

**PEANUT CRSP
PLANNING
REPORT**

S u b m i t t e d t o J R C

B Y U N I V E R S I T Y O F G E O R G I A

(P l a n n i n g E n t i t y)

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PEANUT CRSP

PROPOSAL

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1. INTRODUCTION

The peanut (groundnut), *Arachis hypogaea* L., is an annual legume native to South America, likely originating in Eastern Bolivia. It is now grown in most tropical, subtropical, and temperate countries between 40 degrees North and 40 degrees South. The peanut is unique in that after flowering, fertilization, and fruit set, the pegs elongate and penetrate the soil surface where the fruits enlarge and mature in the soil.

Peanuts are an important oil, food, and feed source worldwide. The seed contains approximately 25% protein and 50% oil, and is a rich source of protein and calories. The oil is easily extracted by crushing, leaving a 50% protein cake. An estimated 80% of the world production is extracted for cooking oil, with the resultant oilcake utilized primarily for animal feed since commercial oilcake is not generally food quality. The present use of peanuts as a food varies with countries and regions from a basic dietary component to a confectionary food. Reliable information from most developing countries on the percentage of the peanut crop which is eaten directly as food is not available. Estimates from the Sudan, for example, range from 25-60%. Peasant farmers in Northern Cameroon (Semiarid Tropical region where 63% of farmers grow peanuts) use half their crop in stew-type dishes, while in the Caribbean region, consumption is almost entirely as a confection. Uses vary regionally within countries; in Northern Nigeria peanuts are used in basic dishes, but in Southern Nigeria are largely consumed as confectionery items. Peanut meal following home oil extraction is often used for food in developing countries. About 50% of the U. S. production is consumed as peanut butter. The haulms make an excellent forage.

Peanuts are well suited to production by small farmers in developing countries, and provide a major source of cash income. More than half of the 18.9 million hectares in the world is grown in developing countries. They are adapted to intercropping, a major production scheme in the tropics, providing a source of nitrogen to the system. Many of the cultivars are short season, and will mature during the short rainy season prevalent in many of the production areas. Acceptable yields are obtained on infertile, acid soils and peanuts are relatively resistant to drought. Peanuts are susceptible to a number of diseases and insect pests which are major problems in production.

The three largest peanut producers (India, China, and the U. S.) all consume the major part of their production domestically, so that the proportion of the world output traded is relatively small. However, whole peanuts, oil, and oilcake (meal) traded in the 1977-1979 period reached 2.6 million tons. Over 60% of the export value came from developing countries. The largest developing country exporters during the 1977-1979 period were Senegal, India, Sudan, Brazil, Gambia, and Mali.

World production figures are given in Table 1. Production in India and China cause Asia to lead the world. Africa is second, with the Semiarid Tropical (SAT) region a major production area. The United States, Argentina, and Brazil lead in production in the Americas. Production in SAT Africa was greatly reduced in the 70's by drought and rosette epidemics, and has not yet reached earlier levels.

Table 1. GROUNDNUT HECTARAGE AND PRODUCTION IN MAJOR PRODUCING COUNTRIES, 1977-78-79 AVERAGE¹

<u>Country</u>	<u>Harvested Area</u> <u>1000 ha</u>	<u>Production</u> <u>1000 metric tons</u>	<u>Average Yield</u> <u>Kg/ha</u>
North America	724	1877	2593
Cuba	15	15	1000
Dominican Republic	52	40	769
Mexico	39	52	1333
United States	614	1768	2879
Other Countries	4	2	500
South America	731	980	1341
Argentina	379	481	1269
Brazil	273	424	1553
Paraguay	21	18	857
Uruguay	3	3	1000
Other Countries	55	54	982
Europe	12	24	2000
Africa	5792	4613	783
Cameroon	202	90	446
Egypt	14	27	1929
Gambia	100	128	1280
Ghana	105	64	610
Ivory Coast	52	50	962
Madagascar	40	41	1025
Malawi	239	165	690
Mali	97	140	1443
Mozambique	200	90	450
Niger	160	83	519
Nigeria	673	318	473
Senegal	1010	874	865
South Africa	214	283	1322
Sudan	1022	983	962
Zaire	270	295	1093
Zambia	35	6	171
Zimbabwe	170	120	1417
Other Countries	1189	781	657
Upper Volta	-	75	-

Asia	11,383	10,320	
Burma	668	450	674
China	2375	2360	994
India	7284	6058	832
Indonesia	525	753	1434
Israel	6	23	3233
Japan	35	66	1886
Pakistan	45	61	1356
Philippines	48	39	813
Taiwan	57	84	1474
Thailand	117	125	1068
Turkey	22	51	2318
Other Countries	167	203	1216
Oceania: Australia	34	47	1382
World Total	18,630	17,790	966

¹ Source: USDA, Agricultural Statistics, 1980; except for Upper Volta which was World Indices of Agricultural and Food Production, USDA, ERS, Statistical Bulletin 669. Production figures derived from site visit interviews often are at variance with such statistics.

Research needs are great in developing countries. Peanuts were rated highest priority for research in a USAID mission survey among 20 topics, excluding small ruminants, sorghum and millet, and beans and cowpeas, which AID had already determined to be of high priority. In recommending a Peanut CRSP (Collaborative Research Support Program, authorized by Title XII of the International Development and Food Assistance Act of 1975 to provide support for long term research, collaborative between U. S. universities and developing countries), the Joint Research Committee recognized the great potential of peanuts to provide food and cash income to farmer and urban populations in the developing world. This document describes a proposed Peanut CRSP.

Program Purpose

The purpose of the Peanut CRSP is to bring together the resources of LDC and U. S. institutions into a long term collaborative research program to relieve constraints that would enable an increase in production and utilization of peanuts in the LDC's.

2. BACKGROUND

A planning grant was awarded to the University of Georgia on August 1, 1980 to develop the structure for the Peanut CRSP. Alabama A & M University was awarded a contract from the University of Georgia to assist in the socioeconomic and food technology phases of the planning effort.

CRSP Development

Steps followed in the planning process included appointment of a Steering Committee to advise in the process; evaluation of cable response from AID missions for country needs and interest; consultation with AID regional bureaus; extensive mailing of questionnaires around the world to determine constraints; attending an International Groundnut Workshop at International Crops Research Institute for the Semi-Arid Tropics (ICRISAT); making assessment trips which include site visits in 13 countries; development of a State-of-the-Art (SOTA) of world peanut production, research capabilities, research in progress, and research needs; and the assembly of a Technical Panel to assist in prioritization of research needs and program development.

Cable Evaluation. In April 1979, a cable was sent to USAID missions to determine interest in the Peanut CRSP. Responses to these cables were provided to the Planning Staff, which in general outlined for each host country: the importance of peanuts, present research on peanuts, identified constraints, and interest in, and level of participation in a Peanut CRSP. Participation was perceived at the following three levels.

- A. Primary collaboration site: collaboration would be achieved by integrating on site research and training programs on peanuts with the CRSP and local scientists would work directly with U. S. scientists in the program.

- B. Secondary collaboration site: locations where peanuts are somewhat a less important crop, institutional capability is less adequate, and/or the LDC designates peanuts at a lower priority; for such cases, field trials, research programs, and training activities could be initiated to the greatest extent possible.
- C. Tertiary collaboration site: countries with considerably lower levels of peanut importance, institutional capability, and/or interest; participation could involve primary research results and germplasm as requested and the provision of technical guidance in response to mission or host country queries; and training in this case might also be provided by the collaborating institutions if funded from other sources.

Analysis of 54 cable responses showed 12 countries with interest as primary sites, 7 secondary interest, 8 tertiary interest, 10 possible interest, and 17 no interest. Nine African, 6 Asian, and 4 Latin American countries expressed primary and secondary interest.

Questionnaires. Questionnaires were developed and mailed extensively around the world, and distributed during site visits. Production levels and prices for peanuts, and a rating of importance of various potential constraints and subconstraints to production and utilization were the major questions covered. A good distribution of responses were received.

ICRISAT Workshop. The Planning Staff attended an International Groundnut Workshop at ICRISAT in India during October 1980. Scientists were present from over 20 countries, and scientists from 16 developing countries gave reports on production and research in their countries. We held several discussions with scientists relative to their research needs. A detailed proceedings was published.

Assessment Trips. Four assessment trips were made in the fall and winter of 1980-1981. Country visits were determined from interest revealed in the cable responses, advice of the Steering Committee, and opinions of senior officers of AID Regional Bureaus.

SOTA. During the planning, information gained was compiled into a State-of-the-Art document. Production estimates, summary country reports, research being conducted, researchers, research locations, and production and utilization constraints were included. This information has been basic to the planning process.

Technical Panel Meetings. The Technical Panel met with the Steering Committee and Planning Staff on 31 March -2 April 1981 and recommended priority research areas and locations. The Technical Panel met for the second and final time 28-31 July 1981 to evaluate the proposals and select those considered appropriate for inclusion in the Peanut CRSP. Included in this group were LDC representatives from Nigeria and CARDI.

Request for Proposals. Based on information gained in our earlier activities and the advice of the Technical Panel, a Request for Proposals was developed. A request for an Expression of Interest was mailed to eligible U. S. universities, USDA research locations, and placed in the Commerce Business Daily on 10 April 1980. Those responding with an Expression of Interest by 11 May 1981 were mailed copies of the RFP, with a 3 July 1981 deadline for receipt of the proposals. Forty proposals were received representing 12 universities or institutes, and one USDA Research Center.

Prioritized Constraints and Identification of Research Needs. Following the accumulation of constraints to peanut production and utilization around the world, evaluation by the Technical Panel and Planning Staff resulted in a prioritization of constraints. These constraints are listed with the research needed to relieve the constraints.

The constraints are: low yields because of unadapted varieties and lack of varietal resistance to diseases, insects, and drought; health hazards and economic losses due to mycotoxin contamination; yield losses due to infestations of weeds, insects, diseases, and nematodes; food supplies inadequate and peanuts are not generally considered a primary food source; economic and sociological problems preventing efficient production and utilization; and physiological and soil microbiological barriers resulting in low yields.

- A. Advanced line, variety testing cultural practices - Introduction of high yielding, disease and drought tolerant advanced breeding lines and varieties. Variety maturity and adaptation will fit short rainy seasons and multicropping systems. Cultural practices will be evaluated, adjusted, and research recommended if necessary to take advantage of yield potentials in new cultivars.

Justification: In LDC's where priority on peanut research is not adequate to support a breeding program, support is needed to insure introduction of genotypes adequate to overcome yield constraints.

- B. Breeding, cultural practices - Breed high yielding disease and drought resistant cultivars, with maturity to fit needs of short rainy seasons and multicropping systems. Adjust cultural practices to take advantage of yield potentials in new cultivars.

Justification: High yielding, disease, insect, and drought tolerant varieties are not available in many LDC's. Program support is necessary to address the needs.

- C. Mycotoxin management - Development of simple detection, monitoring, and detoxification procedures and techniques for prevention of contamination. Determine time, infection sites, and location (e.g. field, storage) of contamination and develop practices to minimize infection.

Justification: Mycotoxin contamination is a worldwide problem. Aflatoxin in peanuts is produced by Aspergillus flavus, a ubiquitous fungus, that invades peanuts pre- and postharvest and produces aflatoxin as a metabolic product. Aflatoxin has been linked to animal deaths due to liver cancer, and is a carcinogen in humans. The problem is often underestimated in developing countries.

- D. Weeds, insects, diseases, nematodes - Develop low cost and efficient control measures for these pests.

Justification: Diseases and pests are a major constraint to peanut production worldwide. In addition to resistant varieties (the most desired means of control, but sometimes unattainable at economic thresholds), cultural and/or biological control measures are needed to minimize yield reductions from diseases and pests.

- E. Food Technology - Determination of the role of peanuts in the food supply and development of improved and new products.

Justification: The reasons for under-utilization of peanuts as a food in many LDC's lie with the lack of identifiable local food forms made of peanuts, lack of knowledge on the part of LDC people of the food value of peanuts, lack of appropriate processing technology to transform the peanut and its by-products into food forms acceptable to the people, and the aflatoxin contamination problem. An increased peanut production that cannot be translated into direct human consumption is inadequate for contributing to the food needs of the people.

- F. Socioeconomics - Research to develop an understanding of land, labor, management, capital, and role of sexes as related to peanut production and utilization and relationships of peanuts to other crops in the cropping system.

Justification: Economic and sociological implications of peanut production and utilization are often not understood sufficiently to fully exploit the potential peanuts have as a food and cash crop in developing countries

- G. Physiology, soil microbiology - Determine physiological barriers to production such as drought tolerance, flowering, photosynthesis and partitioning (top/fruit ratios) and aid breeders in identifying superior germplasm for incorporation into varieties. Improve nitrogen fixation efficiency in peanut/rhizobia associations, and determine role of mycorrhizae in peanut growth.

Justification: The physiological characteristics of peanuts are little understood, especially when grown under high-stress conditions prevalent in LDC's. Varietal improvement should be enhanced through physiological research. Inadequate levels of biological nitrogen fixation appear to be a major limiting factor to peanut production, especially in drier climates, a problem needing research answers. Mycorrhizae are present as intra- and intercellular fungi on many plant roots including peanuts, and could possibly be exploited to increase production if their role were better understood.

3. PROGRAM STRATEGIES

Economic Studies

The implementation of the research program will be preceded by initial economic surveys in each of the linkage countries proposed for specific research. The purpose of these short-term (up to 30 days) studies will be to evaluate the economic and social situation related to peanut production and utilization. Such studies will examine the fluctuations and genesis of farm and market prices, competitive relationships of principal commodities with peanuts, and availability of farm labor, management, capital, and land. The committed resources and governmental plans of proposed linkage countries, as they relate to peanut production, local utilization, and export, must be evaluated.

Considerable information about economic and social conditions exists in the literature, particularly as a result of USAID and World Bank studies, that can be updated and amplified by concise survey data, e.g. recent studies in Cameroon, Senegal, Niger, Sudan. Economic surveys will be accomplished by the management entity through specific contract arrangements.

With this background information to augment present knowledge of constraints due to biological and utilization problems, the CRSP can more accurately involve the host country on the basis of potential usefulness of findings from proposed collaborative research. Other alternatives may also be considered in light of economic evaluations, such as significant changes in proposed research or linkage countries. Gaps in economic and sociological information found in these initial surveys may necessitate more complete research projects in the future.

Coordination with the International Crops Research Institute for the Semi-arid Tropics (ICRISAT)

The management of the CRSP will include significant input from ICRISAT via membership on the Board of Directors. This CRSP planning has profited from ICRISAT representation on the Technical Panel, which enabled coordination of the CRSP to eliminate duplication of ICRISAT efforts. It is proposed that the Management Entity work directly with ICRISAT to develop an international Peanut Newsletter for wide distribution. The proposed ICRISAT research center near Niamey, Niger will initially deal with cereals. Present intentions are to add peanut breeding, pathology, and physiology but the peanut research is not assured at this time. In Malawi ICRISAT presence at or near Lilongwe has been proposed but at present is not accomplished. ICRISAT, as other institutions, is experiencing real financial constraints so that future peanut research may not expand as rapidly as plans suggest.

To avoid the appearance or fact of duplication or overlap between Peanut CRSP and ICRISAT Programs the Management Entity will confer with the ICRISAT Groundnut Program Leader on an annual basis in advance of budgetary and program submissions to AID and provide to AID/BIFAD a special analysis of the two programs. This analysis will form the basis for appropriate CRSP program decisions to avoid duplications or CRSP substitutions for ICRISAT responsibilities. The first such analysis will be prepared within six months after the CRSP is funded and annually thereafter.

The CRSP Management Entity will also maintain close contact with Research Institute for Oil and Oilseeds, Paris (IRHO); Overseas Office for Scientific Research and Technology, Paris (ORSTOM); Tropical Agricultural Research Institute, France (IRAT); African Groundnut Council, Lagos, Nigeria (AGC); United Nations Conference on Trade and Development, Geneva (UNCTAD), Food and Agriculture Organization, Rome (FAO); and World Bank.

Research Plans-Africa

The recovery of peanut production in SAT Africa depends largely on solving the problems of drought and rosette susceptibility of varieties. The CRSP addresses this by low-cost variety and advanced breeding line testing based in Cameroon with linkages to other countries lacking any formal peanut breeding research. More formal breeding work is proposed for Senegal. The established breeding program in Nigeria can furnish valuable collaboration and information. The proposed, but indefinite, ICRISAT peanut program near Niamey, Niger and the proposed Western Sudan peanut breeding effort can contribute to and profit from our proposed Senegal program.

Aflatoxin remains a plaguing and hazardous problem for SAT Africa. The proposed Senegal program with a resident on-site senior scientist will give great impetus to this problem solution across SAT Africa. This is especially pertinent because Senegal (ISRA) breeding programs are investigating aflatoxin resistance. After years of study much empirical knowledge has been gained about the rosette disease. However the exact nature of the causal agent(s) remains unknown. The chronic problem of peanut mottle has not been closely studied outside the U. S. The CRSP peanut virus program in Malawi, to be linked with Nigeria, will take advantage of the country programs expertise and facilities and benefit from the geographic variability of the viruses from the two widely separated areas. The USAID/Florida program in Malawi will provide a strong back up to virology research, and proposed cooperation with the CRSP to provide in-country oversight of the Malawi virus research by a U. S. scientist.**

It is envisioned that these biological research projects will be widely and informally coordinated by correspondence, visits, and workshops among country program scientists and agencies (IRHO, ICRISAT, AGC, etc.) so that the CRSP program will have a significant multiplier effect in this critical research and will accelerate recovery of SAT African peanut production.

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In January 1982 Malawi declined to participate in the Peanut CRSP, despite earlier interest. The virus work has been shifted to Nigeria. Other linkages will be developed.

The food consumption survey and technology study proposed for the Sudan is the most important effort that can be made now to promote increased food use of peanuts, hence improved nutrition and food supply for the rural and urban poor. The success of this study should have important implications for the entire sub-Saharan zone. An on-site U. S. scientist is not planned initially for the Sudan, since the food consumption survey and initiation of product development research will require about 6 months per year for the first 1 to 2 years of U. S. scientist presence in the Sudan.

NOTE: We were not made aware of any food technology research capability in Senegal during our site visit, therefore we had not considered food technology research for that location. During the past week we were informed of an AID activity on millet flour shelf life and millet use in weaning foods, which is linked with ITA (The Senegalese Institute of Food Technology). We are actively pursuing the possibility of centering the Africa food technology research here rather than in the Sudan. We will give due consideration to the merits of each location; such as reduction in cost by consolidation and having less country-sites, the benefits of having the Mycotoxin Management and Food Technology projects at the same location, and lower potential travel costs of U. S. collaborators to Senegal compared to Sudan.

Research Plans-SE Asia

A single initial project for Thailand and the Philippines will relate to development of cultivars that will be appropriate for a planned expansion of acreage in both countries. Thailand is planned as a country-site and the Philippines as a linkage and alternate country-site pending final negotiations. Resulting lines and varieties will be valuable for future testing in other moderate to high rainfall areas of SE Asia which are not considered by ICRISAT. The rigors of priorities will allow only one country site and a research linkage with the other country. Additional areas of research (Food Technology, Entomology, Biological Nitrogen Fixation/Mycorrhizae) in both Thailand and the Philippines are vital to relieving priority constraints in these countries and are included in research at higher funding levels.

Research Plans-Caribbean

The advanced breeding line/variety testing research (primary location is Cameroon) is proposed for Caribbean Agricultural Research and Development Institute (CARDI), headquartered in Trinidad. The cost of this linkage research activity will be small. The anticipated results will be important to countries served by CARDI. CARDI has a research program with peanuts and is very interested in participation in the CRSP. There is a goal to increase production and develop more trade of peanuts between islands. Crop diversification to include peanuts should contribute to increased farm income. Peanuts are an attractive crop, since there is a demand for them and they are a semi-perishable product. At the present, the countries served by CARDI produce 1,500 tons of peanuts annually and import 6,500 tons for consumption. The initial research effort with CARDI is small, however a food technology project has been selected and is planned for the second year at a higher funding level. Priorities and funds will govern further expansion of collaborative research with CARDI.

Country Sites

The Cameroon bridges the Semi-arid Tropical and Humid Tropical Regions of Africa. Varietal and advanced line adaptability research conducted here will be applicable to several countries in Africa. Institutional capability and interest as well as ecological location makes this a good site for linkages to extend the research efforts into Mali, Upper Volta, Niger, and Sudan.

Senegal is located on the western edge of Semi-arid Tropical Africa, and is unique ecologically in having a range of 3 to 5 months rainfall in a short distance north to south. Breeding material can be tested in these zones which increases the transferability of research findings. Present institutional capabilities, interest, and constraints make this an excellent location for the interaction of breeding and mycotoxin management research.

Sudan is located on the Eastern side of the Semi-arid Tropical zone of Africa and is chosen as a country-site because of institutional capability in food technology research in addition to ecological location.

**Malawi is located in a Humid Tropical zone that differs somewhat from the Cameroon site because of higher elevation. Research will be transferable to other nearby Southeast or South African countries. Linking the virus program with Nigeria in SAT Africa will provide contrasting locations for this important research. Institutional capability, the Florida/AID project, and a potential ICRISAT outreach site strengthens the collaborative potential of Malawi.

CARDI-Trinidad is in a Humid Tropical, island ecological zone and is geographically separated from other Humid Tropical locations. Institutional capability and interest favor this as a research center for the Caribbean.

NE Thailand is in the Continental Savanna ecological zone of Southeast Asia (slightly more rainfall than SAT areas) and is centrally located in the region making research findings highly transferrable. A linkage with the Philippines (Humid Tropics) will further expand applicability of the research. Both countries have excellent collaborative linkage potentials; i.e. interest, institutional capabilities, and constraints which need increased research emphasis.

The diagram on page 14 gives pertinent information about each country-site. More detailed information relative to regions, countries, and projects is in Section 4, CRSP Description.

**See footnote, page 10.

Linkage Countries

Linkages with other countries are planned from the primary country sites. These countries have been identified as having similar problems, environmental conditions, interest, and institutional capability to do research. They have shown an interest in collaborating on the type of research that will be conducted at country sites. No U. S. personnel will be located at these linkage sites, but there will be collaboration and exchange of scientific information with the country site. Linkage countries will serve as outreach countries when research results are developed and can be extended to the countries.

Other countries which have similar conditions and needs, but do not have research capability, can be included in outreach programs for extending results obtained at the country sites.

<u>COUNTRY-SITE</u> Cameroon U. Georgia/IAR Economic Survey Advanced Line Testing Cultural Practices (Insect Management)	
SAT: Maraou	Humid Tropics Yaounde

Mali

Upper Volta

Niger

Sudan

<u>COUNTRY-SITE</u> Senegal Texas A & M/ISRA Economic Survey Breeding-Cultural Practices Mycotoxin Management	
SAT: Bambey Kaolack	Continental Savanna: Sefa (Casamance)

<u>COUNTRY-SITE</u> Nigeria U. Georgia/Inst. Agr. Res., ABU, Zaria Economic Survey Etiology and Host Resistance to Rosette, Leaf Mottle, and Other Viruses.	
SAT Zaria Possible linkages: Bambey, Senegal, Maradi, Niger	

<u>COUNTRY-SITE</u> Sudan Alabama A & M/ARC Economic Survey Food Consumption surveys and product development.	
Western Sudan	

<u>COUNTRY-SITE</u> Thailand N. C. State/Khon Kaen Univ. Economic Survey Breeding, Advanced Line Testing, Cultural Practices (Insect Management, Soil Microbiology, Food Consumption Surveys and Product Development)	
Continental Savanna: Khon Kaen	Humid Tropics

<u>COUNTRY-SITE</u> CARDI-Trinidad U. Georgia/CARDI Economic Survey Advanced Line Variety Testing, Cultural Practices (Food Consumption Surveys and Product Development)	
Humid Tropics Trinidad	

Linkage:
Philippines

Burma
Indonesia

Legend:----- Planned Linkages; -----Possible Linkages. () Indicates research to phase in after initial projects, depending on fund availability.

4. CRSP DESCRIPTION

This section describes the research plan for the Peanut CRSP. Prioritized regional constraints, collaborative research project descriptions, goals and objectives of specific projects, and budgets for the CRSP are defined. Research is recommended in four regions, based on the planning evaluations. Highest program priority is given to Semiarid Tropical Africa.

Semiarid Tropical (SAT) Africa

SAT Africa extends across Africa south of the Sahara Desert and includes portions of Senegal, Mali, Mauritania, Upper Volta, Niger, Benin, Nigeria, Cameroon, Chad, Central African Republic, and Sudan. Peanuts are cultivated in SAT Africa for oil, direct consumption, and hay for livestock. The major use is for oil, but the high protein content of peanuts make them an important source of food where protein is inadequate in most diets. SAT Africa is characterized by a population beset with extreme poverty both in rural and urban areas. Peanuts are one of the few crops with enough drought tolerance for the region. Most of the peanuts are grown by peasant farmers on small holdings with usually less than one hectare of peanuts. The importance of peanuts in the economy, the often unrealized value of peanuts as a direct food crop, and the great need for research answers to increased production and utilization means placing SAT Africa in a position of high priority for research under the CRSP.

Constraints:

- A. Low yield potential of varieties because of lack of resistance or tolerance to drought, diseases, and insects.
- B. Yield losses due to drought, diseases, and insects. Estimated annual losses due to the following diseases are: leaf spots, 20-50%; peanut mottle virus, 30%; rosette, up to 55%
- C. Toxicity of peanuts from aflatoxin which endangers the health of humans and animals and lowers market value.
- D. Peanuts often are not regarded as food; restricted array of peanut food preparations with low sensory values; nutritional values unrecognized.
- E. Low yields because of lack of complete physiological adaptation of peanuts and associated microorganisms to the environment.
- F. Prices, markets, farmer, and consumer interest limit production and utilization.

Southeast Africa**

Malawi is proposed as the country-site in this region. Results from work in Malawi should be applicable and transferable to peanut production in surrounding countries. Most of the peanut production in Malawi is by peasant farmers in plantings of less than one hectare. Production is by hand labor. Since all available land and labor is presently utilized to a maximum, increased production can be accomplished only by increased unit area yields. Most of the production is consumed in the country. Increased production, therefore, should result in improved food intake by rural and urban populations and increased income of small farmers.

Constraints:

- A. Low yields due to lack of varietal resistance to leafspot, rusts, and virus.
- B. Yield losses due to diseases and insects. Rust and rosette are primary diseases.
- C. Poor pod set and flowering and high top to pod ratios.
- D. Inadequate nitrogen fixation by rhizobia resulting in low yields.
- E. Prices too high for fertilizer, pesticides, land, labor, and capital.

Southeast Asia

Thailand and the Philippines have been selected as the target countries for research in Southeast Asia. In both countries peanuts are grown by peasant farmers in less than 1 ha plots and most of the peanuts are consumed directly. Thailand exports a few whole nuts and imports some oil and oilcake with a slight balance of trade to the export side. The proposed work is for Northeast Thailand, the poorest area of the country. The work will complement long range plans to increase peanut production. The Philippines are planning greatly increased production in Northern Luzon. Since both countries consume considerable quantities of peanuts directly, both have needs for increased dietary intake (protein and total calories), and have a distinct poor rural and urban population, the Peanut CRSP is well suited and has a potential for short-term impact. Increased production is needed and can be accomplished by encouraging the use of peanuts as a second crop in a rotation and production on farms where peanuts have not been grown, and by stabilized or increased production per unit area. In addition to on-farm consumption, both countries have many small cottage scale processors where new or improved food products could be effectively promoted.

Burma and Indonesia have significant peanut production and could profit from information developed at the country-site in Southeast Asia. Outreach efforts will be extended to these countries as the program develops and information is available.

**See footnote, page 10

Constraints:

- A. Low yield of varieties because of lack of resistance to disease, drought, and insects and poor adaptation.
- B. Low yield due to cropping systems and cultural practices that are not adequate to take advantage of yield potentials of varieties.
- C. Low yields because of inadequate rhizobial nitrogen fixation.
- D. Yield losses due to drought, diseases, and insects. Leafspots, rusts, and peanut mottle viruses cause estimated yield losses up to 50%.
- E. Toxicity of peanuts from aflatoxin which endangers human and animal health and lowers market value.
- F. Restricted array of peanut food preparations with low sensory values; nutritional values unrecognized.
- G. Market system inadequate to move excess peanuts from farms.

Caribbean

CARDI serves the agricultural research interests of 12 English speaking nations or islands from Belize through the lesser Antilles to Guyana. In most cases the people of this Caribbean region have low incomes and are undernourished. Peanuts, although a minor crop at this time (1,500 tons annually), have promise to alleviate in part these problems by supplying income to small farmers through sales in local and inter-island markets and to increase protein and caloric intake of both rural and urban poor. Presently, peanuts are primarily consumed as snack foods, with some peanut butter production. There is very little oil production. A large amount (6,500 tons annually) are imported to supplement local production.

Constraints:

- A. Low yield potential of varieties due to poor adaptation and lack of resistance to diseases and insects.
- B. Low yields due to inadequate mineral nutrition.
- C. Lack of simple food product technology to utilize needed food potential of peanuts.
- D. Lack of gasoline powered machinery to aid in production.

Collaborative Research Project Descriptions

This sub-section establishes priorities for research projects to solve constraints to production in various countries. Priorities are based on such factors as importance of peanuts in the country, interest in and priority placed on peanuts by the host government, interest of the AID mission, collaborative linkage capabilities, importance of constraint to production and utilization, and relative importance of constraint among countries. Proposed project units are listed in priority order for funding.

Project Code: GA/INPEP/CAM/CAR.

Country-Site: Cameroon/CARDI-Trinidad

Linkage Countries: Niger, Mali, Upper Volta.

Priority Constraint: Low yields due to drought and diseases.

Research Needed: Introduction and testing of existing advanced breeding lines and varieties for selection of pest and drought resistant types, and cultural practices which utilize, to a maximum, yield potentials of the varieties.

Rationale for Site Selection and Research to be conducted:

- A. USAID mission and country interest is high.
- B. USAID will place peanut breeder in Northern Cameroon; CRSP proposes to combine efforts and contribute the salary for the breeder.
- C. Countries have similar problems contributing to low yields.
- D. Provides assistance on a primary, secondary, or tertiary linkage level for the needed introduction and testing of improved genotypes.
- E. Makes immediate use of products of breeding progress worldwide.
- F. Requires low level of host country expertise and resources.
- G. Low cost, high probability of success in short-term.
- H. Can be discontinued as country programs mature; added in another country as need arises.
- I. Peanuts are a major cash and food crop in Northern Cameroon, Niger, Mali, and Upper Volta.

Benefits Expected: Stabilized and increased production of peanuts. Yields could increase 50% in the SAT African countries. Increased food supply and farm income should result.

Host Country Lead Institutions: Institute for Agronomic Research, Yaounde and Maroua, Cameroon.

Linkage Country Institutions: CNRA, Tarni, Maradi, Niger; Ministry of Agriculture, Division of Agronomic Research, Bamako, Mali; Institute of Agronomic Research, Ouagadougou, Upper Volta.

U. S. Lead Institution: University of Georgia.

U. S. Principal Investigator: Drs. W. D. Branch and R. O. Hammons.

Project Title: International Peanut Evaluation Program.

Objectives:

- A. Select genotypes, assemble seed, and carry out evaluation under uniform and good cultural practices.
- B. Collect, analyze, and distribute genotype performance information.
- C. Assist in seed increase of superior genotypes for distribution and use in host countries.

Project Code: GA/INPEP/CAR.

Country Site: CARDI-Trinidad.

Linkage Countries: Research will be conducted in selected CARDI countries.

Priority Constraint: Low yields due to disease and unadapted varieties.

Research Needed: Introduction and testing of existing advanced breeding lines and varieties for selection of pest and drought resistant types, and cultural practices which utilize, to a maximum, yield potentials of the varieties.

Rationale for site selection and research to be conducted:

- A. Country interest high.
- B. Several islands have similar problems contributing to low yields.
- C. Provides assistance for the needed introduction and testing of improved genotypes.
- D. Low cost, high probability of success in short time.
- E. Peanuts are a significant food crop and have potential for a greatly expanded food and cash crop.

Benefits Expected: Increased production of peanuts. Yields could increase 25% in CARDI countries. Increased food supply and farm income should result, since farmers could realize income from producing the peanuts that are presently imported.

Host Country Lead Institution: CARDI, University of the West Indies, St. Augustine, Trinidad.

U. S. Lead Institution: University of Georgia.

U. S. Principal Investigators: Drs. W. D. Branch and R. O. Hammons.

Project Title: International Peanut Evaluation Program.

Objectives:

- A. Select genotypes, assemble seed, and carry out evaluation under uniform and good cultural practices.
- B. Collect, analyze, and distribute genotype performance information.
- C. Assist in seed increase of superior genotypes for distribution and use in host countries.

Funding: Please refer to budgets following this section.

Project Code: TX/BCP/S

Country-site: Senegal

Priority Constraint: Low yields due to drought and diseases.

Research Needed: Breeding and cultural practices research to develop disease and drought resistant varieties and cultural practices which utilize to a maximum the yield potentials of the varieties.

Rationale for Site Selection and Research to be conducted:

- A. USAID mission and country interest is high in Senegal.
- B. Location is accessible for travel from U. S. and will minimize travel costs, which is important since this project by nature has a number of co-investigators.
- C. Amount of rainfall decreases rapidly over a relatively short distance from south to north in Senegal providing test locations in different ecological zones.
- D. Germplasm developed here should be adaptable to other areas of SAT Africa.
- E. Research would complement and could cooperate with country programs in Nigeria.

Benefits Expected: Development and introduction to farmers of better varieties of peanuts should easily increase yields 10-15% which should add to both food supply and cash income. Production practices and yields of other major crops (sorghum and millet) should improve because of the nitrogen contribution in the system and more available cash for inputs. High potential for program success is expected from cooperative mission and CRSP efforts.

Host Country Lead Institution: ISRA, Bambey and location in Casamance.

U. S. Lead Institution: Texas A & M University.

U. S. Principal Investigator: Drs. O. D. Smith and C. E. Simpson.

Project Title: Breeding Peanuts for Resistance to Leafspot and Soil-borne Diseases.

Objectives:

- A. Identify the major pathogens associated with soil-borne diseases and the conditions under which they develop.
- B. Determine the seasonal development and relative abundance of foliar disease epidemics to maximize the effectiveness of field screening.
- C. Evaluate Texas breeding lines for adaptability, disease reactions, and acceptability for use as cultivars in Senegal.
- D. Provide opportunity for training Senegalese staff and students.
- E. Develop new populations by hybridization, select, and evaluate lines of potential benefit under Senegal and Texas growing conditions.
- F. Increase seed of select lines for distribution and production.

Funding: Please refer to budgets following this section.

Project Code: TX/MM/S

Host Country: Senegal

Priority constraint: Toxicity of peanuts lead to human and animal health hazards and reduced market value due to mycotoxin contamination.

Research Needed: Research to develop simple mycotoxin (primarily aflatoxin) detection and monitoring procedures, measures to minimize field and storage contamination, and decontamination processes.

Rationale for Site Selection and Research to be Conducted:

- A. Strong country interest evidenced by breeding for mycotoxin resistance project and establishment of peanut meal detoxification pilot plant.
- B. Objective of this field-oriented research is to minimize toxicity of peanuts during production and village storage thus improving on farm and village peanut food quality and to develop simple village-level detoxification procedures.
- C. Results highly transferable across SAT Africa for rainfed peanut culture.
- D. Possible strong linkages with country breeding and insect projects and African Groundnut Council.
- E. Reduction of mycotoxin levels must be achieved as peanuts become more of a major dietary component.

Benefits Expected:

Improved mycotoxin prevention practices will result in significant reduction of mycotoxigenic diseases, such as hepatoma, of people who use peanuts as a regular part of their diet. Accurate statistics do not exist for present morbidity due to these toxic influences. Benefits are difficult to estimate but high levels of aflatoxin are known to exist across Africa and Asia.

The market value of peanuts is directly dependent on aflatoxin content. Country-wide reduction of aflatoxin and associated kernel damage can be expected to improve peanut prices to the farmer; preserve the quality of food; and greatly increase the edible percentage of the crop.

Host Country Lead Institution: ISRA, Bambey and Kaolack.

U. S. Lead Institution: Texas A & M University.

U. S. Principal Investigator: Dr. Robert E. Pettit.

Project Title: Mycotoxin Management in Peanuts by Prevention of Contamination.

Objectives:

- A. Determine where, when, and how frequently peanuts are invaded by mycotoxin producing fungi.
- B. To develop interdisciplinary efforts for the discovery of production, harvesting, and curing practices which can help minimize mycotoxin contamination in peanuts.
- C. Develop inspection procedures for rapid detection and diversion of mycotoxin contaminated peanuts into processing for cleanup and/or detoxification.
- D. Train research staff for detection methodology, fungal identification, and prevention programs so as to manage the mycotoxin problems.

Funding: Please refer to budgets following this section.

Project Code: GA/PV/N

Host Country: Nigeria

Priority Constraint: Low yields and high plant death caused by rosette, peanut mottle virus and other endemic viral diseases.

Research Needed: Determine the etiology of groundnut rosette and provide knowledge of specific causal agents for use in breeding and cultural control programs; to identify variants of peanut mottle virus and implement control strategies against the disease it causes; and provide methods of rapid identification of peanut mottle virus, agents causing groundnut rosette, and other peanut viruses.

Rationale for Site Selection and Research to be Conducted:

- A. Rosette is very damaging (up to 100% loss) and endemic; a principal production problem in Nigeria, and surrounding SAT countries.
- B. Worldwide peanut mottle virus reduces yield 10-35% each year; seed-and-insect borne.
- C. Etiology of rosette and PMV poorly understood thus hampering breeding and cultural control efforts.
- D. Host and linkage country expertise favorable for linkage; country interests high. Despite progress in breeding for resistance, few resistant varieties are available.
- E. Results will be highly transferrable across SAT and SE Africa.
- F. Linkages with German, UK, and ICRISAT work anticipated.

Benefits Expected: Decrease losses in peanut production due to viral disease infestations. Losses due to peanut mottle, clump, and bud necrosis viral diseases range from 30 to 50% of the expected production. Rosette reduces yields every year and epidemics have caused essentially 100% yield losses.

Host Country Institution: IAR, Kano, Nigeria.

Linkage Country Institution: To be established.

U. S. Lead Institution: University of Georgia.

U. S. Principal Investigator: Dr. James W. Demski.

Project Title: Peanut Viruses: Etiology, Epidemiology, and Nature of Resistance.

Objectives:

- A. To determine the etiology of peanut rosette and provide specific agents for use in breeding and control programs.
- B. To identify variants of peanut mottle virus and implement control strategies against the disease it causes.
- C. Provide methods of rapid identification of peanut mottle virus, agents causing groundnut rosette, and other peanut viruses.

Funding: Please refer to budgets following this section.

Project Code: AAM/FS/S

Host Country: Sudan

Priority Constraint: Under-utilization of peanuts as a direct food product.

Research Needed: Food consumption survey to determine the role of peanut as food item in diets; improve existing peanut foods; develop new peanut foods.

Rationale for Site Selection and Research to be Conducted:

- A. Peanuts are important as food but utilization is hindered by lack of knowledge of alternative food preparations and nutritive value of peanut.
- B. Mission and country interest high.
- C. Excellent linkage prospects and expertise at Food Research Center, ARC, but peanut utilization research negligible.
- D. AID sponsored Western Sudan project, which includes peanuts, will facilitate very wide distribution of research results.
- E. Proposed U. S. institution has high expertise in this women-related effort.

Benefits Expected: Increased food intake of protein and calories due to an increase in the use of peanuts as a basic food component. Improved peanut processing and foods will allow increased efficiency of women in food preparation; and/or allow alternative income generation via cottage industries.

Host Country Lead Institution: Agricultural Research Corporation, Food Research Center, Khartoum.

U. S. Lead Institution: Alabama A & M University.

U. S. Principal Investigator: Dr. Bharat Singh.

Project Title: An Interdisciplinary Approach to Optimum Food Utility of Peanuts in SAT Africa.

Objectives

Design and implement a research program to determine the food utility of the peanut for the semi-arid tropics (SAT) of Africa via:

- A. Description and understanding of variations in environment, socioeconomics, and food technologies as they constrain the preservation and utilization of peanut supplies;
- B. Analysis of the current and potential dietary role of existing peanut products; and
- C. Research on the improvement of existing peanut products and the development of new peanut products with suitable energy density, nutrient concentrations and preferred tastes at acceptable cost.

Funding: Please refer to budgets following this section.

Project Code: NCS/BCP/T

Host Country: Thailand (Philippines are an alternate country-site pending further negotiations).

Priority Constraint: Low yields due to inherently low yield potential of varieties and lack of resistance to diseases and insects.

Research Needed: Breeding and advanced line-variety testing and cultural practices research to develop disease and insect resistant varieties and cultural practices which utilize to a maximum the yield potentials of the varieties.

Rationale for Site Selection and Research to be Conducted:

- A. Country interest very high for improved peanut production in Northeast Thailand.
- B. Good linkage prospects with scientists at Khon Kaen University and at the Department of Agriculture Northeast Field Station.
- C. Linkage proposed with the Philippines is in an environment outside ICRISAT research interests.
- D. Present peanut cultivars and cultural practices need improvement.
- E. On-site senior scientist will make great short-term progress in advanced line testing, cultural practices research.

Benefits Expected: Provide needed technology for increased production of peanuts in Northeast Thailand. Work will complement the AID sponsored Northeast Rainfed Project. Provide production base for an additional 300,000 hectares of peanuts in Northern Luzon over the 90,000 (estimate from PCARR) hectares now grown. Profits from farm production plus income the oil mill would generate will be of great economic value to Northern Luzon. Improved prospects for better nutrition of farm people and rural villages in both Thailand and the Philippines.

Host Country Institutions: Khon Kaen University and Department of Agriculture.

Linkage Institution: Philippines program coordinated by Philippine Council for Agricultural Research Resources.

U. S. Lead Institution: North Carolina State University.

U. S. Principal Investigator: Dr. Johnny C. Wynne.

Project Title: Peanut Varietal Improvement for Thailand and the Philippines.

Objectives:

- A. Establish regional testing programs to identify peanut varieties suitable for use in Thailand and the Philippines.
- B. Determine cultural practices used in peanut production and modify either cultural practices or genetic material to increase productivity.
- C. Develop high yielding, early maturing, large-seeded peanut varieties tolerant to drought, soil salinity and resistant to leafspots, rust and leafhoppers.
- D. Provide short-term, academic and technical assistance required to establish projects capable of independent research in peanut variety testing and development.

Funding: Please refer to budgets following this section.

Project Code: NCS/IM/T.

Country Site: Thailand (Philippines are an alternate country-site pending further negotiations).

Linkage Countries: Philippines.

Priority Constraint: Attack on peanuts by a complex of foliage, soil, and storage insect pests that reduce yields, provide entry for pod rotting organisms, transmit virus diseases and destroy and fowl peanuts harvested for food and seeds.

Research Needed: Development of inexpensive pest management practices that would emphasize cultural control practices and insect resistant peanut cultivars.

Rationale for site selection and research to be conducted:

- A. Country interest very high for improved peanut production in Northeast Thailand.
- B. Good collaborative prospects with scientists at Khon Kaen University and at the Department of Agriculture's Northeast Field Station.
- C. Linkage proposed with the Philippines and outreach to Burma and Indonesia extends to environments outside ICRISAT research interests.
- D. Present insect management practices need improvement.
- E. Project will be closely coordinated with N. C. State breeding project at the same location.

Benefits Expected: Provide needed technology for increased production of peanuts in Northeast Thailand. Work will complement the AID sponsored Northeast Rainfed Project. Work will aid in the desired peanut production increase in Northern Luzon, Philippines. Profits from farm production plus income a planned oil mill would generate will be of great economic value to Northern Luzon. Improved prospects for better nutrition of farm and rural village peoples in both Thailand and the Philippines.

Host Country Lead Institution: Khon Kaen University and Department of Agriculture. (Philippines program coordinated by Philippines Council for Agricultural Research Resources).

U. S. Lead Institution: North Carolina State University.

U. S. Principal Investigators: Dr. W. V. Campbell.

Project Title: Management of Arthropods on Peanuts in Southeast Asia.

Objectives:

- A. To determine importance of specific insect pests of peanuts in rainfed and irrigated production.
- B. Determine insect and/or damage thresholds where control measures are feasible.
- C. Evaluate breeding lines, cultivars, and wild Arachis species for resistance to principal insect pests in cooperation with a breeder(s).

Funding: Please refer to budgets following this section.

Project Code: GA/IM/CAM

Country Site: Cameroon

Linkage Countries: Possible linkages with Niger, Nigeria, and Senegal.

Priority Constraint: Attack on peanuts by a complex of foliage and soil insect pests that reduce yields, provide entry for pod rotting organisms, transmit virus diseases, and destroy peanuts.

Research Needed: Development of inexpensive, integrated pest management practices that would emphasize cultural control practices.

Rationale for site selection and research to be conducted:

- A. USAID mission and country interest high.
- B. Relates to USAID and Peanut CRSP coordinated efforts with advanced line and variety testing to further delineate yield constraints.
- C. Central location in SAT region for linkage and outreach efforts.
- D. Insect problems are high in region but research efforts are minimal.

Benefits Expected: Stabilized and increased production of peanuts, which should increase food supply and farm income.

Host Country, Lead Institution: Institute for Agronomic Research, Yaounde and Maroua, Cameroon.

U. S. Lead Institution: University of Georgia.

U. S. Principal Investigators: Dr. Robert E. Lynch.

Project Title: IPM Strategies for Groundnut Insects in SAT Africa.

Objectives:

- A. Identify the major economic pests of groundnut.
- B. Develop economic-injury levels for the major economic pests by quantifying the relationship between pest density and groundnut yields.
- C. Develop reliable sampling procedures for the major pests to estimate population density.

- D. Relate relative pest abundance to groundnut seasonal and developmental phenology.
- E. Develop strategies for insect pest management that will fit into cultural, socio-economic conditions of the small farmer.
- F. Increase knowledge of entomology and research methods of collaborating scientists through training and collaborative research.
- G. Aid in the stabilization and/or increase of groundnut production through implementation of IPM strategies.

Funding: Please refer to budgets following this section.

Project Code: GA/FT/T

Country Site: Thailand

Linkage Countries: Philippines

Priority Constraint: Restricted array of peanut food preparations with low sensory values, and general unrecognition of the nutritional value of peanuts.

Research Needed: Work to characterize socio-economic, cultural, and technical factors which act to prevent efficient utilization of peanuts and development of products, technology, and policy instruments that would promote the increased efficiency of utilization.

Rationale for site selection and research to be conducted:

- A. Peanuts are important as food but utilization is hindered by lack of knowledge of alternative food preparations and nutritive value of peanut.
- B. Mission and country interest is high.
- C. Present peanut utilization research is low, but an adequate collaborative situation exists.
- D. Linkage prospects are good to extend research results and efforts in Philippines.

Benefits Expected: Increased intake of protein and calories due to an increased use of peanuts as a basic food component. Improved peanut processing and foods will allow increased efficiency of women in food preparation; and/or allow alternative income generation through cottage industries.

Host Country Lead Institution: Khon Kaen University, Khon Kaen.

U. S. Lead Institution: University of Georgia

U. S. Principal Investigators: Dr. Tommy Nakayama

Project Title: Consumption of Peanuts as Food and Appropriate Technology for Storage/Utilization

Objectives:

- A. Assess patterns of peanut utilization and determine if there are any socio-cultural factors which need to be addressed.
- B. Develop a package of appropriate technology adapted specifically to address identified constraints; such as storage to control mold and insects using expensive technology, and development of acceptable food products.
- C. Make a quantitative assessment of the efficiency of the system developed.

Funding: Please refer to budgets following this section.

Project Site: AAM(FL)/FT/CAR

Country Site: CARDI-Trinidad

Linkage Countries: CARDI participating countries

Priority Constraint: Protein and calorie malnutrition, and the under-utilization of the peanut to overcome the problem, because of lack of simple food product technology.

Research Needed: Development of acceptable food products of high nutritional value containing peanuts or peanut products and determine impact of these products on nutritional intake of population.

Rationale for site selection and research to be conducted:

- A. Protein and calorie shortage, especially in children and nursing mothers.
- B. Country interest good for increased peanut production, which would provide for expansion of utilization.
- C. Low cost due to proximity of host country-site to U. S. institution.

Benefits Expected: Increased food intake of protein and calories due to an increased use of peanuts as a basic food component. Generation of income via stimulation of inter-island trade.

Host Country Lead Institution: CARDI, University of the West Indies, St. Augustine, Trinidad.

U. S. Lead Institution: Alabama A & M University (subgrant to University of Florida).

U. S. Principal Investigators: Dr. E. M. Ahmed, University of Florida.

Project Title: Peanut Utilization in Food Systems in Developing Countries.

Objectives:

- A. Assess the sensory, nutritional, microbiological and toxicological quality parameters of peanuts and peanut products.
- B. Incorporate indigenous peanuts and peanut products into solid and/or beverage food systems locally consumed.
- C. Prepare and present peanut fortified foods and determine acceptance and value of these products.

Funding: Please refer to budgets following this section.

Project Code: NCS/TX/SM/T

Country Site: Thailand (Philippines is an alternate country site pending further negotiations).

Linkage Countries: Philippines.

Priority Constraint: Inadequate nitrogen fixation by rhizobia and under-utilization of mycorrhizal fungi as accessory roots, both resulting in low peanut yields.

Research Needed: Research to improve the efficiency of biological nitrogen fixation under suboptimum conditions in LDC's and the effectiveness of mycorrhizal fungi in promoting peanut growth.

Rationale for site selection and research to be conducted:

- A. Country interest high for improved peanut production in Northeast Thailand.
- B. Good collaborative prospects with scientists at Khon Kaen University.
- C. Linkage proposed with the Philippines, is in an environment outside ICRISAT research interests.
- D. Present peanut production efficiency needs improvement.
- E. Proposed work complements Texas Breeding project in Thailand.

Benefits Expected: Provide needed technology for increased production of peanuts in Northeast Thailand. Work will complement the AID sponsored Northeast Rainfed Project. Provide base for planned increase in peanut production in Northern Luzon, Philippines. Improved prospects for better income and nutrition of rural and urban population.

Host Country Lead Institution: Khon Kaen University.

Linkage Institution: Philippine program coordinated by Philippine Council For Agricultural Research Resources.

U. S. Lead Institution: North Carolina State University and Texas A & M University.

U. S. Principal Investigators: Dr. Gerald Elkan, NCSU. Ms. Ruth Ann Taber, TAMU, Co-PI.

Project Title: Nitrogen fixation of peanuts in Thailand and the Philippines.

Objectives:

- A. Evaluate the need for inoculation for locally adapted peanut cultivars.
- B. Determine the efficacy of inoculants prepared using strains identified as being effective with local peanut cultivars.
- C. Test the nitrogen-fixing capacity and yield potential of peanut germplasm derived from crosses of locally adapted cultivars and cultivars with high nitrogen-fixing ability.
- D. Survey mycorrhizal fungi predominant in the peanut rhizosphere and roots.
- E. Compare efficiencies of various mycorrhizal fungi strains to promote plant growth.
- F. Determine value of mycorrhizal fungi in relieving various growth stress conditions.

Funding: Please refer to budgets following this section.

5. CRSP Financial Plan and Scientist Involvement

Projects to be included in initial program:

GA/INPEP/CAM and CAR: Georgia/International Peanut Evaluation Program/Cameroon and CARDI.

TX/BCP/S: Texas A & M/Breeding and Cultural Practices/Senegal.

TX/MM/S: Texas A & M/Mycotoxin Management/Senegal.

GA/PV/N: Georgia/Peanut Viruses/Nigeria.

AAM/FT/S: Alabama A & M/Food Technology/Sudan.

NCS/BCP/T: North Carolina State/Breeding and Cultural Practices/Thailand.

Projects to be included at a later date subject to availability of funds.

NCS/IM/T: North Carolina State/Insect Management/Thailand.

GA/IM/CAM: Georgia/Insect Management/Cameroon.

GA/FT/T: Georgia/Food Technology/Thailand

AAM(FL)/FT/CAR: Alabama A & M (Florida)/Food Technology/CARDI

NCS/TX/SM/T: North Carolina State/Texas A & M/Soil Microbiology/Thailand.

Management Entity

Management Entity costs are listed in Table 3. Linkage travel is for both establishing linkages and necessary travel to project sites by the Director while research is underway. Meeting costs are for quarterly Board of Director and Technical Committee Meetings and for the External Evaluation Panel. The contract studies are non-recurring items.

Scientist Involvement

The number of scientists involved in the CRSP and their contribution in terms of equivalent full time scientists are listed in Table 5. Figures are given for the countries covered by the six initial projects. Scientists are separated into three levels; senior: Ph.D, or equivalent; junior: B. S. or equivalent, and graduate students; and technical: clerical, technicians and student employees (working towards B. S. degree). U. S. institution inputs come from budgets of accepted projects, while host country institution numbers are estimated. In-country time of principal and co-principal U. S. investigators is also estimated and included in Table 4. A total of 110 individuals would be involved.

TABLE 1

Budget Summary
Peanut CRSP

<u>CATEGORY</u>	<u>FY82</u>	<u>FY83</u>	<u>FY84</u>	<u>FY85</u>	<u>FY86</u>	<u>TOTAL</u>
<u>AID PROGRAM FUNDS COST SHARED</u>						
GA/INPEP	37,345	72,360	82,571	82,571	82,571	357,418
TX/BCP	85,059	164,810	188,048	188,048	188,048	814,013
TX/MM	56,679	109,821	125,305	125,305	125,305	542,415
GA/PV	37,638	72,929	83,212	83,212	83,212	360,203
AAM/FT	46,083	89,290	101,880	101,880	101,880	441,013
NCS/BCP	37,825	73,289	156,080	156,080	156,080	579,354
NCS/IM	-	50,120	57,737	57,737	57,737	223,331
GA/IM	-	68,766	78,463	78,463	78,463	304,155
GA/FT	-	64,571	73,677	73,677	73,677	285,602
AAM/FL/FT	-	81,201	92,650	92,650	92,650	359,151
NCS/TX/SM	-	181,212	206,763	206,763	206,763	801,501
Total Cost Shared	300,629	1,028,369	1,246,386	1,246,386	1,246,386	5,068,156
<u>AID PROGRAM FUNDS NOT COST SHARED</u>						
GA/INPEP	48,373	66,733	92,852	92,852	92,852	393,662
TX/BCP	51,036	79,109	90,263	90,263	90,263	400,934
TX/MM	34,007	52,714	110,147	110,147	110,147	417,162
GA/PV	22,583	35,006	39,942	39,942	39,942	177,415
AAM/FT	37,650	42,859	48,902	48,902	48,902	227,215
NCS/BCP	22,695	35,178	213,648	213,648	213,648	698,817
NCS/IM	-	22,042	25,150	25,150	25,150	97,492
GA/IM	-	24,000	27,384	27,384	27,384	106,152
GA/FT	-	29,994	34,364	34,364	34,364	133,086
AAM/FL/FT	-	37,977	43,473	43,473	43,473	168,396
NCS/TX/SM	-	75,782	86,777	86,777	86,777	336,113
Total NCS	216,344	501,394	812,902	812,902	812,902	3,156,444
<u>TOTAL AID PROGRAM FUNDS</u>						
GA/INPEP	85,718	139,093	175,423	175,423	175,423	751,080
TX/BCP/S	136,095	243,919	278,311	278,311	278,311	1,214,947
TX/MM/S	90,686	162,535	235,452	235,452	235,452	959,577
GA/PV/M	60,221	107,935	123,154	123,154	123,154	537,618
AAM/FT/S	83,733	132,149	150,782	150,782	150,782	668,228
NCS/BCP/T	60,520	108,467	369,728	369,728	369,728	1,278,171
NCS/IM/T	-	72,162	82,887	82,887	82,887	320,823
GA/IM/CAM	-	92,766	105,847	105,847	105,847	410,307
GA/FT/T	-	94,565	108,041	108,041	108,041	419,688
AAM/FL/FT/CAR	-	119,178	136,123	136,123	136,123	527,547
NCS/TX/SM/T	-	256,994	293,540	293,540	293,540	1,137,614
Total AID Program Funds	516,973	1,529,763	2,059,288	2,059,288	2,059,288	8,224,600

TABLE 1

Budget Summary - Page Two

TOTAL NON-FEDERAL COST SHARED PROGRAM FUNDS

<u>CATEGORY</u>	<u>FY82</u>	<u>FY83</u>	<u>FY84</u>	<u>FY85</u>	<u>FY86</u>	<u>TOTAL</u>
GA/INPEP	12,324	23,879	27,248	27,248	27,248	117,947
TX/BCP/S	28,455	55,135	62,909	62,909	62,909	272,317
TX/MM/S	18,907	36,634	41,799	41,799	41,799	180,938
GA/PV/M	27,729	53,727	61,303	61,303	61,303	265,365
AAM/FT/S	15,994	30,990	35,360	35,360	35,360	153,064
NCS/BCP/T	13,314	25,798	54,940	54,940	54,940	203,932
NCS/IM/T	-	16,190	18,473	18,473	18,473	71,609
GA/IM/CAM	-	17,137	19,553	19,553	19,553	75,796
GA/FT/T	-	35,981	41,054	41,054	41,054	159,143
AAM/FL/FT/CAR	-	49,697	56,704	56,704	56,704	219,809
NCS/TX/SM/T	-	87,284	99,591	99,591	99,591	386,057
TOTAL	116,723	432,452	518,934	518,934	518,934	2,105,977

ACCUMULATED TOTALS

AID Cost Shared	300,629	1,028,369	1,246,386	1,246,386	1,246,386	5,068,156
AID Not Cost Shared	216,344	501,394	812,902	812,902	812,902	3,156,444
TOTAL AID PROGRAM	516,973	1,529,763	2,059,288	2,059,288	2,059,288	8,224,600
Ga/Mgt. Entity	360,255	243,010	251,865	236,205	217,283	1,308,618
Ga/Mgt. Entity Supplement*	-	-	68,847	104,507	123,429	316,783
TOTAL AID PROGRAM + MGT. ENTITY	<u>877,228</u>	<u>1,772,773</u>	<u>2,400,000</u>	<u>2,400,000</u>	<u>2,400,000</u>	<u>9,850,001</u>
Non-Federal Cost Shared	116,723	432,452	518,934	518,934	518,934	2,105,977
GRAND TOTAL	993,951	2,205,225	2,918,934	2,918,934	2,918,934	11,955,978

*The Management Entity supplement will be used to cover costs of overseas audits. Surplus funds in this category will be used for additional technical assistance and increases in project support as approved by the Board of Directors.

TABLE 2

Budget for University of Georgia
International Peanut Evaluation Program Project (INPEP/CAM, CAR*)
AID FUNDS

<u>Category</u>	<u>FY82</u>	<u>FY83</u>	<u>FY84</u>	<u>FY85</u>	<u>FY86</u>	
			<u>Cost Shared</u>			
Salaries	\$10,064	19,500	22,248	22,248	22,248	
Fringe Bene.		2,607	5,052	5,764	5,764	5,764
Supplies & Equipment	13,161	25,500	29,093	29,093	29,093	
Travel	2,839	5,500	6,275	6,275	6,275	
Other direct costs	1,032	2,000	2,282	2,282	2,282	
Indirect Costs	<u>7,642</u>	<u>14,808</u>	<u>16,909</u>	<u>16,909</u>	<u>16,909</u>	
Total	37,345	72,360	82,571	82,571	82,571	
<u>Not Cost Shared - Pass Through Funds</u>						
On-site breeder (50%)	25,966	23,317	43,317	43,317	43,317	
Other	<u>22,407</u>	<u>43,416</u>	<u>49,535</u>	<u>49,535</u>	<u>49,535</u>	
Total	48,373	66,733	92,852	92,852	92,852	
Total AID	85,718	139,093	175,423	175,423	175,423	
<u>NON-FEDERAL COST SHARED</u>						
Total GA	12,324	23,879	27,248	27,248	27,248	
GRAND TOTAL	98,042	179,655	202,671	202,671	202,671	

*Combined budgets for Cameroon and CARDI portions of project.

TABLE 2 - Cont'd.
 Budget for Texas A & M University
 Breeding/Cultural Practices Project (TX/BCP/S)
AID FUNDS

<u>Category</u>	<u>FY82</u>	<u>FY83</u>	<u>FY84</u> <u>Cost Shared</u>	<u>FY85</u>	<u>FY86</u>
Salaries	\$26,811	51,950	59,270	59,270	59,270
Fringe Bene.	6,435	12,468	14,225	14,225	14,225
Supplies & Equipment	12,386	24,000	27,382	27,382	27,382
Travel	11,870	23,000	26,241	26,241	26,241
Other direct costs	6,452	12,500	14,261	14,261	14,261
Indirect Costs	<u>21,105</u>	<u>40,892</u>	<u>46,669</u>	<u>46,669</u>	<u>46,669</u>
Total	85,059	164,810	188,048	188,048	188,048
<u>Not Cost Shared - Pass Through Funds</u>					
Total	51,036	79,109	90,263	90,263	90,263
Total AID	136,095	243,919	278,311	278,311	278,311
<u>NON-FEDERAL COST SHARED FUNDS</u>					
Total TX	28,455	55,135	62,909	62,909	62,909
GRAND TOTAL	164,550	299,054	341,220	341,220	341,220

TABLE 2

Budget for Texas A & M University
Mycotoxin Management Project (TX/MM/S)
AID FUNDS

<u>Category</u>	<u>FY82</u>	<u>FY83</u>	<u>FY84</u> <u>Cost Shared</u>	<u>FY85</u>	<u>FY86</u>
Salaries	\$22,089	42,800	48,835	48,835	48,835
Fringe Bene.	5,301	10,272	11,720	11,720	11,720
Supplies & Equipment	3,355	6,500	7,416	7,416	7,416
Travel	10,941	21,200	24,189	24,189	24,189
Other direct costs	929	1,800	2,054	2,054	2,054
Indirect Costs	<u>14,064</u>	<u>27,249</u>	<u>31,091</u>	<u>31,091</u>	<u>31,091</u>
Total	56,679	109,821	125,305	125,305	125,305

Not Cost Shared - Pass Through Funds

On-site sci.	-	-	50,000	50,000	50,000
Other	<u>34,007</u>	<u>52,714</u>	<u>60,147</u>	<u>60,147</u>	<u>60,147</u>
Total	<u>34,007</u>	<u>52,714</u>	<u>110,147</u>	<u>110,147</u>	<u>110,147</u>
Total AID	90,686	162,535	235,452	235,452	235,452

NON-FEDERAL COST SHARED FUNDS

Total TX	18,907	36,634	41,799	41,799	41,799
GRAND TOTAL	104,902	199,169	277,251	277,251	277,251

TABLE 2

Budget for University of Georgia
Peanut Virus Project (GA/PV/M)
AID FUNDS

<u>Category</u>	<u>FY82</u>	<u>FY83</u>	<u>FY84</u> <u>Cost Shared</u>	<u>FY85</u>	<u>FY86</u>
Salaries	\$11,870	23,000	26,243	26,243	26,243
Fringe Bene.	1,823	3,532	4,030	4,030	4,030
Supplies & Equipment	8,464	16,400	18,712	18,712	18,712
Travel	6,193	12,000	13,692	13,692	13,692
Other direct costs	1,806	3,500	3,994	3,994	3,994
Indirect Costs	<u>7,482</u>	<u>14,497</u>	<u>16,541</u>	<u>16,541</u>	<u>16,541</u>
Total	37,638	72,929	83,212	83,212	83,212
<u>Not Cost Shared - Pass Through Funds</u>					
Total	22,583	35,006	39,942	39,942	39,942
Total AID	60,221	107,935	123,154	123,154	123,154
<u>NON-FEDERAL COST SHARED FUNDS</u>					
Total GA	27,729	53,727	61,303	61,303	61,303
GRAND TOTAL	87,950	161,662	184,457	184,457	184,457

Table 2

Budget for Alabama A & M University
Food Technology Project (AAM/FT/S)

<u>Category</u>	<u>FY82</u>	<u>FY83</u>	<u>AID FUNDS</u>		
			<u>FY84</u> <u>Cost Shared</u>	<u>FY85</u>	<u>FY86</u>
Salaries	\$18,064	35,000	39,935	39,935	39,935
Fringe Bene.	4,335	8,400	9,584	9,584	9,584
Supplies & Equipment	2,581	5,000	5,705	5,705	5,705
Travel	11,870	23,000	26,243	26,243	26,243
Other direct costs	2,064	4,000	4,564	4,564	4,564
Indirect Costs	<u>7,169</u>	<u>13,390</u>	<u>15,849</u>	<u>15,849</u>	<u>15,849</u>
Total	46,083	89,290	101,880	101,880	101,880
<u>Not Cost Shared - Pass Through Funds</u>					
Total	37,650	42,859	48,902	48,902	48,902
Total AID	83,733	132,149	150,782	150,782	150,782
<u>NON-FEDERAL COST SHARED FUNDS</u>					
Total AAMU	15,994	30,990	35,360	35,360	35,360
GRAND TOTAL	99,727	163,139	186,142	186,142	186,142

TABLE 2

Budget for North Carolina State University
Breeding, Cultural Practices Project (NCS/BCP/T)

AID FUNDS

<u>Category</u>	<u>FY82</u>	<u>FY83</u>	<u>FY84</u> <u>Cost Shared</u>	<u>FY85</u>	<u>FY86</u>
Salaries	\$18,691	36,216	76,166	76,166	76,166
Fringe Bene.	2,649	5,133	7,320	7,320	7,320
Supplies & Equipment	1,290	2,500	9,000	9,000	9,000
Travel	4,129	8,000	18,000	18,000	18,000
Other direct costs	258	500	1,000	1,000	1,000
Indirect Costs	<u>10,808</u>	<u>20,940</u>	<u>44,594</u>	<u>44,594</u>	<u>44,594</u>
Total	37,825	73,289	156,080	156,080	156,080

Not Cost Shared - Pass Through Funds

On-site sci.	-	-	120,000	120,000	120,000
Other	<u>22,695</u>	<u>35,178</u>	<u>93,648</u>	<u>93,648</u>	<u>93,648</u>
Total	<u>22,695</u>	<u>35,178</u>	<u>213,648</u>	<u>213,648</u>	<u>213,648</u>
Total AID	60,520	108,467	369,728	369,728	369,728

NON-FEDERAL COST SHARED FUNDS

Total NCS	13,314	25,798	54,940	54,940	54,940
GRAND TOTAL	73,834	134,265	424,668	424,668	424,668

TABLE 2

Budget for North Carolina State University
 Insect Management Project (NCS/IM/T)
AID FUNDS

<u>Category</u>	<u>FY82</u>	<u>FY83</u>	<u>FY84</u> <u>Cost Shared</u>	<u>FY85</u>	<u>FY86</u>
Salaries	-	17,800	20,310	20,310	20,310
Fringe Bene.	-	-	-	-	-
Supplies & Equipment	-	2,500	2,853	2,853	2,853
Travel	-	15,500	17,949	17,949	17,949
Other direct costs	-	-	-	-	-
Indirect Costs	-	<u>14,320</u>	<u>16,625</u>	<u>16,625</u>	<u>16,625</u>
Total	-	50,120	57,737	57,737	57,737
<u>Not Cost Shared - Pass Through Funds</u>					
Total	-	22,042	25,150	25,150	25,150
Total AID	-	72,162	82,887	82,887	82,887
<u>NON-FEDERAL MATCHING FUNDS</u>					
Total NCS	-	16,190	18,473	18,473	18,473
GRAND TOTAL	-	88,352	101,360	101,360	101,360

TABLE 2

Budget for University of Georgia
Insect Management Project (GA/IM/CAM)
AID FUNDS

<u>Category</u>	<u>FY82</u>	<u>FY83</u>	<u>FY84</u> <u>Cost Shared</u>	<u>FY85</u>	<u>FY86</u>
Salaries	\$	34,431	39,286	39,286	39,286
Fringe Bene.		2,986	3,407	3,407	3,407
Supplies & Equipment		11,500	13,122	13,122	13,122
Travel		5,530	6,310	6,310	6,310
Indirect Costs		<u>14,319</u>	<u>16,338</u>	<u>16,338</u>	<u>16,338</u>
Total		68,766	78,463	78,463	78,463
<u>Not Cost Shared - Pass Through Funds</u>					
Total		24,000	27,384	27,384	27,384
Total AID		92,766	105,847	105,847	105,847
<u>NON-FEDERAL COST SHARED FUNDS</u>					
Total GA		17,137	19,553	19,553	19,553
GRAND TOTAL		109,903	125,400	125,400	125,400

TABLE 2
Budget for University of Georgia
Food Technology Project (GA/FT/T)

AID FUNDS

<u>Category</u>	<u>FY82</u>	<u>FY83</u>	<u>FY84</u> <u>Cost Shared</u>	<u>FY85</u>	<u>FY86</u>
Supplies & Equipment		8,650	9,870	9,870	9,870
Travel		24,500	27,955	27,955	27,955
Other direct costs		17,650	20,139	20,139	20,139
Indirect Costs		<u>13,771</u>	<u>15,713</u>	<u>15,713</u>	<u>15,713</u>
Total		64,571	73,677	73,677	73,677
<u>Not Cost Shared - Pass Through Funds</u>					
Total		29,994	34,364	34,364	34,364
Total AID		94,565	108,041	108,041	108,041
<u>NON-FEDERAL COST SHARED FUNDS</u>					
Total GA		35,981	41,054	41,054	41,054
GRAND TOTAL		130,546	149,095	149,095	149,095

TABLE 2

Budget for Alabama A & M University (Florida)
Food Technology Project (AAM/FL/FT/CAR)

AID FUNDS

<u>Category</u>	<u>FY82</u>	<u>FY83</u>	<u>FY84</u> <u>Cost Shared</u>	<u>FY85</u>	<u>FY86</u>
Salaries	\$ -	22,500	25,673	25,673	25,673
Fringe Bene.	-	225	257	257	257
Supplies & Equipment	-	30,340	34,618	34,618	34,618
Travel	-	8,100	9,242	9,242	9,242
Indirect Costs	-	<u>20,036</u>	<u>22,860</u>	<u>22,860</u>	<u>22,860</u>
Total	-	81,201	92,650	92,650	92,650
<u>Not Cost Shared - Pass Through Funds</u>					
Total	-	37,977	43,473	43,473	43,473
Total AID	-	119,178	136,123	136,123	136,123
<u>NON-FEDERAL COST SHARED FUNDS</u>					
Total AAM/FL	-	49,697	56,704	56,704	56,704
GRAND TOTAL	-	168,875	192,827	192,827	192,827

TABLE 2

Budget for North Carolina State and Texas A & M Universities
Soil Microbiology Project (NCS/TX/SM/T)

AID FUNDS

<u>Category</u>	<u>FY82</u>	<u>FY83</u>	<u>FY84</u> <u>Cost Shared</u>	<u>FY85</u>	<u>FY86</u>
Salaries	\$ -	75,000	85,575	85,575	85,575
Fringe Bene.	-	13,820	15,769	15,769	15,769
Supplies & Equipment	-	19,000	21,679	21,679	21,679
Travel	-	16,900	19,283	19,283	19,283
Other direct costs	-	8,000	9,128	9,128	9,128
Indirect Costs	-	<u>48,492</u>	<u>55,329</u>	<u>55,329</u>	<u>55,329</u>
Total	-	181,212	206,763	206,763	206,763
<u>Not Cost Shared - Pass Through Funds</u>					
Total	-	75,782	86,777	86,777	86,777
Total AID	-	256,994	293,540	293,540	293,540
<u>NON-FEDERAL MATCHING FUNDS</u>					
Total NC/TX	-	87,284	99,591	99,591	99,591
GRAND TOTAL	-	344,278	393,131	393,131	393,131

TABLE 3

Budget for Management Entity
Component of Peanut CRSP
University of Georgia

AID FUNDS

<u>Category</u>	<u>FY82</u>	<u>FY83</u>	<u>FY84</u>	<u>FY85</u>	<u>FY86</u>
<u>Operational</u>					
Salaries	\$62,000	70,000	78,000	86,000	94,000
Fringe Bene.	14,000	16,000	18,000	20,000	22,000
Travel	20,000	20,000	20,000	22,000	22,000
Supplies & Equipment	5,000	5,500	6,000	6,500	6,500
Communication	5,000	5,500	6,000	6,500	7,000
Meeting Costs	10,000	10,000	10,000	10,000	10,000
Research Newsletter	<u>5,000</u>	<u>5,000</u>	<u>5,000</u>	<u>5,000</u>	<u>5,000</u>
Subtotal	121,000	132,000	143,000	156,000	166,500
<u>Supplementary Activities</u>					
Contract studies ¹	120,000	-	25,000	25,000	0
Technical Assistance ²	<u>-</u>	<u>25,000</u>	<u>25,000</u>	<u>-</u>	<u>0</u>
Subtotal	120,000	25,000	50,000	25,000	0

SUMMARY

Total Direct costs	241,000	157,000	193,000	181,000	166,500
Indirect Costs (30.5%)	73,505	47,885	58,865	55,205	50,783
Indirect costs of projects ³		<u>45,750</u>	<u>38,125</u>	<u>-</u>	<u>-</u>
Total	360,255	243,010	251,865	236,205	217,283

¹ FY82-Socioeconomic surveys; FY84 and FY85 - Compilation of mechanical technology and seed technology advances for developing countries.

² Technical assistance in response to country requests.

³ One-time indirect costs (30.5% x 25,000 x number of projects).

Table 4. Total Number of equivalent-full-time (EFT) scientist years devoted to peanut CRSP.

Country	Scientist Level	<u>SOURCE OF SCIENTISTS</u>						
		U. S. Institution		Host Country ¹ Institution		On-Site for CRSP		Time of U.S.P.I.'s On-site ²
		No.	EFT	No.	EFT	No.	EFT	EFT
Cameroon ³	Senior	2	0.35	4	0.8	1	1.0	0.2
	Junior	0	0	4	0.4	0	0	0
	Technical	3	0.25	4	0.8	0	0	0
CARDI-Tr ³	Senior	2	0.05	1	0.2	0	0	0.04
	Junior	0	0	1	0.2	0	0	0
	Technical	3	0.05	1	0.2	0	0	0
Senegal (Breeding)	Senior	6	0.97	4	0.8	0	0	0.5
	Junior	3	0.70	2	2.0	0	0	0.2
	Technical	10	5.10	2	2.0	0	0	0
Senegal (Mycotoxin)	Senior	5	1.35	2	0.4	1	1.0	0.3
	Junior	1	0.5	2	0.4	0	0	0
	Technical	3	0.62	2	0.5	0	0	0
Nigeria ³	Senior	2	0.70	4	1.0	1	0.25	0.2
	Junior	0	0	2	2.0	0	0	0
	Technical	2	1.3	4	0.8	0	0	0
Sudan	Senior	6	1.3	4	1.0	0	0	0.5
	Junior	2	1.0	2	0.4	0	0	0
	Technical	1	0.5	1	1.0	0	0	0
Thailand	Senior	3	1.2	4	1.75	1	1.0	0.4
	Junior	1	1.0	2	1.2	0	0	0
	Technical	6	2.6	2	2.0	0	0	0
Total All Countries	Senior	24	5.92	23	5.95	4	3.25	2.14
	Junior	7	3.20	15	6.60	0	0	0.2
	Technical	25	10.42	16	7.30	0	0	0

¹ Estimated.

² Estimated amount of total time of U. S. Institution scientists in first column that will be spent in host country.

³ Same U. S. personnel as Cameroon project.

6. Implementation Plan

This implementation plan, commencing with receipt of the CRSP funding by the management entity, gives tentatively the major activities and accomplishments over the first year.

0-3 Months

- A. Meet with Board of Directors and Technical Committee.
- B. Confer with Groundnut Program Leader, ICRISAT, to begin Special Analysis.
- C. Arrange contracts for economic/socioeconomic studies in Cameroon, Senegal.
- D. Commence formalization of host country agreements with Cameroon.
- E. Work with USAID Cameroon in securing and arranging for in-country clearances for Senior Scientist; and development of coordinated program.

3-6 Months.

- A. Meet with Board of Directors
- B. Complete Special Analysis of CRSP/ICRISAT programs.
- C. Evaluate country reports from contract studies; determine if previously planned linkages are justified.
- D. Initiate and conclude agreement, with GA/INPEP/CAM and CAR project if program is justified.
- E. Arrange contracts for economic/socioeconomic studies of Malawi, and Thailand.
- F. Commence formalization of host country agreements with Senegal, and Malawi.

6-9 Months

- A. Evaluate country reports from contract studies; make final judgments on CRSP projects.
- B. Initiate agreements with Georgia, Texas A & M, N. C. State and Alabama A & M.
- C. CRSP project GA/INPEP/CAM and CAR initiated.
- D. Initiate host country clearance for the senior scientist to be located in Senegal.

9-12 Months

- A. Meet with Board of Directors and Technical Committee.
- B. Commence formalization of host country agreements with Sudan and Thailand.
- C. CRSP project TX/BCP/S initiated.
- D. Begin plans with ICRISAT for development of Peanut Research Newsletter.
- E. CRSP project TX/MM/S initiated.

7. MANAGEMENT ENTITY.

The Management Entity will be responsible to AID for technical and administrative matters for the Peanut CRSP.

- A. Negotiate and execute grant agreements with AID, participating U. S. Universities, and host country (LDC) institutions.
- B. Receive from AID all grant funds and assume fiscal accountability for those funds, to include: annual fund allocations to subgrantees, suitable procedures for fiscal reports, and preparation of an annual budget plan in collaboration with the Technical Committee and Board of Directors approval. Provide for central administration of funds for meetings of the Board of Directors, Technical Committee, External Evaluation Panel, reports, and other documents. The Management Entity will provide travel funds for the Board of Directors and External Evaluation Panel. The Technical Committee travel should come from the domestic travel portion of individual projects.
- C. Recommend and negotiate with AID the addition or deletion of projects or their modification based on the advice and recommendations of the External Evaluation Panel and/or the Technical Committee and with approval of the Board.
- D. Make necessary reports to AID, BIFAD, and JRC on progress and accomplishments of the Peanut CRSP.
- E. Employ a Director and supporting staff as authorized in the Management Entity budget and provide general administration through the appropriate office of the university.
- F. Initially, arrange short-term contract studies of the economic situation as related to peanut production and utilization in each linkage country. These studies will furnish additional information for final decisions on kinds and locations of collaborative relationships.
- G. Initiate cooperatively with ICRISAT a "Peanut Newsletter" to provide a forum for peanut researchers worldwide to publish summaries of significant research, preliminary findings of special interest, listing of researchers and locations, and news items of wide interest.

Management Staff shall consist of a Director, and an Administrative Secretary.

- A. The Director is a full-time position for overall leadership of the CRSP, and should be an established, experienced, administratively competent plant scientist with a Ph.D. degree.
- B. The Administrative Secretary is a full time position for an experienced person with secretarial competence and ability to assist in organization and execution of the various CRSP functions.

Maximum operational flexibility should be given to the participating universities by the Management Entity. The initial role of the Management Entity will be to assist the universities in initiating research programs, and afterwards have a supportive role.

board of Directors. Each participating U. S. university shall appoint one administrative representative to the Board of Directors, and an alternate representative if desired. Board members should be able to make institutional commitments for the CRSP. These members cannot also be members of the Technical Committee. A representative from ICRISAT will be on the Board. The Board will:

- A. Provide liaison between institutional administrators and the Management Entity.
- B. Establish policy for the CRSP.
- C. Review and approve annual budgets, expenditure patterns, and the plan for allocation of funds to the component projects.
- D. Approve program changes such as addition or deletion of projects or changes in project objectives.
- E. Receive, and utilize in its decisions, reports from the Technical Committee and External Review Panel, and review progress and accomplishments of the CRSP.
- F. If deemed necessary by the Board, appoint an Executive Committee, or Representative to be available to the Management Entity to plan for meetings and act for the Board between meetings.
- G. Elect a chairman for the board by procedures and terms as outlined by the Board.
- H. Schedule any appropriate or necessary meetings with host country administrators, Technical Committee, External Review Panel, and host-country or U. S. university principal investigators and with their own support.
- I. Concur in the selection of the Peanut CRSP Director.

Technical Committee One principal or co-principal investigator from each participating U. S. university shall be a member of the Technical Committee, and the CRSP Director shall be an ex-officio member. A chairman and terms of appointment will be determined by procedures established by the committee. The Committee will assist in:

- A. Review and recommend plans for the research, and training components of projects, including the addition, modification or deletion of components.
- B. Development of annual budget plans for the allocation of funds to projects, and policies on project reports and publication of research results, and preparation of reports.
- C. Establishment of mechanisms for coordination of programs in host countries. A system should be established for U. S. project leaders to meet with host country researchers and administrators and AID representatives to establish necessary communication within the CRSP. These meetings should be held during the project leaders travels to host countries related to their research activities.
- D. An internal annual review of the Peanut CRSP to summarize progress and make plans for forthcoming year. AID and JRC representatives should participate in such reviews. Annual report drafts should be presented by project leaders at this meeting for later assembly by the Management Entity.

External Evaluation Panel

This Panel shall consist of three to five eminent scientists recommended by the CRSP Management Entity to AID/BIFAD for specified terms of appointment. Periodically as appropriate the Panel shall:

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

8. ENVIRONMENTAL IMPACT

Initial Environmental Examination - The activities of this project fall into the area described in Environmental procedure regulations, Para. 216.2 (c) "Analyses, Studies, Academic or Investigative Research, Workshops and Meetings." These classes of activities will not normally require the filing of an Environmental Impact Statement or the preparation of an Environmental Assessment. It is possible that an output of this project will be set of procedures, guidelines or research results which when used would require such assessment. However, the project itself only proposes research and directly supportive activities. Under these guidelines this activity clearly qualified for a negative determination at the time when a threshold decision is determined.