yields and production stability, lower costs, and enhance peanut use
   - Support programs in terms of equipment, supplies, travel, and personnel.

2. Improve the research capability of host country institutions by

   - Scientist to scientist collaboration on mutual research program problems
   - Offering short term and degree oriented training programs for host-country staff at U.S. institutions, workshops and Centers
   - Providing on-site consultation in the host countries by U.S. scientists

Global Plan

The Peanut CRSP is global in nature, because of the worldwide distribution of the crop, its importance in developing countries, and the potential for research to relieve production and utilization constraints and better realize its potential to contribute to an increased food supply in countries where total food and protein supply is marginal. Key

research locations are situated in three major world regions:

SAT Africa - Senegal, Burkina Faso, Niger, Nigeria, Sudan

Breeding peanut for resistance to foliar and soil-borne diseases in Senegal with linkages to Burkina Faso and Niger by Texas A&M University.

Mycotoxin management in peanut by prevention of contamination in Senegal by Texas A&M University.

Peanut viruses: etiology, epidemiology, and nature of resistance in Nigeria by University of Georgia.

IFM strategies for groundnut insects in Burkina Faso by University of Georgia.

An interdisciplinary approach to optimum food utility of peanut in Sudan by Alabama A&M University.

Southeast Asia - Philippines, Thailand

Peanut varietal improvement for Thailand and Philippines by North Carolina State University.

Management of arthropods on peanut in Thailand and Philippines by North Carolina State University.

Rhizobia influence on nitrogen fixation and growth of peanut in Thailand and Philippines by North Carolina State University.

Mycorrhizal fungi influence on growth of peanut in Thailand and Philippines by Texas A&M University.

Consumption of peanut as food and appropriate technology for storage/utilization in Thailand and Philippines by University of Georgia.

Caribbean - Trinidad, Jamaica, Belize, Antigua, St. Vincents, St. Kitts.

Peanut improvement for the Caribbean by University of Georgia.

Peanut utilization in food systems in the Caribbean by Alabama A&M University and University of Florida.

Strategy

A strategy for accomplishing the goals of the Peanut CRSP formed the basis of the original plan, with a continued improvement in the execution of the strategy.

1. The research is located at key locations in three major regions in the developing world. The locations conduct research that is not only beneficial to the countries conprising the major locations, but provide information that will relieve production and utilization constraints in neighboring countries of the region. Key countries were selected by location, capability, and interest.

2. Develop linkages to non-CRSP countries in the region to disseminate information obtained at the primary locations, and conduct adaptive research if necessary to extend the research.

3. Plan and conduct workshops with regional participation to train researchers and disseminate research information.

4. Technical assistance is available through the program to provide on-site consultation in nonparticipating countries. Upon requests of USAID missions, appropriate U.S. scientists will be engaged to provide short-term consultation on specific problems.

5. A very important component of strategy is coordination with international centers, who by design and practice have an international capacity to conduct research and disseminate information. With proper planning and coordination, the CRSP and centers programs can be extremely complementary. The Peanut CRSP works closely with ICRISAT, which has a peanut as a mandate crop. The ICRISAT peanut program leader is a member of the Peanut CRSP Board of Directors, plans are shared, and CRSP and ICRISAT researchers are in frequent contact. The breeding project in the Philippines has a cooperative linkage with IRRI through the Institute of Plant Breeding, University of the Philippines at Los Banos in the development of peanut cultivars to follow rice in a cropping system.

Program Support by Regions Global Total

CATEGORY	1985	1986	1987	1988	1989	TOTAL
			SAT AFRICA			
TX/BCP/Se, BF, Nr	342,426	342,426	376,668	359,547	342,426	1,763,493
TX/MM/Se	210,452	225,483	248,032	236,757	225,483	1,146,207
GA/PV/Na	123,154	131,475	144,622	138,049	130,875	668,175
GA/IM/BF	105,847	113,693	125,061	119,377	113,693	577,671
AAM/FT/Su	150,782	150,782	165,860	158,321	150,782	776,527
TOTAL AID	932,661	963,859	1,060,243	1,012,051	963,259	4,932,073
Cost Share	214,458	220,829	242,199	234,223	226,274	1,137,983
Grand Total	1,147,119	1,184,688	1,302,442	1,246,274	1,189,533	6,070,056
			SOUTHEAST ASIA			
NCS/BCP/TP	369,728	369,728	406,701	388,252	369,728	1,904,137
NCS/IM/TP	104,887	104,887	115,376	110,132	104,887	540,169
NCS/SM/TP	199,743	172,966	190,263	181,614	172,966	917,552
TX/SM/TP	93,790	140,790	154,868	147,830	140,790	678,068
GA/FT/TP	138,756	122,039	134,252	128,121	122,018	645,186
Total AID	906,904	910,410	1,001,460	955,949	910,389	4,685,112
Cost Share	175,388	189,791	208,777	199,275	189,784	963,015
Grand Total	1,082,292	1,100,201	1,210,237	1,155,224	1,100,173	5,648,127
			CARIBBEAN			
GA/BCP/CAR	175,423	183,680	202,048	192,864	183,680	937,695
AAM/FL/FT/CA	136,123	145,388	159,927	152,658	145,388	739,484
Total AID	311,546	329,068	361,975	345,522	329,068	1,677,179
Cost Share	58,348	64,184	70,602	67,393	64,184	324,711
Grand Total	369,894	393,252	432,577	412,915	393,252	2,001,890
			GLOBAL			
Total AID	2,151,111	2,203,337	2,423,678	2,313,522	2,202,716	11,294,364
Cost Share	448,194	474,804	521,578	500,891	480,242	2,425,709
PROGRAM TOTAL	2,599,305	2,678,141	2,945,256	2,814,413	2,682,958	13,720,073
M. Entity	375,553	302,969	404,949	291,118	337,773	1,712,362
GRAND TOTAL	2,974,858	2,981,110	3,350,205	3,105,531	3,020,731	15,432,435

	1985-1986	1987-88-89
AID Program	4,354,448	6,939,916
ME	678,522	1,033,840
Total	5,032,970	7,973,756
Cost Share	922,998	1,502,711
GRAND TOTAL	5,955,968	9,476,467

EXECUTIVE SUMMARY

FOR

TRIENNIAL REVIEW

BY THE

EXTERNAL EVALUTAION PANEL

1985

EXECUTIVE SUMMARY

The Peanut Collaborative Research Support Program CRSP grant document established an External Evaluation Panel (EEP) consisting of three to five eminent scientists recommended by the CRSP Management Entity to AID/BIFAD for specified terms of appointment. Periodically as appropriate the EEP shall:

1. Review projects and programs of the CRSP and provide written evaluation.
2. Make recommendations for the addition; elimination; or modification of component projects and overall objectives, to include retention, elimination, or addition of new overseas sites.

An EEP was nominated and approved during 1984.

Mr. Donald C. Pickering, Agriculturalist, World Bank, Washington, DC (later designated chairman).

Dr. A. Hugh Bunting, Tropical Agronomist/Ecologist, and Professor Emeritus of Agricultural Development Overseas, the University of Reading, England.

Dr. Pierre Gillier, Peanut Breeder/Agronomist, and retired Head of Oilseeds Department, IRHO, Paris.

Dr. Kenneth H. Garren, Peanut Pathologist and retired USDA Peanut Research Leader, Suffolk, Va.

Dr. Max Milner, Food Scientist/Nutritionist and retired Executive Secretary of the American Institute of Nutrition, Washington, D.C.

An organizational meeting was held in Washington, D.C. in November 1984 to develop a scope-of-work and a schedule for U.S. univerisity and host-country site visits in compliance with requirements for a Triennial Review in the Guidelines for CRSP's established by BIFAD/AID. These visits were accomplished from February through September 1985.

The scope-of-work developed for the U.S. university and host-country site visits covered the following items:

1. Implementation and Management
2. Adequacy of Science
3. Geographic Coverage and Applicability of Research
4. Institutional Development
5. Research Progress and Application
6. Summary
7. Reviewer Recommendations.

PEANUT CRSP

Summary Assessment by the External Evaluation Panel

INTRODUCTION AND METHODOLOGY

This summary is based on the findings of the five man Panel appointed to evaluate the progress of the Peanut CRSP during its first three years or so of operation. Three of the Panel members, Garren (USA), Gillier (France), and Pickering (UK) had played some part in the planning of the Program at its inception. The two others, Bunting (UK), and Milner (USA), came to it with a broad familiarity with the CRSP approach in addition to long years of experience in research and the production and utilization of the crop. The national diversity of Panel members ensured a well rounded assessment of CRSP activities. However, it was recognized that their geographic dispersion and pressure of other duties would perforce limit interactions largely to exchanges of correspondence, and telephone conversations, except during field trips to US institutions or collaborating countries.

In light of this limitation on exchange of views, the Panel agreed at the outset on standard formats for evaluation of research projects at US institutions and in collaborating countries as appropriate to each group 1/. Formats were derived from the Panel's scope of work as previously debated and agreed with the governance of the CRSP. Covering each major area of interest, the review forms sought to ensure consideration and rating of each significant component on a six point scale together with summary comments for each major area, an overall recommendation rating for each project, plus a narrative section highlighting review findings. While this approach might be criticized as being somewhat mechanistic, Panel members found it to be a satisfactory method of recording their views and providing a basis for objective assessment and comparative analysis of performance.

To the extent possible, the Panel conducted its assessments by operating in groups of two individuals whether at US institutions or in collaborating countries. Groupings varied according to perceived professional needs and individual comparative advantage, and to some extent availability. Such variations promoted the objectivity of assessments and underscored the importance of following a standard review format.

THE ASSESSMENT

The Panel expresses itself generally in complete agreement with the concept of the Peanut CRSP and with its principal features. The

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1/ See Introduction, p. 3-6.

targetting of efforts based on alleviation of five primary constraints identified in the planning phase via clearly articulated research objectives is an appropriate approach. Program design, utilizing a small number of US institutions has minimized program overhead and management costs and has clearly proven cost effective. The eight host countries chosen as collaborators have enabled the Program to impact in three major geographic regions: Southeast Asia, Semi Arid Tropical Africa, and the Caribbean. A summary assessment of projects and their contribution to the overall progress of the CRSP is presented below.

LOW YIELDING CULTIVARS

The three projects having this constraint as their primary objective are evaluated as follows:

International Peanut Evaluation Program (GA/INPEP)

This is arguably the most complex logistically, and is perhaps the least satisfactory of all projects within the CRSP. Originally planned for collaboration with three francophone West African countries (one of which subsequently failed to ratify its collaboration agreement) plus five territories in the Caribbean Region, it is an operation calling for comparatively heavy in-country involvement and hence travel by the US Principal Investigator (P.I.). In the event this had not occurred as of mid 1985, and results have suffered considerably in consequence.

Reports on the state of the program in individual countries and the responsible US institution with recommendations have been submitted by the Panel to the management of the CRSP. In summary form they call for:

- Significantly more collaboration and guidance from the US Principal Investigator, with serious consideration to the provision of a Co-Investigator in recognition of the comparative institutional and related weaknesses of collaborating countries.

- Sub division of the West African and Caribbean efforts into two sub projects to take account of their basic environmental differences.

- Consideration of network development in West Africa to facilitate interaction between country investigators and with the P.I. The possibility of extending such networking to closer linkages with the Senegal based CRSP breeding project (TX/BCP/S) should be an aspect of this consideration. However, the Panel counsels caution in this latter aspect of its recommendation because of Nigerian and Burkinian concerns about domination by Senegalese researchers. These concerns under-score the importance of (an) active Principal Investigator(s).

- Given better support from the P.I. the Panel recommends consideration of expansion of on-site research in Niger via the CRSP to establish the constraints on yields from insects, diseases and nematodes.

- In the Caribbean the recommended heavier PI involvement should be directed towards facilitating increased training of local staff. This should follow a review of the feasibility of refining the Caribbean sub project to take account of the perceived need for studies on such questions as differing maturity responses by cultivars, and the impact and epidemiology of such diseases as rust and leaf spots on yield in the Caribbean region.

  (Response: Retirement of the co-Principal Investigator for the project early in the program left one person with excessive travel needs in two regions. The P.I. felt that there was not the need for an annual visit in the cultivar testing program. Each host country collaborator visited the U.S. P.I. for short-term training and a visit was made by the U.S. P.I. to each country for establishment of the project. The EEP view is accepted.

  Based on Board and Technical Committee deliberations and the EEP concurrance, the program in West Africa (Niger and Burkina Faso) has been linked to the Texas A&M breeding project in Senegal. Expansion of the West Africa work will be with proper deliberation and planning. We will be cognizant of the concern of domination of the program by Senegal.

  The GA/INPEP will be concentrated into a GA/BCP/CAR program in the Caribbean. More interaction with the local staff will follow, cultivar improvement will expand, and research will be initiated on disease, physiological, and mineral nutrition problems).

Disease-Resistant Peanut Varieties for Semi-Arid Environments (TX/BCP/S)

The project is characterized by sound design, good science, administration, coordination, and strong in-country support by the Principal Investigator, his colleagues, and his institution. Its potential for results that will be useful not only in Semi Arid Tropical Africa but also in the US and other semi-arid regions of the world is significant and argue strongly for its continuation.

On the other hand, the major generic problems in conducting and managing agricultural research in Senegal have inevitably impacted adversely on progress. Fortunately the work of the CRSP receives strong support from the USAID Mission. Changes being sought by major aid agencies in Senegal, including the US, in the administration of the national agricultural research institute (ISRA) seek to improve this situation. In the event that they do not, and particularly, remove the serious bottlenecks hampering the flow of external and counterpart funds to the project, special action will be called for as indicated below.

Notwithstanding the "country" problems referred to above the Panel strongly supports the project and recommends its continuation. Specific suggestions follow:

- o The system of disbursing CRSP funds should be simplified in order to remove the acute financial constraint on project implementation. In the event that modified procedures, involving financial planning by, accountability requirements of, and direct channelling to relevant Senegalese researchers, are unacceptable to ISRA management, consideration should be given to the use of an external fund manager of CRSP funds perhaps in USAID Dakar. The Panel would prefer not to see the latter course of action but recognizes that financial management problems must be overcome if an otherwise excellent project is not to founder.

  (Response: We are aware of this problem and have tried to impress upon the administration the urgency of timely availability of funds. Hopefully the newly appointed administration and new procedures will aid in this matter. The new ISRA Director General has been informed and indicated a willingness to help. The ISRA administration has not been in favor of a permanently located U.S. CRSP person. We are aware of donor efforts to effect a change in ISRA management of research and funds).

- o The drought hazard in Senegal, and in other SAT African countries, has seriously limited the collection of yield and other data from field tests. This could and should be ameliorated by expanding the geographic scope for the project to the Casamance Region (in the South of Senegal), an area of more reliable rainfall, but nevertheless relevant to the Semi Arid Tropics.

  (Response: Agreement has been made and tests were conducted in the higher rainfall regions of Burkina Faso in 1985. This alleviates the need for tests in the Casamance region which has rainfall similar to that of the Burkina Faso test sites. The linkage to Burkina Faso and Niger because of the change in the GA/INPEP project will further spread the risk of climatic problems in Senegal).

Peanut Varietal Improvement for Thailand and Philippines (NCS/BCP/TP)

Covering two countries representative of peanut producers in much of the East Asia Region this project is well designed and is being satisfactorily implemented by all agencies concerned. The US institutions, the P.I. and his colleagues, collaborating scientists and institutions demonstrate a commendable cooperative relationship. Their project is entirely relevant to the needs of small scale peanut growers in the East Asia Region and is producing results of value to plant breeders for the US peanut industry.

The Panel strongly recommends continuation and has no more than the following minor suggestions to improve an excellent endeavor:

- o Consideration should be given by the P.I. and his colleagues to minor extensions (one or two days) in country visits. Their

technical assistance value is perceived by the Panel and collaborating scientists to be of a very high order and should not be downplayed. Part of this technical assistance should be to foster to stronger linkages between Philippines and Thai researchers.

(Response: The U.S. P.I.'s plan to spend more time in both host countries within time and fund constraints. Mature Ph.D. candidates from NCSU are presently spending a year doing thesis research in Thailand and Philippines which contributes to this need of more in-country time).

- In the Philippines the Panel commends the excellent support of the coordinating body PCARRD. It suggests action may be needed by PCARRD to establish criteria and guidelines for defining the factor of "quality" in peanut as perceived in the Philippines. PCARRD should also work with the P.I. to foster peanut program linkages between Philippine and Thai researchers.

  (Response: The lack of research on quality of new peanut germplasm is a weakness of the project that was recognized earlier. Work was initiated on oil quality of germplasm at NCSU in 1984. We will try to expand this work and coordinate with the food technology projects as much as possible).

- In Thailand, project implementation would be facilitated by improved timeliness in the release of CRSP and counterpart funds, which in turn would be facilitated by more and better advanced planning of research activities by Thai project managers. At the central government level, the Peanut CRSP Coordinator should seek to facilitate linkages between Thai and Filippino researchers in the peanut breeding field.

  (Response: Effort will be made to seek more timely release of CRSP funds. We feel this is not a great problem. Relative to Thailand and Philippine cooperation, a regional workshop is planned for 1986 and further interaction will be encouraged.

MYCOTOXIN MANAGEMENT

Whereas only one project addresses this topic as a primary objective, four others take it into account as a secondary objective. This they do in an entirely logical and appropriate manner in their design and implementation. The following paragraphs present Panel findings on:

Mycotoxin Management in Peanut by Prevention of Contamination and Monitoring (TX/MM/S)

As noted earlier, all those concerned with the Peanut CRSP at Texas A & M have dedicated full support at all relevant levels. The project is seen to have strengthened an already significant program in mycotoxicoses and public health, and has added a valuable international perspective. In Senegal, its value is appreciated; its major thrust is appropriate and should be continued. Whilst in no way downplaying the importance of

speculative basic research, the Panel nevertheless feels that there may be some slight over-emphasis on this aspect to the detriment of cooperative endeavors in the collaborating country. Comment has already been made regarding unsatisfactory research administrative and flow of funds in Senegal. This state of affairs equally affects the project under review. The Panel's recommendations in that respect are the same as for TX/BCP/S and will not be repeated here.

As implied above, the Panel is satisfied with the design and implementation of this project, subject to improvement in administrative arrangements in Senegal. It should continue along the lines planned with some fine tuning of the work by the P.I. and his colleagues at Texas A & M., and some relaxation of efforts by them to undertake all the maintenance of the laboratory instrumentation and other equipment for the researchers in Senegal. As noted, the Panel feels that an apparent slight preoccupation with basic research considerations and "high tech" instrumentation should be corrected in order to improve the "spin-off" from US work to Senegalese and other developing country conditions. In the Panel's view these are likely to continue to be characterized by limited technical knowledge and comparatively unsophisticated technological equipment in the short to medium term in this field.

> (Response: A reasonably good effort has been put forth to train Senegalese researchers in the maintenance of equipment. Spare parts are a problem to obtain on a timely basis. New, appearingly sophisticated, procedures, are needed to advance knowledge in how to prevent aflatoxin contamination. These procedures will be adapted to LDC use and staff trained in their use).

YIELD LOSSES FROM PESTS

Five projects have primary objectives within this constraint domain. Two have already been reviewed in the context of their focus on low yielding cultivars, viz TX/BCP/S and NCS/BCP/TP. The other three concerning peanut viruses in Nigeria, arthropod management in Thailand and Philippines, and IPM strategies for groundnut insects in Burkina Faso are addressed below.

Peanut Viruses: Etiology, Epidemiology, and Nature of Resistance (GA/PV/N)

In general terms the project is seen by internationally recognized virologists to be well designed and highly relevant to an important and industry-wide constraint. It is staffed by exceptionally able and enthusiastic scientists in the US and the collaborating country of Nigeria. Despite perceived problems arising from lack of financial support from within Nigeria the project has made good progress and should be continued. Specific recommendations follow, based on Panel member reviews at the University of Georgia, in Nigeria, and at international meetings in Cambridge, England that discussed "New Developments in Techniques for Virus Disease of Groundnut".

- The plan of work for future research in Nigeria could be too ambitious for available staff and resources. This problem

should be addressed, prioritizing the items therein as recommended in the 1983 CRSP Annual Report but also taking account of the outcome of the Cambridge meetings and the evolving scope of work required on the Rosette virus. Broadening the area of cooperation with other concerned institutions in Europe and elsewhere, and in particular those represented at Cambridge meetings referred to above should also be sought in the context of meeting plan objectives. However, the Panel understands that funding for the institutions in question may prove a major constraint to their future active involvement. Action is needed by the P.I. and management of the CRSP to establish the financial implications, and to pursue means of promoting the degree of cooperation deemed desirable between the CRSP and these institutions.

(Response: Meetings in September 1985 with cooperators Misari, Ansa, Kuhn, and Demski were completed. Cooperators are only working on projects or areas for which they volunteered. All of Misari's and 50% of Ansa's (Nigerian cooperators) research efforts are on the peanut program which should allow ample time to accomplish the objectives. Institutions involved in the project, other than Georgia and Nigeria are voluntary and receive no CRSP funds and a high degree of cooperation exists).

- o Financial support to the Nigerian collaborating scientists to facilitate their travel outside Nigeria for exchange of views, techniques, and intellectual enhancement should be actively pursued. Its provision should be made on terms that enable the researcher in question to utilize it for the purposes intended and with minimal administrative barriers to such use.

(Response: New procedures approved at the University of Georgia will allow for travel advance to non-university employees).

- o Continued support and assistance from the USAID Mission in Nigeria will be important in facilitating the importation of equipment and other logistical problems concerning the project.

(Response: Efforts will be made to continue this linkage).

Management of Arthropods on Peanut in Thailand and Philippines (NCS/IM/TP)

In common with the other projects designed and operated by North Carolina State University in Thailand and Philippines, this was judged to be of excellent quality, highly relevant to the countries concerned, and enthusiastically and competently managed. The project should be continued as planned subject to generic observations made in respect of NCS/BCP/TP and the following minor course adjustments.

- o If this has not already been done, the Panel recommends that consideration be given to initiating studies on post harvest pests of peanut in the collaborating countries. The Panel

recognizes that this observation is a reflection of a perceived overall Peanut CRSP weakness, i.e., of failure to give explicit consideration to post harvest pest problems. This deserves serious thought during discussions of possible extension of CRSP activities.

(Response: A U.S. graduate student will be involved in post harvest pest research. Local research in Philippines and Thailand will be initiated in 1986. Effort to coordinate research with the Food Technology project will be made).

- o The Panel strongly supports the proposed sabbatical for the P.I. in Thailand or the Philippines and suggests that, in addition to fostering project linkages between Thailand and Philippines, he should to the extent possible promote networking with other Asian peanut producing countries, such as Indonesia, Malaysia and Burma.

(Response: Dr. Campbell plans to be in Thailand and Philippines for six months beginning in September 1986. He has been to Burma at AID invitation for consultation on insect problems and has been invited for further work there in 1986).

IPM Strategies for Peanut Insects in SAT Africa (GA/IM/BF)

The project is well conceived and highly relevant to Burkina Faso itself and also to peanut producing countries generally in SAT Africa. Its linkages particularly with IRHO/CIRAD scientists, but also with staff of such institutions as IITA and SAFGRAD located in Burkina Faso, are important and should be strengthened in this context and also in light of the value of such linkages to the University of Georgia in its work on peanut in the US.

The Panel recommends continuation of the project as conceived and articulated in the plan of work subject to the following observations:

- o Special efforts are needed to convince senior research administrators in the national research organization, IBRAZ, of the relevance of the project to the needs of the country. This may best be done by encouragement to the University of Ouagadougou Research Institute (ISP) personnel to improve contacts with IBRAZ.

(Response: Closer cooperation between the ISP and IBRAZ is evident).

- o Given realization of the relevance of the project by IBRAZ, problems of experimental plot allocation, insecticide procurement and access to transport could well be resolved. However, the Panel recognizes the problems of overcoming bureaucratic prejudice. It wonders if judicious interventions by USAID Mission may be called for in this regard.

(Response: The project was established with ISP because of facilities and staff availability and interest. Hopefully beaucratic problems will not interfere with the good research being accomplished. Both groups are now in the same ministry).

INADEQUATE FOOD SUPPLIES

The CRSP focus on this constraint has been via three projects managed by the Universities of Alabama A & M, and Georgia in Sudan and the Caribbean, and Thailand and Philippines respectively. An attempt has been made therefore to cover all three regions of the CRSP focus. That it has not been entirely successful in this regard is partially a function of the choice of collaborating countries: who was to predict the impact of a coup and the Sahelian drought on Sudan? It is also partially a function of judgment as to the interpretation of the role of the CRSP at the adaptation and development end of the research and development (R&D) association. Some would argue that much of the food technology research in peanut relevant to developing countries has been completed and that what remains is technology dissemination with perhaps a modicum of adaptation to meet local dietary preferences and socio-economic conditions. This debate exercised the planners of the CRSP and remains alive during its evaluation.

The following questions continue to be raised:

- o Is there unnecessary duplication in the Philippines and Thailand projects?

  (Response: Replication of research may be viewed as duplication, but necessary at times. Duplication will be minimized).

- o Are food technology projects within the CRSP related more to what US collaborators are able and prepared to provide rather than to the real needs of host countries?

  (Response: Research is developed based on in-country surveys and response to what the cooperators view as important).

- o Is there not a need for additional agro-economic studies on peanut utilization?

  (Response: Yes. Cost may control what is done. A study is being planned for the Philippines for 1986).

- o Should not the CRSP expand its mandate to cover more fully the area of post harvest handling and subsequent utilization? This question is posed with particular reference to the apparent need for systematic checks for the presence of aflatoxins and, when detected, a determination of their concentrations.

  (Response: Reason for this question is not completely understood, since aflatoxin control and post harvest problems are a significant part of the program).

The Panel considers that questions such as those raised above warrant debate within the governance of the CRSP and by those responsible for deciding future funding. Whereas, as indicated above and elsewhere, the Panel considers the Peanut CRSP to be, by and large, extremely successful

in its concept and execution of projects pertaining to production problems, it feels that some rethinking of the "food technology" aspects may be called for. More precisely, and rather than obfuscating the question by consideration of individual project issues, the Panel recommends as follows:

- o Appointment of a specialized sub group to review the "food technology" projects undertaken within the CRSP to establish their relevance and to advise the Board of Governors of the CRSP on possible redirection of effort.

- o The sub-group will comprise three distinguished food technology scientists. Dr. Max Milner will represent the EEP as a resource person. Additional resource persons will include the Principal Investigators for each food technology project, plus such other relevant persons concerned with the planning of this aspect of the CRSP and the implementation of these projects as it deems necessary.

- o The sub-group will be provided with and expected to review all relevant documentation. After such review and consultation with the resource persons it will submit its report through Dr. Milner, who will comment on behalf of the EEP, to the management of the CRSP.

- o Redesign of projects as recommended by the sub group and accepted by management within the framework of the CRSP, and their implementation within temporal and budgetary parameters assigned by the financing agency.

  (Response: A subgroup was selected and met at the Georgia Experiment Station 19 and 20 December 1985. Members were: Dr. John Cherry, Chairman, Director of USDA/ARS Eastern Research Laboratory, Philadelphia; Dr. Lloyd Rooney, Cereal Quality, Texas A&M University; and Dr. Guy Woodruff, Food Scientist Emeritus, University of Georgia. Dr. Clinton Chichester, Food Scientist, University of Rhode Island, cancelled. Dr. Max Milner, EEP, participated. Project plans, progress, and EEP reports were provided. Recommendations will be utilized in the Food Technology projects. A report from this subgroup and comments by Dr. Milner follow this Summary Assessment.

SOIL MICROBIOLOGICAL BARRIERS (NCS/TX/SM/TP)

This is a primary objective of the joint project between North Carolina State and Texas A & M Universities in Thailand and Philippines. Divided between Rhizobial and Mycorrhizal considerations affecting nitrogen fixation and growth of peanut, the project has clearly established its relevance within collaborating countries, in addition to the soundness of its design and the competence of the Principal Investigators from the two US institutions concerned. The projects have clear regional and international significance and should be continued. The Panel under-scores the importance of testing the effectiveness of local Rhizobial strains against imported material. Additional comments are as follow:

- With regard to the NCSU component, the Panel was very favorably impressed by the P.I. but, in view of his rather personalized management style, suggests that consideration of broadening the geographic scope of the project should be subject to his continuing availability.

  (Response: The comment refers to proposed expansion to Cameroon. The Board and TC has already voted not to expand to Cameroon).

- A comparable problem is seen within the Phi'ippines project. Future plans of work must take account of management within Philippines. This may be weakened by staff promotion. US Principal Investigators must be alive to the likely need for downward adjustment of short term goals pending familiarization and provenance of new collaborating country project managers.

  (Response: We have no control over duties assigned to the collaborators, such as administration. Efforts are underway to increase graduate training of Philippine students, both at UPLB and NCSU).

- As noted earlier the Thailand project, as also that in Philippines, would benefit from a slight prolongation of time spent by the PI in-country, on technical assistance grounds.

  (Response: Travel clearance has hampered trips planned in the past. More time will be planned in future trips).

- With regard to the considerations affecting mycorrhizae, the Panel is alive to the speculatory nature of the research. Continuation is strongly supported, with the proviso that expansion of scope should be conditional on a clear indication of the beneficial impact on productivity of peanut by mycorrhizal fungi together with an indication of possible means of manipulating the soil environment to increase their establishment. Future reports by the P.I. should address these issues perhaps in consultation with other experts in the field, such as Dr. James Hendrix, University of Kentucky, and Dr. Norman Schenk, University of Florida, with the objective of providing CRSP managers with the evidence needed to make these decisions.

  (Response: The P.I. is aware of the project nature. Research will focus on ways of efficient inoculation. The P.I. is in professional contact with other U.S. researchers in the field, and will continue to seek their advice).

CONCLUSION

The Panel would like to take this opportunity of expressing its gratitude to all concerned with the Peanut CRSP for their patience, forbearance and professionalism in their dealings with the EEP. As indicated above, the Panel is fully supportive of the aims, objectives and accomplishments of the Peanut CRSP. Panel members trust that their observations will be seen to be both constructive and relevant.

SUBJECT: Ad Hoc Committee Report for Peanut CRSP External Evaluation Panel to Study Food Technology Projects Research Focus, December 19-20, 1985.

The External Evaluation Panel (EEP) Ad Hoc Committee, composed of J. G. Woodroof, L. W. Rooney and J. P. Cherry (Chairman), met with representatives of the Food Technology projects, Peanut Collaborative Research Support Program (PCRSP), December 19-20, 1985. PCRSP representatives included: B. Singh, J. C. Anderson, T. Nakayama, R. Raunikar, A. Resurreccion, R. Brackett and L. R. Beuchat. Also present were M. Milner, EEP representative, and D. G. Cummins, Program Director. The EEP Ad Hoc Committee's assignment was to advise the CRSP Board of Directors about the relevance of the projects focusing for the past three years on adequate food supplies from peanuts and, if needed, possible program redirections.

Prior to the meeting, Dr. Cummins sent each Ad Hoc Committee member: a) initial planning reports for the three food technology projects; b) annual progress reports of the PCRSP scientists for each of three years (1982-84); and c) the 1985 EEP assessments evaluating progress made on the projects. The charge of the Peanut CRSP Summary Assessment by the EEP, pgs. VII-IX, was explained to Ad Hoc Committee members, whereby they came to the review prepared to discuss the questions with PCRSP representatives.

The Ad Hoc Committee agrees with the EEP summary assessment that the PCRSP has been extremely successful in its concepts and most projects have objectives relevant to the needs of less developed countries (LDC). It was recognized that the PCRSP is staffed with competent scientists successfully working within funding constraints to develop programs in food science, technology and production to meet the needs of the LDCs. Some project activities have already been modified and redirected by PI's based upon EEP advi[illegible] and criticisms. We compliment the PI's on their interest and enthus[illegible]sm to participate in international agricultural development, especia[illegible]y in view of the relatively modest funding levels available in the individual projects. Reactions of the Ad Hoc Committee relative to the food technology projects follow.

The Ad Hoc Committee evaluated the EEP's concern that the food technology projects involved only technology transfer activities without basic research. We believe that basic research on peanut composition, processing properties, aflatoxin detection and control, processing properties and other aspects relevant to peanut utilization has been accomplished and is continuing at PCRSP institutions. These fundamental aspects have not been incorporated into the annual reports since much of the research is not supported directly by PCRSP funds. The Ad Hoc Committee believes that the food technology projects investigators should incorporate into their research activities and progress reports more of the fundamental research that is being done by PCRSP institution collaborators to support the project activities in the LDC's.

Major surveys on post harvest utilization of peanuts have been conducted to determine how peanuts are used in foods. The Ad Hoc Committee feels that the surveys have served a useful purpose to provide information on the relative importance and problems in utilization of

peanuts. We believe that PCRSP PI's should compile a publication to assess the current international situation on use of peanuts in food. Although the surveys may seem like duplication of research (as indicated in the EEP question," unnecessary duplication in the Philippines and Thailand project?"), the data are actually showing the individuality of each country. In studies on the acceptability of new types of foods, the restraints which differ greatly among countries, have to be identified and evaluated. Detailed individual reports on the surveys are useful; but, an overall report on the use and role of peanuts in LDCs would be valuable to point out similarities and contrasts among Asian, African and Caribbean areas. The surveys have already provided guidance to the U.S. and LDCs for future research on postharvest and food product development and laboratory testing of quality. The information obtained in the current surveys is undoubtedly incomplete; however, we believe additional large surveys are not justified and that the resources should be applied to solving problems already uncovered.

Aflatoxin contamination of foods made from peanuts in LDCs is a major problem that is being addressed by PCRSP scientists. This contamination is pervasive and excessive. Research, e.g. proper drying methods and packaging, (CO_2) applications, and management of the aflatoxin problems, are ongoing as part of the PCRSP. Research to improve harvesting, handling, storage, packaging and processing of peanuts for food includes evaluation of the effects on aflatoxin levels. It was agreed among meeting participants that postharvest technologies of 20-30 years ago which could be used directly or after slight modification, e.g. solar drying methods for postharvest utilization, might be more practical in LDCs and should be used in studies to understand peanut quality. There is a need for closer collaboration of the food technology scientists with other PCRSP groups, especially the microbiologists working on mycotoxin management, detection and methods for detoxification of aflatoxin in contaminated peanuts.

The review showed a clear realization by PCRSP scientists that food technology research should be more closely coordinated with breeding and variety evaluation programs through collaborative studies. Through the years, breeding and variety evaluation studies have mainly concentrated on agronomic factors, yields, size uniformity and disease resistance. Attempts to improve productivity, yield, disease and insect resistance, etc., cannot be assumed to be successful unless food quality is improved or at least not impaired. The food technologists need to define the attributes of peanuts with acceptable "quality" for use in the major kinds of peanut foods. For example, are peanuts with acceptable quality for roasting, also acceptable for boiling? Do varieties of peanuts exist with variation in processing properties, i.e. brittle testa? Closer collaboration among plant breeders and food scientists in both the U.S. and LDC's could prevent the development of peanuts with poor processing properties. PCRSP PI's are already moving in this direction. A publication summarizing current knowledge of peanut processing qualities in relation to plant breeding may be useful. A critical evaluation is needed of current information on rapid screening methods for food quality for use by plant breeders. However, before this can be accomplished, the properties of peanuts with good and poor processing qualities need to be documented. A study of the literature could show that this information may already be available.

The development of simple modifications of existing peanut processing techniques is an area worth consideration. Would it be possible to develop microbial cultures that could expedite fermented foods production? An example would be Kisra of the Sudan fortified with peanut cake. PCRSP PI's have research underway ranging from basic to applied processing research.

On the question of agro-economics or marketability of peanuts, the collaborative work that would be done by plant breeders, microbiologists and food scientists must recognize the practical, economic feasibility of adopting new technological advances in LDCs. Understanding of the environmental and socio-economic constraints, as well as those of food preservation and preparation technology are needed if cost-effective, tasty, nutritious and aflatoxin-free peanut products are to be made available. Agro-economic or socio-economic aspects or impacts need to be recognized relative to the costs of developing and commercially advancing new peanut products. However, the financial constraints of the PCRSP do not permit sufficient resources to accomplish detailed economic-social studies. Those studies, when they are critically required, can possibly be funded from other sources, i.e. AID country funds, World Bank, etc.

The annual reports of the PCRSP food technology projects should more clearly document fundamental studies conducted at PCRSP institutions that support the applied technology transfer and research activities in LDCs. We believe that USAID leverages their funds to the optimum through the PCRSP program. However, the EEP must remain cognizant of the fact that most PI's have modest funds to use at the project level. Thus, PCRSP research must be carefully focused and coordinated with other country developmental funds.

Worthy of recognition is that most of the research in food technology covered by the Ad Hoc Committee review is included in the top three priorities of the First National Peanut Consultation and Peanut-CRSP Review held at PCARRD, Los Banos, Laguna, Philippines, on February 7-8, 1985 (Attachment A). The scientists of the PCRSP have already taken the initiative to expand the projects to cover more fully the important areas of postharvest handling and subsequent utilization which the Ad Hoc Committee recommends should be supported by the EEP.

Summary: We believe that the PCRSP Food Technology projects have been and are in the process of responding positively to the EEP criticisms by reorienting research activities. We do not see unnecessary duplication. PCRSP food technology reports could be improved. Better interaction of food technology projects with other appropriate PCRSP institutions that support PCRSP LDC activities. The Caribbean project appears to be underway and should be productive. Publications are needed to summarize the survey results and the current information on peanut processing qualities, especially in respect to plant improvement programs.

EEP Comments and PI Response: The EEP Chairman, Don Pickering has reviewed the Ad Hoc Committee report and is fully in agreement with its deliberations and recommendations. Max Milner, EEP member for Food Technology, was involved in the meeting and his views are incorporated into the report. The PI's have recognized needs for improvement since the first review, and have been modifying research to reflect EEP review, and will continue to improve the projects based on the EEP and Ad Hoc Committee reports.

Attachment A

PRIORITY RESEARCH AREAS IN PEANUT (PHILIPPINES)[1/]

1. Establishment of benchmark information and agro-economic assessment of production, post production, utilization and marketing.

2. Improvement of postharvest handling techniques such as stripping, drying and storage to manage aflatoxin problems; standardization and improvement of packaging to prolong shelf life and improve acceptability of food products.

3. Development of a seed production, processing, storage and distribution scheme.

4. Development of low cost technology to reduce high input costs such as use of rhizobium and mycorrhizae, organic fertilizer, green manuring, botanical pesticides, biological control and minimize tillage.

5. Development and improvement of village level processing and utilization.

6. Establishment of water and fertilizer requirements under various cropping systems.

7. Disease management with emphasis on epidemiology of virus and development of integrated approaches to control major diseases.

8. Testing, evaluation and improvement of farm tools and equipment suitable for small farm conditions.

9. Testing and evaluation of POT under various agro-economic conditions.

10. Development of technology transfer techniques.

11. Development of integrated insect pest management and establishment of economic threshold levels for major insect pests.

12. Development of high yielding pest resistant varieties tolerant to stress conditions and suited to various cropping systems, e.g., rice-based, coconut-based, corn-based, and sugarcane-based.

1/Summarized output resulting from the First National Peanut Consulation and Peanut-CRSP Review held at PCARRD, Los Banos, Laguna, Philippines, February 7-8, 1985.

EXECUTIVE SUMMARY

FOR

ANNUAL REPORT 1982

PREFACE

Beginning 1 July 1982 as a joint venture among the U. S. Agency for International Development (AID), U. S. universities, and host country institutions, the Peanut Collaborative Research Support Program (CRSP) has completed a successful first year. The Peanut CRSP goal is to develop research programs for improving production and utilization of peanut, in turn enhancing the food and cash income status of farmer and urban populations in the host countries. The U. S. producers and consumers will benefit from the research findings through programs of the collaborating U. S. institutions.

The early success of the Peanut CRSP was in part due to:

- Identification of production and utilization constraints for focused research projects, and selection of U. S. and host country collaborators.
- U. S. collaborators visited host institutions in all nine countries and met with administrators and collaborators for a solid, early start.
- Excellent support received from AID missions and AID/Washington.

CRSP agreements were concluded with all the U. S. universities and most of the host country institutions, and research begun in 9 of the 11 projects. Research programs focus on breeding and varietal improvement; cultural practices; disease, insect, and mycotoxin management; soil microbiology; and food product storage, development, and utilization. Some early achievements are:

- Introduction and initial testing of a wide range of germplasm in nine host countries that could improve yields, and increase resistance to diseases, insects, and mycotoxins.
- Reciprocal introduction of elite germplasm into U. S. breeding programs.
- Assessment of the type and extent of disease, insect, and mycotoxin problems present in the host countries.
- Development of a simple process to remove aflatoxin from crude peanut oil adaptable to home or village use.
- Improvement in methodology for aflatoxin detection in peanut and diversion of contaminated peanut in processing.
- Tentative identification of two viral agents responsible for transmitting and inducing symptoms of the rosette disease.
- Identification and description of a new, potentially problematic, virus disease in peanut in the U. S., along with the development of actions necessary to control the spread of the virus.
- Development and pretesting of surveys to determine peanut consumption designed to guide future product development.
- Initial surveys to determine extent and type of mycorrhizae inhabiting peanut roots and initiation of rhizobia studies.
- Providing short-term study experiences in the U.S. for several host country researchers.

We are anticipating much progress during the second year of activity based on the groundwork laid during the first year. Thanks to all concerned who have contributed to a successful year.

David G. Cummins

David G. Cummins
Program Director, Peanut CRSP
--December 1983--

EXECUTIVE SUMMARY

FOR

ANNUAL REPORT 1983

Executive Summary

As a third generation CRSP in the total program, the Peanut initiative by AID and BIFAD gained advantages from earlier CRSPs. Peanut CRSP progress continued during the second year; a summary of the major components follow.

Specific features - Program planning features continued to serve the CRSP well. These elements were incorporated into the implementation of the Peanut CRSP as follows:

Targeted effort - Constraints were reviewed internally during the past year to assure targeted research objectives established were maintained for each host country and U. S. institution. Collaborators identified or described in the planning process were established to the extent possible. Only slight modifications have been necessary but have forthrightly been undertaken, based on needs.

Efficient design - Four U. S. universities continue to provide the critical mass, for a highly manageable CRSP. Resources have been directed for minimum management costs and maximized program expenditure and impact.

Global impact - Collaboration with nine prime host countries has been established for impact into three major regions; SAT Africa, Southeast Asia, and the Caribbean. (Specific countries include Senegal, Mali, Burkina Faso, Niger, Nigeria, Sudan, Thailand, Philippines, and the the English speaking Caribbean Countries through CARDI). All missions continue to participate and assist the CRSP.

Constraint Alleviation - The CRSP was designed around primary constraints, each addressing specific technological needs in developing countries. Research projects and objectives (in both Host Countries and US) were aimed at these needs. Notable accomplishments occurred in several programs during the past year. The following new research results are itemized under each constraint.

Constraint: Low yielding cultivars

Research - Superior germplasm was identified; will lead to adapted cultivars; Thailand and Philippines

Research - Superior cultivars and breeding lines introduced; evaluations underway in Africa and Caribbean.

Constraint: Mycotoxin hazards to health

Research - Pod rotting organisms identified in Senegal; research in progress to reduce avenue of mycotoxin infection
Research - Heat-tolerant beneficial organisms were identified; fungi and bacteria which may be antagonistic and combat mycotoxin causing fungi

Constraint: Pest damage to crops

Research - Host plant resistance being identified; leafspot, rust, charcoal rot, leaf hoppers, and leaf miners, from Thailand and Philippine results
Research - Milliped and termite destruction of seedlings determined; stand establishment potential, from Burkina Faso results
Research - Pod and root rot organism identified in Senegal; resistant lines may lead to increased yields and quality

Constraint: Food source-supply and quality

Research - Peanut role in diet and consumption patterns determined in Africa, Southeast Asia, and Caribbean; strong guidance for product improvement.
Research - Storage with inert gas maintained food quality and crop seed germination; pilot project set up now for Philippines

Constraint: Biological barriers - soil microbes

Research - Selected rhizobia (for N fixation) were superior to common African and Southeast Asia strains; yield increase potentials apparent.
Research - Mycorrhizal fungi ("root extending" organisms) selected in Philippines and Thailand; adaptation and enhancement of peanut growth under study; potentials for other areas.

Resource Management - Participants in the CRSP continued collaborative interaction. Emphasis was placed on

- Coordination - for program expansion and assure adequate linkage
- Communication - on research content and progress and adequate overlap, avoiding duplication
- Resource utilization - assure funds were efficiently placed and aimed on constraints, with a sense or urgency by the investigators and their organizations.

CRSP participants fulfilled their expectations as follows:

*Scientists (US and LDC)

- US based scientists participated in 542 total days of overseas collaborative and support work; this reflects approximately 2.1 man years of senior scientists interacting with counterparts in LDC research sites and program coordination.

- LDC based scientists reviewed programs and discussed mutual interests; ten scientists and LDC representatives visited eight US research locations - primarily on a scientist-to-scientist basis. Common methodologies and research plans resulted, to advance on-going research initiatives.

- Additional training accomplished included three host country technicians trained at ICRISAT, and nine US and two host country students enrolled in graduate programs.

*Technical Committee (TC)

- Reviewed research progress and recommended redirection of some resources.

- Reviewed needs and proposed Asian workshop, joint with ICRISAT.

- Outlined expectations and guidelines for the EEP.

*Board of Directors (BOD)

- Outlined content and time table for Triennial Review

- Reviewed and finalized panel reviewers, which were approved by BIFAD and AID

- Meet by conference call when possible for travel savings

*Management Entity (ME)

- Coordinated all international travel and assured advanced clearance with AID and Mission

- Initiated host country contacts, resulting in four additional linkages and agreements

- Briefed CGAR group at ICRISAT on Peanut CRSP and legume work in Southeast Asia

*External Evaluation Panel (EEP)

- Panel identified, participants agreed to assist Peanut CRSP

- Planned meeting to establish review criteria and schedule

The full report focuses on progress and accomplishments in research. The CRSP process is working well, as the program enters its third year. The success is largely due to the fine collaborative relationships established by scientists, aided by numerous organizations, agencies, and Missions.

EXECUTIVE SUMMARY

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Constraint: Low yielding cultivars

Research - Five new peanut germplasm lines are in advanced testing stages in the Philippines for potential release as new cultivars.

Research - An introduced cultivar into Thailand appears to be better yielding than the commonly grown cultivar.

Research - Superior yielding cultivars emerging in material introduced through the germplasm evaluation program in Burkina Faso, Niger and Jamaica.

Research - Lines with good yields and superior agronomic characteristics are emerging from the Senegal program.

Constraint: Mycotoxin hazards to health

Research - Widespread potential for aflatoxin contamination in peanut exists in Senegal. The incidence of Aspergillus flavus in immature peanut pods collected from several geographical regions revealed that up to 24% of the pods and 15% of the surface disinfested seed contained viable propagules.

Research - Comparative studies of field drying methods in Senegal, following digging, showed that drying on a raised mat with an awning accelerated drying over windrow or raised mat methods. The degree of Aspergillus flavus infestation was slightly lower in kernels dryed on the raised mat, but aflatoxin levels were lower in kernels dryed in windrows.

Constraint: Pest damage to crops

Research - Identified twelve peanut lines resistant to rosette virus, which will aid greatly in broadening the base of resistant cultivars and aid in determining the nature of resistance.

Research - The leaf miner was most prevelant insect found in Thailand with yield losses up to 40% in a damage/yield relationship study. Five peanut lines were identified with a high level of resistance, which gives promise to the development of a resistant cultivar.

Research - Threshold studies in the Philippines show that reduced rates of insecticides controlled insects sufficiently while maintaining peanut yields.

Research - Pre-harvest damage to peanut pods by termites, a major soil insect in Burkina Faso, was greatest when peanut was grown on ridges compared to flat seed beds.

Research - Aflatoxin content of stored "in shell" peanut was higher from locations in Burkina Faso that had higher levels of preharvest pod damage from soil insects.

Constraint: Food source - supply and quality

Research - Hand separation of damaged or moldy kernels following blanching to remove seed coats reduced aflatoxin in resultant peanut butter from over 100 ppb to essentially 0 in preliminary results from Philippines and Thailand.

Research - Acceptable fermented products (such as yogurt types) are being produced from peanut in the Philippines.

Research - Acceptable cookies were made from composites containing 50% black-eyed pea flours in work at Alabama A&M in support of the Sudan project. Protein content was 151% over the wheat protein content.

Research - Post harvest surveys in the Caribbean showed a higher probability of aflatoxin in peanut gleaned from the field after harvest compared to those remaining intact on the plant and removed during the primary harvest process.

Constraint: Biological barriers - soil microbes

Research - Results to date in Philippines and Thailand on survival of Rhizobium in soil following flooding for rice production indicate adequate populations for inoculation of a resultant peanut crop.

Research - In field studies in Thailand, evidence was shown that the application of an efficient mycorrhizal fungus could increase peanut yields.

Resource Management - Participants in the CRSP continued collaborative interaction. Emphasis was placed on

- Coordination - for program expansion and assure adequate linkage
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- Resource utilization - assure funds were efficiently placed and aimed on constraints, with a sense of urgency by the investigators and their organizations.

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- LDC based scientists reviewed programs and discussed mutual interests; 17 scientists and LDC representatives visited collaborators at several US research locations - primarily on a scientist-to-scientist basis. Common methodologies and research plans resulted to advance on-going research initiatives.

- Additional training accomplished included one host country technician trained at ICRISAT, and 18 US and 6 host country students enrolled in graduate programs.

Technical Committee (TC)

- Reviewed research progress and recommended program plans and budgets for Board action.

- Faciliated EEP site visits to US Universities.

Board of Directors (BOD)

- Finalized EEP Scope-of-Work and assisted in university site visits.

- Reviewed research progress and approved program plans and budgets.

Management Entity (ME)

- Provided support to Principal Investigators in project management, travel clearances, and equipment approval.
- Assisted the EEP in planning and coordinating the Philippine and US University site visits.

External Evaluation Panel (EEP)

- Met with Technical Committee, Board of Directors, and Management to finalize a Scope-of-Work for the Panel review of US and host country program sites.

- Made site visits for program review in the Philippines and the US Universities.

The full report focuses on progress and accomplishments in research. The CRSP process is working well, as the program enters its fourth year. The success is largely due to the fine collaborative relationships established by scientists, aided by numerous organizations, agencies, and USAID Missions.