THREE-YEAR REPORT
AND
REQUEST FOR EXTENSION

THE BEAN/COWPEA COLLABORATIVE RESEARCH SUPPORT PROGRAM

MICHIGAN STATE UNIVERSITY

MICHIGAN STATE UNIVERSITY

BEAN/COWPEA CRSP MANAGEMENT OFFICE
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May 1, 1984

Dr. Anson Bertrand, Director
Office of Agriculture
Bureau of Science and Technology
US International Development Cooperation Agency
Agency for International Development
Washington, DC 20523

Dear Dr. Bertrand:

On behalf of Michigan State University, management entity for the Bean/Cowpea CRSP, presently funded under Grant No. AID/DSAN-XII-G-0261, I wish to formally request a three-year extension with new funds to support continuation of the Program. Documentation supporting this request as designated in Preliminary Guidelines for Triennial Review and Three-Year Extension is submitted under separate cover. This documentation will include a fiscal and programmatic review of CRSP activity with projections for the final years of the original grant and the requested extension years. We would be more than happy to provide on request any additional information which may be helpful.

Sincerely,

Pat Barnes-McConnell

Pat Barnes-McConnell, Ph.D.
Director

PBM:skb:5695B

cc: Dr. B. L. Pollack, Program Manager
Dr. F. W. Johnson, BIFAD Liaison
Dr. L. L. Boyd, Chair, Board of Directors
Dr. M. J. Silbernagel, Chair, Technical Committee
Dr. J. H. Anderson, Institutional Representative, MSU

In thoughtful discussions among the outstanding US and non-US professionals associated with this CRSP, various points of view have been shared in attempts to identify research strategies which will contribute to human well-being throughout the world. From the array of national, cultural, ethnic, gender, class and disciplinary perspectives, their interactions with one another have opened new horizons to the development and application of evolving science and technology. The researchers, most of whom had been wrestling with global issues independently long before coming together in the CRSP, have been stimulated by one another and have found excitement and power in the expanded peer relationships. The professional traffic of scholars among CRSP countries highlights the mutual benefits of such relationships and emphasizes a growing appreciation of the mutual dependency. As Professor Paul Streeten has pointed out "knowledge is a common good and its pursuit unites scholars across the world."[1] This intellectual dependency is a mirror image of the economic and environmental interdependence that exists among all countries including the US and the developing countries which are the Host Countries (HCs) of this CRSP. World hunger and malnutrition are undeniable and poignant examples which are experienced at some level in all countries.

According to the Washington, D.C. Environmental Fund, the US population is approximately 235,000,000 people. However, US land available to produce food for this growing mass is being lost at an average of over a million acres a year, mostly to urban sprawl. Presently, US agriculture, the most prolific in the world, produces an abundance of food for US consumption. The US also produces each year, millions of dollars worth of food for export.[2]

Some of this surplus food is sold on the international market and helps address the US balance of payments deficit. That deficit is recently reported to be over $40 billion this year and expected to surpass $80 billion by the end of 1985--a foreign debt level that dwarfs that of most developing countries.[3] Other surplus food from the US enters the international arena as foreign assistance to poverty and famine ridden areas of the world. Such areas are often plagued by instability and political strife which threaten the existence of all nations. Basic commodity shortages frequently fan those flames, jeopardizing international efforts to address such global concerns as pollution, population growth, nuclear weapons and security. An additional complication is that developing countries represent the largest growth markets for the sale of US exports compared to US exports to developed countries. These same developing countries are also the countries from whom the US imports raw materials critical to commercial industries and defense.[4]

The importance of US food production to the US and the rest of the world presents a serious and complex dilemma. The Environmental Fund projects that if the population of the US continues to increase at the present rate and the land available for agriculture continues to decrease, by the year 2000 all the food produced by the US will need to be consumed within the US. A vanishing US export market capacity and depleted food assistance program could have dire implications. Further, no country can avoid being affected by such recent occurrences as the expanded use of chemical warfare, changing weather patterns worldwide and the large numbers of severely stressed national economies. All of these issues demonstrate that the US lacks immunity to the painful unemployment, mass poverty, hunger, drought, infestation and disease problems suffered by many countries of the world. In reality, the US too is a developing country. It, too, will benefit from a sharing of resources and the strengthening of national institutions with whom it can collaborate.

Thus, for world humanitarian needs as well as for US survival requirements the US agricultural network, especially its Land-Grant community, must play an even more prominent role in the international arena than it has in the past. HC and US students entering this arena, for which most contemporary professionals were never prepared, require from their educational institutions greater international participation. HC and US faculty, who must face those young men and women in classrooms and supervise their research in laboratories and in the field, require increased international professional experience and continuing education. For US and HC participants CRSPs can provide an example of human resource development based on shared scientific, technical and socio-cultural understanding.

The promise of US Title XII and HC institutions is heightened by their joining together the best of HC and US scientific and traditional agriculture and the related disciplines. Through their heterogeneous resources, their composite experience and their vast research capacity, such collaboration is a natural extension of the Land-Grant tradition. The new findings emerging from the array of Bean/Cowpea CRSP projects only hint at the long-term potential: US and HC cowpea germ plasm crosses in Africa outperformed other exotic and traditional lines during the recent severe drought there; basic research contributes to scientific understanding of genetic, agronomic and socio-cultural factors important in the maintenance of rich natural germ plasm pools--a constantly changing trust especially important for those who rely on beans and cowpeas as food; monoclonal antibody procedures developed for quick, simple and inexpensive detection of seed borne viruses in beans; native fungal isolates showing promise in biological insect control which can minimize use of expensive and often toxic synthetic insecticides; village level technology for increasing among rural and urban populations the availability of inexpensive cowpea meal acceptable in the preparation of traditional foods.

Through such research efforts new mutually rewarding relationships are being fashioned with sensitivity and care. Over the long term they will provide the foundation for strengthening communication, respect and trust among future agricultural leaders. To the extent that the CRSPs function well and are truly collaborative research and training programs, they will leave behind a major human and scientific legacy. If we are lucky, they will also make a noticeable impact on world poverty, malnutrition and hunger.

Pat Barnes-McConnell
Program Director
Michigan State University

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1 Paul P. Streeten. Social Science Research on Development: Some Problems in the Use and Transfer of an Intellectual Technology. The Agricultural Development Council, Inc., July, 1975.

2 Bradford Morse. "Where 80% of UN Resources Go." Christian Science Monitor, April 19, 1983.

3 Alan Murray. "Payments Gap Rose in Fourth Period to $15.29 Billion." Wall Street Journal, March 20, 1984.

4 Edmund S. Muskie. "The West's Stake in Third-World Aid." Christian Science Monitor, August 6, 1980.

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SECTION II--PROGRAM REVIEW AND EXTENSION REQUEST

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*Information presented for each project is as follows:

Introduction

Years One Through Three Reference Guide

Three-Year Progress Report

Project Evaluation

Years Four and Five

Extension Years Six Through Eight

Log Frame

Institutional Response to Recommendations for Projects Rated Less Than Satisfactory by ERP

Letter from Lead Institution

Letter from USAID in Host Country

Budget Review and Extension Request

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THE BEAN/COWPEA COLLABORATIVE RESEARCH SUPPORT PROGRAM
THREE-YEAR REPORT AND EXTENSION REQUEST

DOCUMENT GUIDE

This document is the three-year progress report of the CRSP for FY81-FY83, a projected report of FY84 and FY85--the final two years of the original grant, and a three-year extension proposed plan and budget projection for FY86-FY88. This information is conveyed by this document which in its entirety is made up of three sections.

Section I is an executive summary of the Program including (1) a program summary report of the first three years, (2) a series of individual project review profiles (one-sheet with brief project descriptions, progress reports, evaluations, actions taken and resolutions) and (3) budget summaries and projections through FY88.

Section II is a more detailed three-year program report and extension request information. It is separated into subsections. Each subsection, relative to the program or individual project which is its subject, has (1) a three-year progress report reference guide to information found in previously prepared printed materials incorporated in this document, (2) a year four and five projection and year six through eight extension plan, (3) the original Log Frame, (4) a budget review and budget extension proposal and (5) important communications including statements of adjustments for those projects rated by the ERP to be less than satisfactory, letters from the lead institutions evaluating CRSP involvement and letters from the appropriate AID missions.

Section III is the Appendix which includes the following previously prepared materials:

<u>AID Project Evaluation Summary</u>

<u>Bean/Cowpea CRSP Brochure</u>

<u>1983 Annual Report: Executive Summary</u>

<u>Bean/Cowpea CRSP Women-in-Development Pamphlet</u>

<u>Beans-Cowpeas Production Constraints and National Programs</u>

<u>1983 Annual Report: Technical Summary</u>

<u>Vanguard Vol. 1</u>

<u>Pulse Beat, Spring 1984</u> with <u>Bean/Cowpea CRSP Bibliography insert</u>

<u>Research Highlights Vols. 1-5</u>

<u>Women-in-Agriculture Guide--Cameroon</u>

<u>Monograph No. 1</u>

<u>1983 Annual Report: External Review Panel</u>

Thus, by this complete document in three sections, a request is made by Michigan State University as Management Entity for a three-year extension of the Bean/Cowpea CRSP from October 1, 1985 through September 30, 1988 to be funded in the amount of $11,254,140.

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SECTION I

THREE-YEAR REPORT AND EXTENSION REQUEST: EXECUTIVE SUMMARY

PROGRAM SUMMARY

INTRODUCTION

The Bean/Cowpea Collaborative Research Support Program (CRSP) is a program of coordinated projects in Africa and Latin America addressing hunger and malnutrition through research on the production and utilization of beans (Phaseolus vulgaris) and cowpeas (Vigna unguiculata). The CRSP reflects the Title XII "Famine Prevention and Freedom from Hunger" mission of the US Foreign Assistance Act under which the program is funded. Contributing to the alleviation of hunger and malnutrition in developing countries by improving the availability and utilization of beans and cowpeas, the CRSP also makes a significant contribution to agriculture in the US. The research findings and identified biological resources hold potential for solving or reducing important agricultural constraints to the availability of beans and cowpeas in all legume-producing nations.

As stated in the grant which established the Bean/Cowpea CRSP,

> "This program is a long-term effort designed to bring together the research capabilities of participating universities, collaborating Title XII institutions including USDA and other federal research agencies, appropriate LDC institutions and international centers into a comprehensive and coordinated effort in research and training to generate and apply knowledge that can assist in alleviating principal constraints to improved production, marketing and utilization of beans and cowpeas in LDCs. It is based on the assumption that there are large areas of overlap between U.S. and developing country needs for research, marketing and utilization of these two crops. Substantial mutual advantages are expected to result from joint research program efforts which cut across national boundaries and different levels of agricultural development."

The Bean/Cowpea CRSP is one of seven CRSPs which through interactions among the partners (AID-US Institutions-Host Country [HC] Institutions) has evolved a research and training effort to address issues of food availability in designated areas throughout the world. Although the seven have many basic characteristics in common, each CRSP has a configuration which is somewhat unique. These differences emerged from the needs of the respective partners, the research requirements of the commodity and the stage of Title XII development at the time the particular program was begun.

As the third such program to be developed, following the Small Ruminant CRSP and the Sorghum/Millet CRSP, the Bean/Cowpea CRSP was the beneficiary of two especially critical lessons. First, it was determined that the Host Countries to participate should be identified early in the planning process. This facilitated HC involvement in planning the specific research, their acceptance of a role in that research and their readiness to begin work once the program was implemented. Secondly, to avoid a great deal of unproductive transition time, it was determined that the Planning Entity should be allowed to be a serious candidate for Management Entity when the CRSP was implemented. These two changes from the original guidelines for CRSP development have been major factors in the important achievements of the Bean/Cowpea CRSP despite its short time in existence.

Even though at program initiation all prospective participants were identified, the first year was taken up with acquiring the final approvals (which could not precede actual funding). Official government and institutional signatures on the required documents in the US and thirteen participating HCs had to be acquired. The task for the second year was getting the projects off the ground--funds could begin to flow, identified professionals could request released time, students could apply for training and, if admitted right away, could be sent off to begin that training, approvals for equipment purchases could be requested from AID and the lucky few receiving the approvals promptly could order the first equipment before the end of the year. Thus, for the most part, it was not until late in the third year that preliminary research was enough under way to suggest tentative initial findings. There are striking exceptions where important and significant results have already been obtained. These are frequently the consequences of the Program's being able to capitalize on previous long-term thinking, associations and background research which fitted the precise needs of the CRSP and required only its guided human and financial resources to push the work over the top. An excellent example of this is the first work reported in the CRSP Vanguard series by a senior US researcher, his former student who is presently a research leader in the participating HC, and a current graduate student working with the team.

PROGRAM GOAL

By making available to the international agricultural research and development system a new avenue to the US agricultural research network, the Bean/Cowpea CRSP is organized to make important contributions to the resolution of difficult and persistent problems associated with bean and cowpea production and utilization.

The grant document puts forward the following goal of the Bean/Cowpea CRSP:

"The goal to which this program is to make a significant contribution is improvement in living conditions of small farm producers in LDCs and increased availability of low cost nutritious foodstuffs in the marketplace for the rural and urban poor in LDCs."

PROGRAM PURPOSE

The grant document further identifies the following purpose of the CRSP:

"The purpose of this program is to organize and mobilize financial and human resources necessary for mounting a major multi-institutional U.S.-LDC collaborative effort in research and training. This effort is expected to provide the knowledge base necessary to achieve significant advances in alleviating the principal constraints to improved production, marketing and utilization of beans and cowpeas in LDCs. A subpurpose is to improve the capabilities of appropriate LDC institutions to generate, adopt and apply improved knowledge to local conditions."

PLANNING PROCESS

During planning, a thorough identification was made of HC and US problem areas, interests and capabilities. The planning group met with HC nationals engaged in legume research at national and international conferences and workshops. International groups were invited to the US to further refine the effort. Extensively researched and honed to the needs of the HC and the international agricultural community, the CRSP research projects evolved from this comprehensive process. Below is a chronology of the Bean/Cowpea CRSP planning process as presented in the Final Planning Report.

Chronology of the Bean/Cowpea CRSP Planning Process

July, 1978	BIFAD authorized planning for Bean/Cowpea CRSP.
August, 1978	Experiment Station representatives met in Chicago authorizing MSU to submit the planning grant proposal.
October, 1978	Planning grant awarded to MSU, effective as of this date.
October, 1978-- June, 1979	Dr. Donald Wallace on leave from Cornell joined with Dr. Wayne Adams of MSU to carry out the planning effort.
October, 1978	Letter to Title XII institutions requesting indications of manifest interest--43 responded.
October, 1978	Wallace and Adams made orientation trips to University of Missouri and USAID-Washington. LDC questionnaires subsequently developed and disseminated.
December, 1978	Wallace attended Western Regional Project #150 Participants Meeting in Berkeley, California to present a report on the objectives and expected planning procedures of this CRSP.
January-- February, 1979	Wallace and Adams visited CIAT, Guatemala, Panama, Costa Rica, Colombia, and Chile. Collected information on constraints. Met potential collaborators.
February, 1979	Adams visited Dominican Republic, FAO meeting. Wallace visited IITA. Collected information on constraints. Met potential collaborators.
February, 1979	Wallace attended Southern Region Meeting of American Society of Horticultural Science in New Orleans to acquaint cowpea workers of the south and southeastern US with the goals and procedures of the Bean/Cowpea CRSP.
March, 1979	Adams attended PCCMCA meeting, Honduras. Collected information on constraints. Met potential collaborators.
April-May, 1979	Fact-finding team visits to South America, Caribbean and Mexico, West Africa, and East Africa--team members from various Title XII institutions. Collected information on constraints. Met potential collaborators.
May, 1979	Bean/Cowpea proposals received from interested institutions responding to RFP. Proposals received from 77 persons representing 25 institutions.
May, 1979	Dr. Pat Barnes-McConnell joined Planning Office.

June, 1979	Planning team presented Interim Report to JRC, Iowa.
June, 1979	Barnes-McConnell attended Grain Legume Workshop, University of the West Indies, Trinidad. Collected information on constraints. Met potential collaborators.
June, 1979	International Peer Review Panel Meeting to evaluate proposals received. Sixteen panel experts represented CIAT, IITA, IICA and US senior legume scientists.
July, 1979	Progress report to JRC, Virginia.
August, 1979	Adams and Barnes-McConnell attended Grain Legume Workshop at University of Nairobi. Collected information on constraints. Met potential collaborators.
September, 1979	Barnes-McConnell visited Tanzania, University of Dar es Salaam, College of Agriculture. Collected information on constraints. Met potential collaborators.
October, 1979	Host Country Advisory Group Meeting, MSU. Prioritized constraints relative to country needs. Subsequently matched country needs with US evaluated proposal topics.
November, 1979	Meeting with JRC for approvals of Title XII institutions and collaborating research scientists abroad.
December, 1979	Meeting of the representatives of US institutions approved for involvement in further planning. Constraints by geographic areas reviewed. Potential US research teams designed. Country research response sheets sent to potential developing country collaborators.
January, 1980	JRC meeting--approval of overseas trips by US representatives of potential research teams.
March, 1980	Attendance at East African Bean Conference, Malawi, Adams and Barnes-McConnell. Confirmation of constraints chosen for research in Africa. Attendance at PCCMCA meeting, Guatemala, Adams. Confirmation of constraints chosen for research in Latin America.
March--April, 1980	Meetings on-site of potential US and HC collaborators-- a) familiarizing US collaborators with the specific resources, problems and culture of the country in which work to be conducted; and b) providing an opportunity for scientists of the US and the HCs to get to know each others' interests, capabilities and approaches to problam solving, in preparation for: c) developing specific research designs and budgets to address the problems identified.

April, 1980	JRC meeting--approval of 10 institutions to participate in the CRSP.
April, 1980	CRSP Development Meeting, Chicago O'Hare, with the 10 institutions approved for CRSP involvement. Brief report of the collaborators' meetings, the Global Plan, decisions on the CRSP Management Entity and the initial five institutions to be members of the first Board of Directors.
May, 1980	Review and comment on the Global Plan received from participating US institutions.
June, 1980	Presentation of Bean/Cowpea Global Plan and proposal to implement the CRSP to JRC and AID (one institution subsequently omitted).

PROGRAM CONSTRAINTS

The constraints to the availability of beans and cowpeas, as identified during the planning process, became the basis for the development of the global or master plan. These constraints as presented in that plan defined the major issues which the project research was designed to address. The constraints are as follows:

1. Limitations due to pests and diseases,
2. Plant response limitations,
3. Limitations of the physical environment,
4. Farming practices limitations,
5. Storage problems,
6. Production-consumption economics,
7. Nutrition, food preparation and health,
8. Sociocultural factors, and
9. Education, training and research capability.

EVOLUTION OF THE GLOBAL PLAN

The Global Plan for the Bean/Cowpea CRSP was developed by the Planning Entity based on the identified constraints. Implemented during the first year of this program, the plan presented a configuration of nine US lead institutions providing leadership in eighteen projects all of which are presently in existence. Early on, just before the presentation and approval of the initial Global Plan, a tenth lead institution (Mississippi) withdrew from involvement. After plan approval, there were two other revisions made in the plan--Mexico was substituted for CIAT (although CIAT remains involved) and Botswana was substituted for Guyana. Nonetheless, the world-wide research needs for beans and cowpeas which were identified as needing to be included in the initial efforts of the CRSP are all being addressed.

At the time that the plan was evolving, much about the CRSP mode was new and uncharted. Guidelines for program implementation had to be developed which would reinforce the mission and keep the program on track. It was determined that the Bean/Cowpea CRSP projects were to

1. Be individual but structurally integrated in order to make the maximum contribution to the availability of beans and cowpeas in areas where they are important to human diet;

2. Emphasize multidisciplinary research integrating production and non-production issues;

3. Focus on research in traditional settings;

4. Build strong and collegial professional relationships among the HC and US researchers in each project;

5. Make financial resources available for both HC and US research activity;

6. Contribute to the strengthening of HC institutions through the enhancement of facilities and equipment needed to support that research;

7. Contribute to the strengthening of HC institutions through a significant level of graduate and undergraduate study, short-term courses, conferences and workshops;

8. Pay specific attention to the roles and participation of women;

9. Be alert to mechanisms for information dissemination; and

10. Provide an opportunity for private sector participation in research activity and in the dissemination of products.

GLOBAL RESEARCH PLAN

BEAN/COWPEA CRSP

SEMI-ARID ZONE

TEMPERATE ZONE

AFRICA

Nigeria

Cowpea processing and preservation; child health associated with cowpea foods

Kenya

Drought and heat resistance in disease-resistant beans for semi-arid regions

Cameroon

Non-pesticide control of cowpea pests in field and storage

Tanzania

Responses to bean insect and disease problems and their economic viability for small farmers

IITA

Collaboration and interaction with CRSP programs in Brazil and West Africa

Senegal

A program to improve the quality of cowpea varieties for production and utilization in semi-arid zones

Malawi

Bean germplasm evaluations and the basis of maintenance of land race diversity

INCAP

Cooking time and protein digestibility

CIAT

Bean plant responses to stress and N-fixation

Brazil

Multiple disease resistance screening; cowpea insect pathogens; N-use efficiency

Dominican Republic

Introgression of disease-resistant germ plasm in adapted bean cultivars for the Caribbean.

LATIN AMERICA

Guyana

Cowpea farming systems research and variety evaluation

Honduras

Increase and stabilization of Honduran bean production through disease resistance

Ecuador

Nature of wide adaptation in beans and socio-cultural interpretations (replication varying natural environmental factors--see Guatemala)

Guatemala

Nature of wide adaptation in beans and socio-cultural interpretation (replication varying natural environmental factors--see Ecuador

GLOBAL RESEARCH PLAN (Revised)

BEAN/COWPEA CRSP

NIGERIA

1. Cowpea processing and preservation; 2. child health associated with cowpea foods

KENYA

Drought and heat resistance in disease-resistant beans for semi- arid regions

CAMEROON

Non-pesticide control of cowpea pests in field and storage

TANZANIA

Responses to bean insect and disease problems and their economic viability for small farmers

A F R I C A

IITA

Collaboration and interaction with CRSP cowpea programs

SENEGAL

A program to improve the quality of cowpea varieties for production and utilization in semi-arid zones

MALAWI

Bean germplasm evaluations and the basis of maintenance of land race diversity

CIAT

Collaboration and interaction with CRSP bean programs

BOTSWANA

Cowpea farming systems research and variety evaluation in semi-arid areas

DOMINICAN REPUBLIC

Introgression of disease-resistant germ plasm in adapted bean cultivars for the Caribbean

L A T I N   A M E R I C A

BRAZIL

1. Multiple bean disease resistance screening;
2. cowpea insect pathogens;
3. N-use efficiency of bean production

HONDURAS

Increase and stabilization of Honduran bean production through disease resistance

INCAP

Cooking time and protein digestibility of beans

ECUADOR

Nature of wide adaptation in beans and socio-cultural interpretations (replication varying natural environmental factors -- see Guatemala)

MEXICO

Bean plant responses to stress and N-fixation

GUATEMALA

Nature of wide adaptation in beans and socio-cultural interpretation (replication varying natural environmental factors -- see Ecuador)

S E M I - A R I D   Z O N E

T E M P E R A T E   Z O N E

MANAGEMENT ORGANIZATION

Management Entity (ME)--Michigan State University

Total program and fiscal responsibility for the performance of the CRSP rests with the Management Entity. The administrative work of the CRSP, organized and funded by the Management Entity, is achieved through the participation of groups as follows:

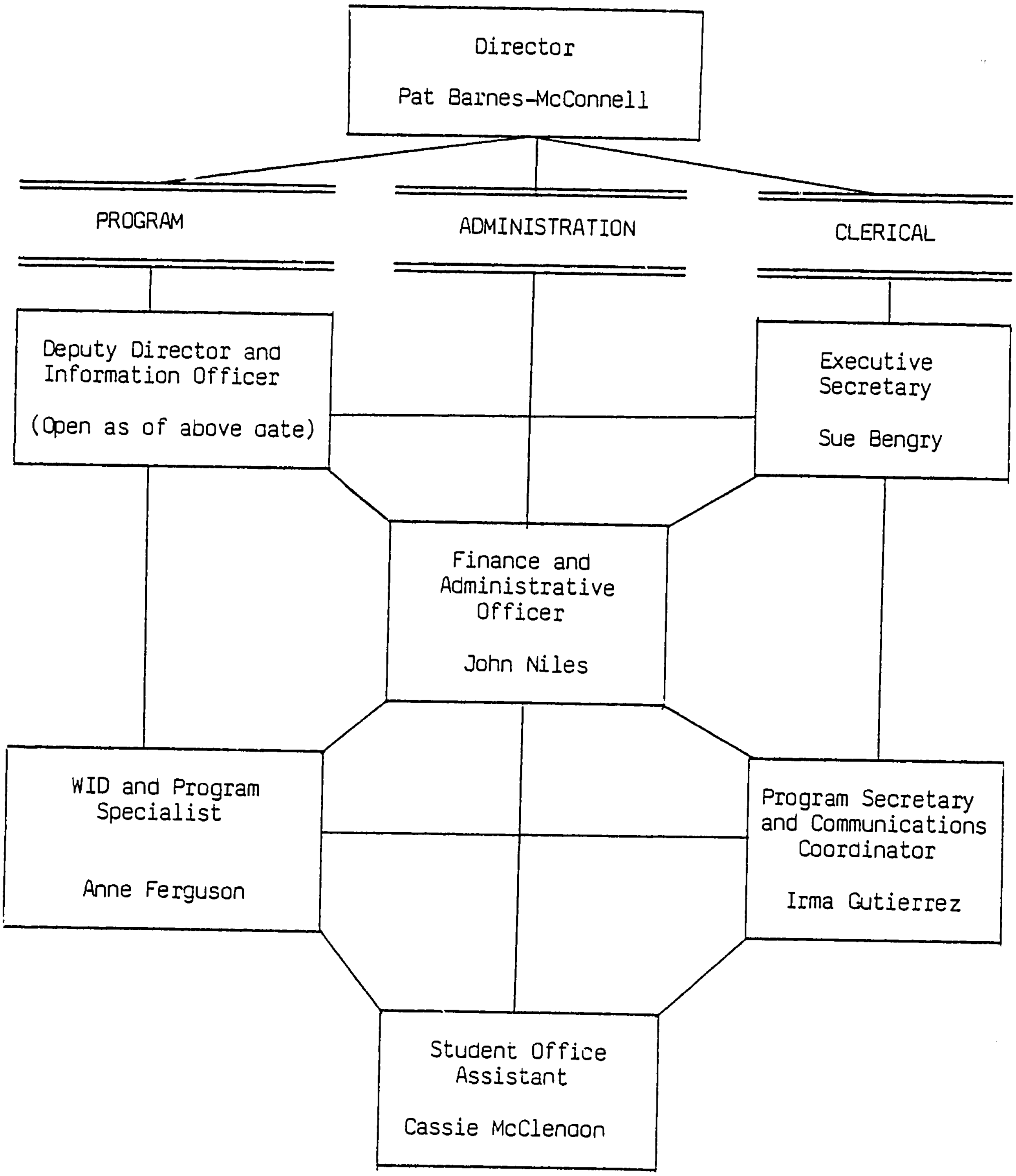
Management Office (MO)

This is the operational office of the Management Entity for the Bean/Cowpea CRSP. It is located on the Michigan State University campus but maintains constant communications with the project personnel in the US and HCs as well as the management support groups listed below. The MO is organized with the following staff positions.

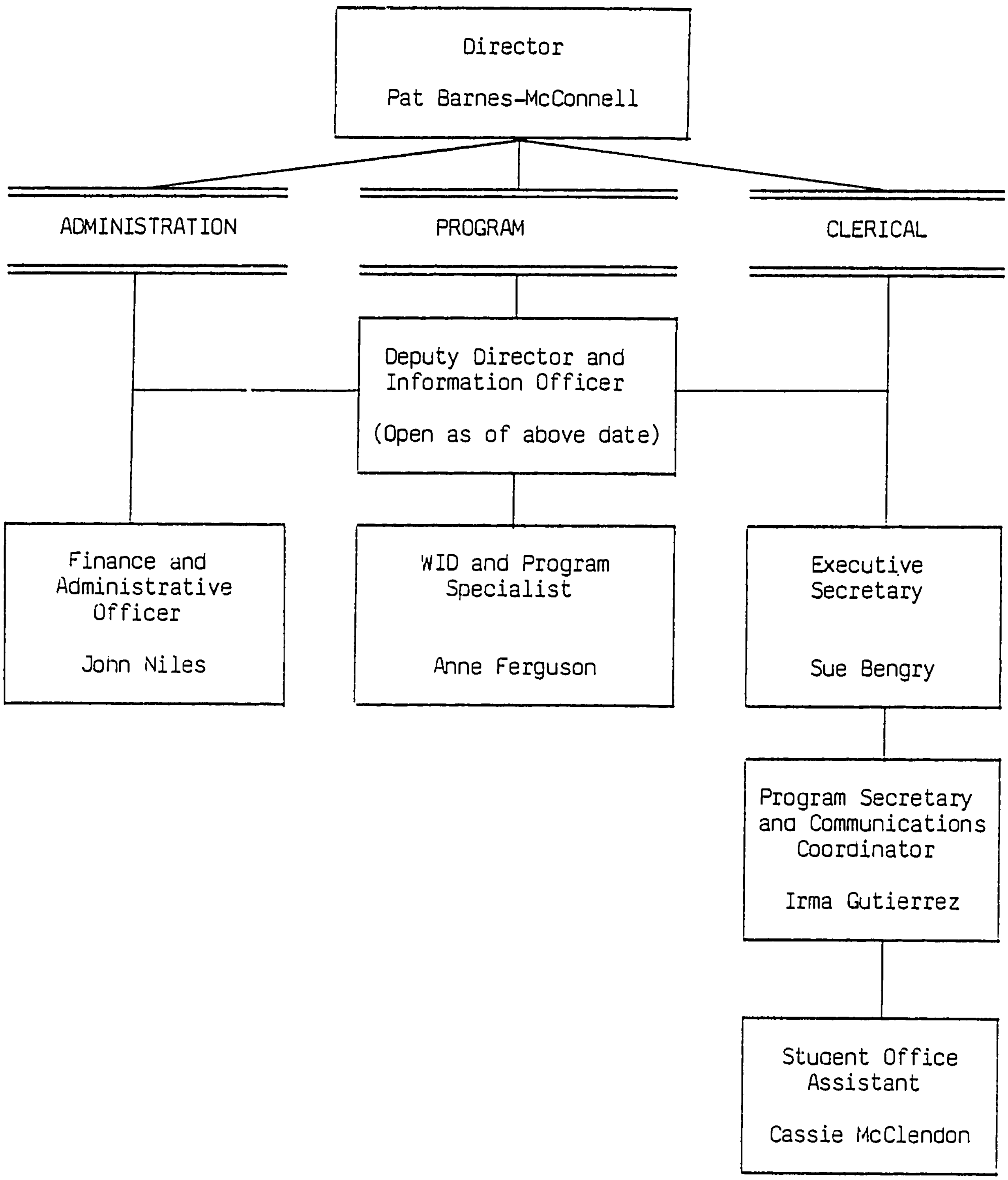
Director	100%
Deputy Director	50%
WID/Program Specialist (50%/50%)	100%
Administrative Officer	100%
Executive Secretary	100%
Secretary-Receptionist	100%

Despite almost 100 percent turnover in staff within the last 1-1/2 years, the Management Office has continued to (1) monitor project activity in US and HCs as needed, (2) provide support and guidance to all projects, (3) reinforce attention to the WID perspective, (4) reinforce communication among the various participants of the CRSP, (5) encourage better project integration in the lead and HC institutions, (6) provide staff support to the BOD, TC and ERP, (7) carry out the policies and recommendations of these groups, (8) maintain communication flow between the CRSP and AID/BIFAD as well as (9) increase the published output and (10) represent the CRSP in wider national and international settings.

BEAN/COWPEA CRSP MANAGEMENT OFFICE
INTERACTION CHART
January 1, 1984



BEAN/COWPEA CRSP MANAGEMENT OFFICE
ORGANIZATION CHART
January 1, 1984



External Review Panel (ERP) 7 members

Eminent scientists from an array of disciplines with no previous connection to the CRSP are appointed by BIFAD to annually review and evaluate the individual CRSP projects and the Program as a whole. The ERP has completed two reviews of the CRSP. A report of their findings each year presents the results of US and HC site visits and project progress report reviews.

Institutional Representatives (IRs) 10 members

There is one IR from each of the nine lead institutions plus an additional one from the University of California-Riverside/Davis system. There are no regularly scheduled meetings but frequent mailings from the MO keep them informed of overall CRSP activity. They are the senior link between the CRSP project personnel at their institution and the administration there. Letters from the IRs indicating the role and contributions of the projects with their institutions are included in Section II.

Board of Directors 5 members

Elected from among the nine lead institutions' Institutional Representatives, this is the policy-making group of the CRSP. One member is a standing member representing the Management Entity. In addition to these five members, the Board invites consulting members to its meetings from among the HC administrators. An average of three meetings are held per year staffed by the Management Office. Examples of policies passed by the Board are presented below.

1. Bean/Cowpea CRSP Policy on US/HC Distribution of Funds:

A. The existing policy previously adopted by the CRSP Board indicates that not less than 50% of USAID funds for support of projects be spent in or directly on behalf of Host Countries. In order to:
(1) Insure CRSP focus on the solution of Host Country problems rather than on the maintenance of existing research programs of US institutions, and
(2) Nourish a climate of collaboration and partnership between the US and Host Country PIs,
this policy is upheld and is to be based on each total grant period.

B. However, experience has demonstrated that the US PI is uniquely restricted when institutional indirect costs for project support are taken solely from the US 50% of the total funds. Therefore, the 50/50 split is to be applied to the total project budget exclusive of all indirect costs.

C. Some projects have not settled into a spending pattern in the Host Country comparable to that in the US. Thus, in order to maintain a 50/50 split, more of each year's funds must be alloted to the half of the team spending less. Assuming that authorized project spending suggests the progress of approved research activity, it is appropriate to encourage Host Country utilization of project funds. Therefore, where Host Country spending patterns are seriously below the expected level, the Host Country and US

PIs will be requested to submit to the MO for TC discussion the reasons for the spending patterns and their suggestions for addressing the issue, including possible recognition of an unrealistic Host Country budget level.

2. Bean/Cowpea CRSP Policy on Institutional Involvement:

The Bean/Cowpea CRSP Board of Directors is concerned about the degree to which institutional participation occurs in CRSP projects beyond activities associated with the individual PIs. Of special concern is the extent to which PIs interact with their Institutional Representatives and the extent to which the Administration of the lead institution is aware of the project's progress. It is strongly recommended therefore that at each institution significant steps be taken to strengthen institutional ownership through (a) internal project reviews with attention to greater institutional integration, (b) identification of project strengths and weaknesses with appropriate institutional response and (c) when relevant, institutional participation in on-site project analyses.

3. Bean/Cowpea CRSP Policy on Project Allocations:

If there is an effective and consistent quarterly spending pattern of 80 percent (actual costs reimbursement not including encumbrances) projects may be considered for allocations up to 100 percent of project need as requested and demonstrated by the Principal Investigator. Maintenance of spending patterns less than 80 percent receive allocations commensurate with the prior spending pattern at a level which will discourage the accumulation of excess carry-forward funds.

4. Bean/Cowpea CRSP Policy on Training:

The Bean/Cowpea CRSP has as a major goal the strengthening of HC institutions through the training of HC nationals, a critical resource necessary for successful long-term research. To achieve this goal, CRSP projects are to give emphasis to the training of Host Country persons over the training of US persons. This policy adopts a Host Country priority rather than US exclusion and refers to both short-term training and graduate education.

5. Bean/Cowpea CRSP Policy on Participation of Non-CRSP Developing Countries:

Whereas the Bean/Cowpea CRSP has institution building and strengthening as a major goal, the BOD endorses the concept of CRSP Host Countries inviting scientists, representing limited-resource nations in CRSP regions of the world, to participate in Host Country collaborative research and training efforts which may provide mutual benefits.

Technical Committee (TC) 7 members

Composed of researchers associated with the CRSP, this group is responsible for internal project review and research coordination. Members and their alternates are appointed by the Board. It is made up of:

Researchers from CRSP US institutions	5
Researchers from CRSP HC institutions	1
Representatives from IARCs (CIAT or IITA)	1

An average of five meetings are held per year staffed by the Management Office. Some of the major activities of this group have been (1) monitoring progress of projects, (2) reviewing requested changes in projects, (3) responding to ERP recommendations, (4) identifying new areas for collaboration and cooperation, (5) determining most efficient and effective methods for disseminating CRSP information and (6) making recommendations to the Board regarding policies needed for the successful operation of the projects.

INTERNATIONAL TRAVEL OF MANAGEMENT GROUPS

To carry out the responsibilities assigned by the grant, most of the groups described above were required to travel internationally. Information on that travel is presented below.

BEAN/COWPEA INTERNATIONAL TRAVEL THROUGH 9-30-83
(Person Trips)

Project	To Collaborating Country	Prof. Mtg. in Another Country	To IARCs
Board of Directors	0	0	0
External Review Panel	10	0	0
Technical Committee	0	0	7
Total	10	0	7
Management Office	28	0	2

COUNTRY RESEARCH PROJECT ORGANIZATION

The research of the CRSP is organized in sets of HC and US teams collaborating in addressing one or more constraints to bean or cowpea production and utilization. No projects are free standing in the US without HC alliances. All evolved from the two-year planning effort.

Total projects		18
Africa	8	
Latin America	10	
Host Countries		13
Africa	7	
Latin America	6	
Bean projects		12
Africa	3	
Latin America	9	

Cowpea projects		6
Africa	5	
Latin America	1	
US lead institutions		9
US institutions contributing resource scientists	14	
Cooperating International Research Centers		2

COUNTRY RESEARCH PROJECT PERSONNEL

Notwithstanding coups or serious coup attempts in five of the CRSP HCs, food riots and other forms of political unrest, the projects continue their steady forward progress. This noteworthy achievement is undoubtedly the product of convivial professional relationships formed among the heterogeneous group of competent people whose human natures seem to demand that, in the midst of confusion and havoc, they seek the path of greatest dedication to the application of science in solving social problems.

PROFESSIONAL RESEARCHERS PARTICIPATING IN CRSP

	Males	Females	Total
HC	90	11	101
US	53	16	69
Total	143	27	170

US RESEARCHERS IN RESIDENCE IN HCS FOR 6 MONTHS OR LONGER

6 males 2 females 8 total

The organization of project research teams has developed based on the needs and existing resources of the projects and the professional relationships established between the HC and US PIs. Three successful models have emerged:

1. No US scientists are stationed in the HCs but active communication, professional cooperation and collegial relationships are maintained. This model is especially appropriate where the HC, similar to the US, maintains a critical mass of scientists including effective senior scientists. Example: Senegal.

2. Junior scientists (including post-doctorates or advanced Ph.D. students) are stationed in HCs, under close and frequent supervision of senior US PIs, to work with national programs. This model is especially successful where there is an effective HC team but less than a critical mass in the identified research area. Example: Brazil.

3. Senior US scientists are stationed in HCs to work with national programs. This model is especially effective where the HC has very limited research personnel and the US PI acts as a stimulus to building a critical mass. Example: Botswana.

These models of collaboration are only three among many possibilities, but they evolved from surveys of existing needs and resources and candid negotiations among the principals during the planning and early implementation phases. Because the structure of model #1 is the most equitable and mutually rewarding for the long term, those projects for whom models #2 or #3 are currently the most appropriate are motivated to focus attention on a comprehensive plan to achieve that level of operation.

To reinforce and maintain professional relationships within and among the US/HC teams, project personnel consult with one another frequently, visiting one another's programs and assessing the progress of laboratory and field research strategies jointly developed. The international travel sustained by the projects through the first three years of the CRSP is presented below.

BEAN/COWPEA CRSP INTERNATIONAL TRAVEL THROUGH 9-30-83
(Person Trips)

Project	To Collaborating Country	Prof. Mtg. in Another Country	Training--IARCs
Botswana/CSU	2	0	1
Brazil/BTI	12	2	0
Brazil/Bliss	7	1	0
Brazil/Hagedorn	2	0	0
Cameroon/UGA	6	3	1
Dom. Republic/UNE	14	0	2
Dom. Republic/UPR	5	3	3
Ecuador/COR	20	1	2
Guatemala/COR	15	2	1
Honduras/UPR	8	3	0
INCAP/WSU	8	1	0
Kenya/UCD	7	0	0
Malawi/MSU	14	0	1
Mexico/MSU	4	0	0
Nigeria/UGA	4	14	2
Nigeria/MSU	3	4	0
Senegal/UCR	9	1	0
Tanzania/WSU	9	5	2
Total Project Trips	149	40.0	15.0
Average US/HC Trips Per Project Per Year	3	.7	.3

PROGRAM ACHIEVEMENTS

Research

In the less than three years of actual operations, CRSP researchers are already reporting significant contributions to CRSP goals. For example,

1. Research illuminating the interaction of altitude (temperature) and latitude (daylength) now suggests it is possible to identify each cultivar's optimal environment (see Vanguard Vol. 1, No. 1 in Section III).

2. Large collections of bean and cowpea germ plasm have been made throughout Africa and Latin America.

3. Large numbers of local and exotic bean and cowpea lines have been screened for
   Pest resistance
   Disease resistance
   Heat resistance
   Drought resistance

4. Breeding programs were initiated incorporating these materials with those of the US collections and the IARCs--these materials also shared with national and international programs. Testing has begun at many sites offering an array of altitude/latitude variations.

5. One national germ plasm guide, growing out of the extensive germ plasm survey and research, has been prepared for publication.

6. Extremely early cowpeas were developed producing acceptable yield under the recent severe African drought and heat conditions (see Research Highlights Vol. 1, No. 1 in Section III).

7. Bean-tepary crosses have progressed to field trials which have identified drought resistance (see Research Highlights Vol. 1, No. 6 [in process]).

8. Quick, inexpensive and technically feasible methodology was developed for assessment of viral contamination of lines to be transported across national boundaries (see Research Highlights Vol. 1, No. 5 in Section III).

9. Five new multiple disease resistant bean genotypes were released and made available to breeding programs (see Research Highlights Vol. 1, No. 2 in Section III).

10. Basic research on the genetics of inheritance of resistance proceeding.

11. Research on variations among strains of plant pathogens is generating information critical to disease control.

12. Interactions were identified among bacterial isolates, their concentrations and host plant genotypes as important components in disease control.

13. Over one hundred isolates of insect pathogens were collected for research on biological insect control (see Research Highlights Vol. 1, No. 3).

14. Insect control research on identified cowpea pests' life-cycle and reproductive habits is generating important preliminary findings.

15. Experimental results with superior bean selections and superior isolates of Rhizobium phaseoli is suggesting greater than usual levels of nitrogen fixing potential adequate for commercial level bean production on small farms using traditional cropping systems.

16. Secondary research is generating important information on the role of women in food production (see Women-in-Agriculture Guide--Cameroon in Section III).

17. Socio-cultural and socio-economic studies are generating important information which will contribute to decision making in breeding programs.

18. Methodology is being developed for village-level production of cowpea meal acceptable for preparation of traditional foods (see Research Highlights Vol. 1, No. 4 in Section III).

19. An extensive canvassing of the variety of methods used for evaluation of bean quality has been done and a report of these methods is being organized for use by the scientific community (see Monographs Vol. 1, No. 2 [in process]).

20. Extensive secondary research completed on the eating of legume leaves and their role in traditional diets (see Monographs Vol. 1, No. 1 in Section III).

21. Appropriate farming implements were developed (jointly with other groups) suitable for an identified Host Country farming system and environment.

22. Collaboration achieved with other international agricultural programs funded by AID and other bilateral donors.

23. CRSP-sponsored, organized and run workshops and short courses (i.e., BNF, biological insect control, MSTAT) have been contributing to the professional programs of CRSP students and the continuing education of CRSP professionals.

Details of research achievements--1983 Annual Report: Technical Summary, Section III.

Training

From the beginning the CRSP has made an on-going effort to emphasize the training of US and HC scientists prepared to work together in the international agriculture context. This effort is the result of a CRSP philosophy that research capacity must be strengthened to build a long-term attack on constraints to food availability throughout the world. While not emphasized to the same extent as the training of HC nationals, US students are also supported under the CRSP. These students, often in exchange arrangements to HCs, provide good counterparts to HC students studying in the US. Frequently important potentially long-term professional relationships evolve (some of the US and HC PIs were students together years ago at a Title XII institution). In addition, US students are provided invaluable learning experiences that will render them more knowledgeable future professors of US and HC students studying in the US in subsequent years. Thus, all is done with an eye toward what will exist after a CRSP project comes to an end.

Strengthening HC institutions through short-term and long-term training in informal and formal settings is encouraged by each of the CRSP's projects. Especially encouraged is graduate-level education to help build a critical mass of professional researchers in the Host Countries participating in this CRSP.

As a part of that effort, projects maintain a strong concern for the educational advancement of women and, through the support of their Host Country colleagues, are gradually being successful. The potential for human resource development is especially significant in this program because of continuing efforts to reinforce gender participation as well as the participation of diverse national/ethnic groups. [illegible] following charts and diagrams show CRSP training activity over the first three years.

1983 BEAN/COWPEA CRSP TRAINING COMPONENT

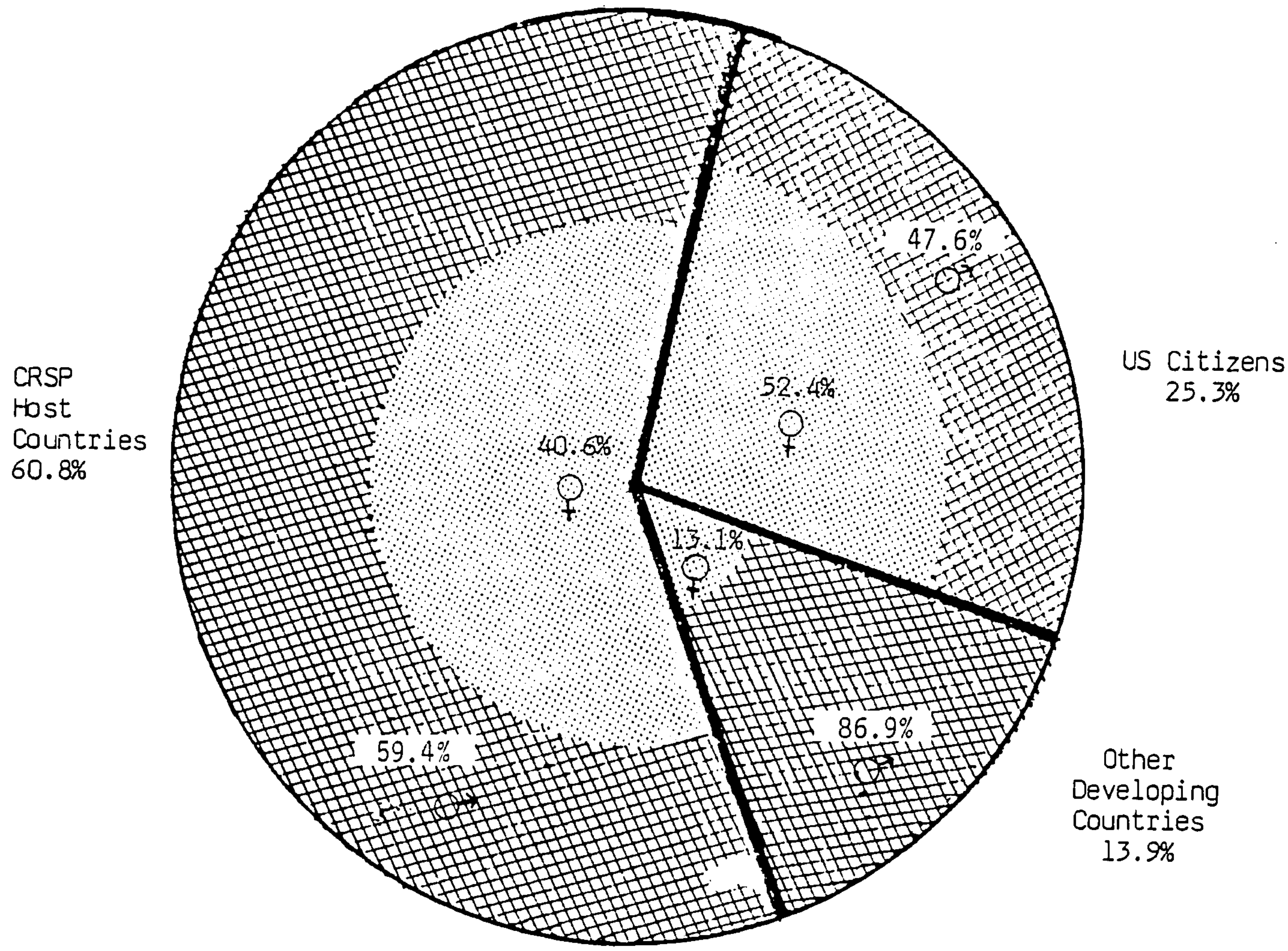
	HOST COUNTRY				UNITED STATES				OTHER DEVELOPING COUNTRIES				TOTAL
	Degree*		Non-Degree**		Degree		Non-Degree		Degree		Non-Degree		
	M	F	M	F	M	F	M	F	M	F	M	F	
BOTSWANA	0	1	2	0	0	2	0	1	0	0	0	0	6
BRAZIL/ROBERTS	0	0	14	24	0	1	1	2	0	0	0	0	42
BRAZIL/BLISS	1	0	1	0	0	0	0	0	0	0	0	0	2
BRAZIL/HAGEDORN	0	0	0	0	0	0	0	0	0	0	0	0	0
CAMEROON	0	0	0	0	0	0	0	0	0	0	1	0	1
DOM. REP./COYNE	2	0	2	0	1	1	0	0	2	0	0	0	8
DOM. REP./LOPEZ-ROSA	3	0	2	1	1	0	4	2	0	0	0	0	13
ECUADOR	0	0	0	1	0	0	0	1	0	0	0	0	2
GUATEMALA	3	0	1	0	2	0	1	0	1	0	2	0	10
HONDURAS	1	0	2	0	0	0	0	0	0	0	0	0	3
INCAP	5	6	6	2	5	5	0	0	2	0	1	0	32
KENYA	1	1	1	0	1	0	0	2	0	0	0	0	6
MALAWI	2	0	0	0	1	1	0	0	0	0	0	0	4
MEXICO	1	0	1	0	0	0	0	0	0	1	0	1	4
NIGERIA/MARKAKIS	0	1	0	0	0	0	0	0	0	0	0	0	1
NIGERIA/MCWATTERS	0	0	0	0	2	1	0	0	0	1	0	0	4
SENEGAL	2	0	1	0	1	2	0	0	6	0	4	0	16
TANZANIA	2	1	4	3	0	1	0	0	1	0	0	0	12
Total	23	10	37	31	14	14	6	8	12	2	8	1	166***

* The majority of these students are enrolled in Master's or Ph.D. programs in US institutions. In a few cases individuals are completing Bachelor's degrees prior to enrollment in graduate programs.

** Included here are programs of from a few days to nearly a year's duration attended by students and technicians associated with the CRSP.

*** It should be noted that some degree students have also participated in non-degree training and in these cases have been counted in each category. While the total number of traineeships is 166, the actual number of individuals is 149.

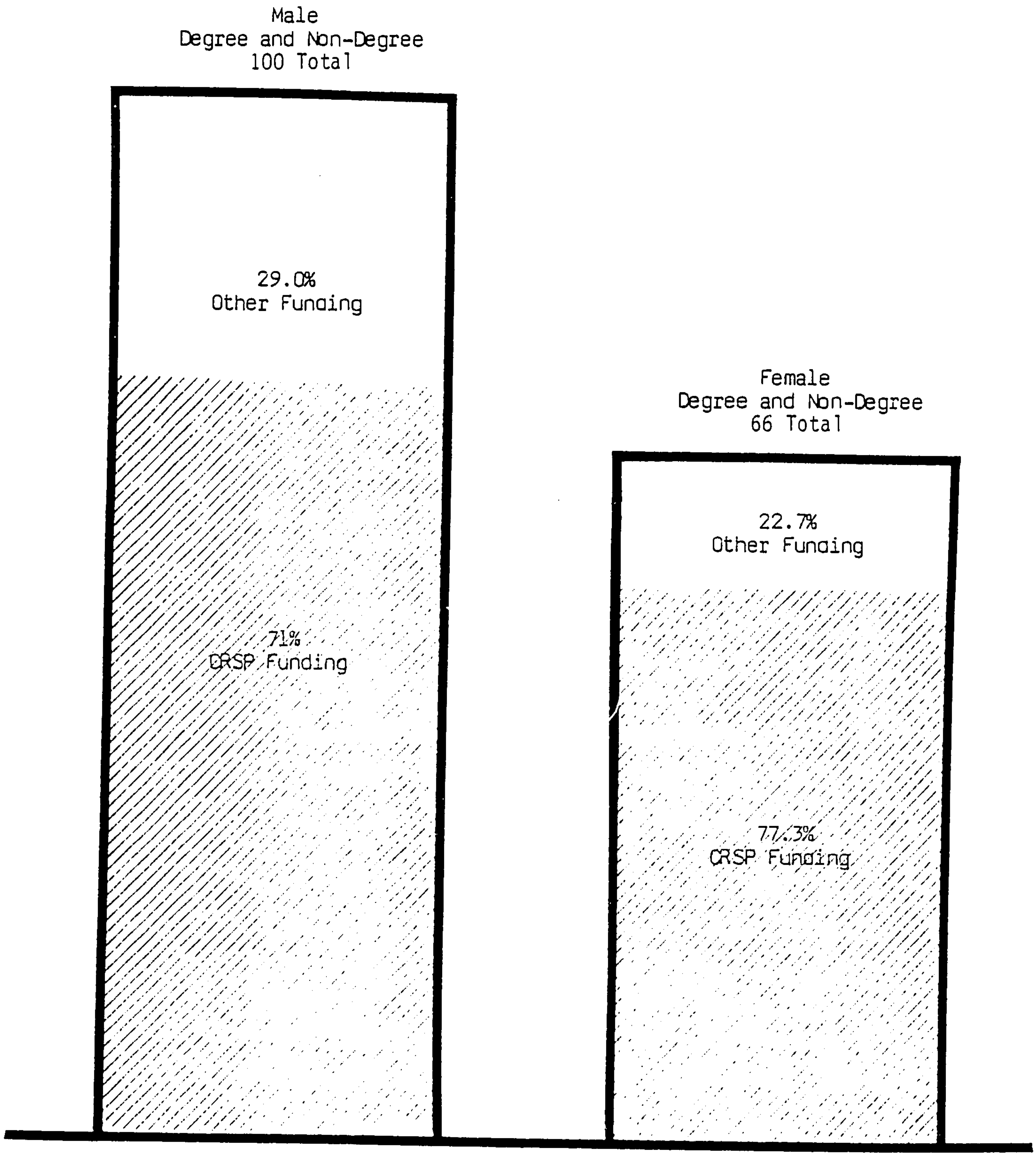
BEAN/COWPEA CRSP TRAINEES BY COUNTRY OF ORIGIN AND GENDER*



	Male Funding CRSP	Male Funding Other	Male Total	Female Funding CRSP	Female Funding Other	Female Total	Total
Degree Programs							
US Citizen	6	8	14	8	6	14	28
Host Country	15	8	23	4	6	10	33
Other Developing Countries	9	3	12	2	0	2	14
Subtotal	30	19	49	14	12	26	75
Non-Degree Programs							
US Citizen	5	1	6	8	0	8	14
Host Country	31	6	37	28	3	31	68
Other Developing Countries	5	3	8	1	0	1	9
Subtotal	41	10	51	37	3	40	91
Total	71	29	100	51	15	66	166

*Some trainees participated in degree and non-degree programs and, in these cases, have been counted in both categories. The actual number of individuals trained is 149 (86 males and 63 females).

BEAN/COWPEA CRSP STUDENT TRAINEES BY FUNDING SOURCE AND GENDER



LINKAGES WITH INTERNATIONAL AGRICULTURAL RESEARCH CENTERS (IARCs)

From the beginning, when the heads of the respective legume programs at CIAT and IITA were invited to participate in CRSP planning (i.e., Peter Graham and subsequently Aart Van Schoonhoven from CIAT; Peter Goldsworthy and subsequently Shiv Singh from IITA), CRSP and IARC scientists have maintained collegial professional relationships which in many cases predated the birth of the CRSP. These relationships have, in most cases, grown to the mutual advantage of both groups. Examples of the relationships are as follows:

1. The heads of the legume programs of the cooperating IARCs alternate on the Technical Committee (Shiv Singh of IITA and Aart Van Schoonhoven of CIAT).

2. IARC scientists have taken sabbatical leaves to study with senior CRSP scientists and CRSP scientists have spent their sabbaticals at the IARCs (i.e., CIAT's Steve Temple to Wisconsin; IITA's Earl Watt to Michigan State University; CRSP's Matt Silbernagel to CIAT).

3. CRSP graduate students (i.e., Paul Gniffke from Cornell) and trainees (i.e., Betty Gondwe from Tanzania) trained and conducted research at IARCs. The CRSP has sponsored several such trainees. IARC-trained graduates (i.e., Moffi Ta'Ama) have found positions in CRSP projects.

4. IARC plant material is included among lines in CRSP trials (i.e., Dominican Republic) and among the material evaluated in the CRSP food science research (i.e., INCAP).

5. Conversely, CRSP material has been used by CIAT and additional lines have been requested and are being furnished to IARCs by CRSP teams (i.e., Kenya/University of California tepary crosses).

6. CRSP and CIAT cooperate in agronomic and varietal on-farm research such as presently being planned in Honduras.

7. The CRSP and CIAT have worked together sponsoring important joint professional meetings such as the Rust workshop held in 1983 in the Dominican Republic. At this meeting, international leaders in rust research reached agreement on new evaluation criteria and labels to be used worldwide as the standard in rust evaluation trials.

8. The CRSP and IITA are co-sponsoring a worldwide cowpea conference in November of 1984 in Ibadan, Nigeria.

These cooperative efforts evolved as mutual advantage was perceived by the respective units. The MOUs between the CRSP and the IARCs demonstrate the extent to which both groups are concerned that duplication is held to a minimum, complementarity is enhanced and our respective resources are used as efficiently and appropriately as possible to increase the availability of beans and cowpeas in the food deficient areas of the world.

CONCLUSION

The CRSP has concentrated on maintaining a well-integrated research and training program. It has attempted to strike a balance between the research needs of legume science for the common good and the more narrow special needs of participating US and HC research programs. A high level of communication among the participants and especially across the disciplines supports this balance (i.e., researchers rotating through terms on the Technical Committee, multi-disciplinary participation in CRSP meetings and workshops). We are now beginning to see project leaders turn to one another for assistance in specified areas. Sometimes projects help train new personnel for one another. For example, a HC food scientist, beginning food quality assessments of the lines being developed by the CRSP disease resistance project in his country, visited with the food science US and HC team in another country to learn of the major ideas and findings emanating from their work. Another CRSP project on drought and heat tolerance is negotiating with a disease resistance project to have the promising lines for drought and heat screened by them for disease resistance. A similar service function to other CRSP projects is being performed by one of the projects concentrating on biological nitrogen fixation.

Slowly the real value of the wealth of resources represented by an organization of this size and complexity is making itself understood. While overall management keeps the few persons responsible for critical points in the operation, such as the AID program officer, the BIFAD liaison person, and the Management Office, extremely busy, all parts together suggest the energy and exciting potential in the program as a whole. The constraints identified are complex and stubborn and long-term research is expected to be required if they are to be adequately addressed. If there is any hope that this process can be accelerated, it will be through assembling an array of competent, dedicated persons who are heterogeneous in their professional and cultural backgrounds. Unencumbered by gender discrimination and national/ethnic neglect, this is best described as intellectual germ plasm. And indeed, it is the true promise of the Bean/Cowpea CRSP.

PROJECT REVIEW AND EVALUATION PROFILES

EXTERNAL REVIEW PANEL EVALUATIONS AND FOLLOW-UP

At the Annual Meeting of the ERP, the progress reports of the projects and site reviews were discussed at length and evaluated. A summary is presented here.

Project Evaluation Scales

Each project was assessed in seven categories related to the review issues agreed upon at the beginning of the process. The categories are:

1. Administration of Project
   - 1.1 Host Country
   - 1.2 United States
   - 1.3 AID
   - 1.4 Interaction
2. Technical Personnel
   - 2.1 Host Country
   - 2.2 United States
   - 2.3 Collaboration
3. Project Progress
   - 3.1 Log Frame/Consistency of Objectives with Activities
   - 3.2 Achievement of Natural Science Objectives
   - 3.3 Achievement of Social Science Objectives
   - 3.4 Achievement of Training Objectives
   - 3.5 Publications/Information Dissemination
   - 3.6 Food and Nutritional Component
   - 3.7 Consideration of Women in Development (WID) Issues
   - 3.8 Application to Systems Used by Small Farmers
   - 3.9 Contribution to Development in the Host Country
4. Linkages
   - 4.1 Host Country
   - 4.2 AID Projects
   - 4.3 International
5. Overall Major Project Strengths/Deficiencies (See complete ERP Report in Section III)
6. Response to Prior ERP Project Recommendations
7. Overall Recommendation Rating

The items within the categories were assessed using the scales presented below.

Overall Rating: General performance was considered with projects receiving one of three recommendations: #1 continuation with no major changes, #2 continuation with some changes recommended, and #3 continuation only with identified changes.

Five-Point Evaluation Scale (for items 1-3.8, 4 and 6): Within a project each category was judged to be Exceptional (E), Highly Satisfactory (HS), Satisfactory (S), Less than Satisfactory (LS), and Unacceptable (UA). In some cases a specific criterion was not applicable and thus was rated Not Applicable (NA).

Contribution to Development in the Host Country (for item 3.9): Evolving development potential was evaluated on the basic of Limited (L), Potentially Limited (PL), Potentially Important (PoI), Potentially Useful (PU), Already Important (AI), Highly Promising (HP), Long-Term Potential (LTP), and Beginning to Show Potential Worldwide Significance (WW).

Overall Major Project Strengths/Deficiences (for Item 5): Brief descriptive statements included in texts of Project Evaluation Profiles are presented in the complete 1983 ERP Report.

SUMMARY 1983 EXTERNAL REVIEW PANEL EVALUATION PROFILES

	ADMINISTRATIVE 1.1	1.2	1.3	1.4	TECHNICAL 2.1	2.2	2.3	PROGRESS 3.1	3.2	3.3	3.4	3.5	3.6	3.7	3.8	3.9	LINKAGES 4.1	4.2	4.3	RESPONSE TO ERP 6	RATING* 7
BOTSWANA	HS	HS	S	S	LS	HS	S	S	E	LS	HS	S	NA	S	HS	PoI	E	LS	HS	S	1
BRAZIL/ROBERTS	S	HS	S	S	LS	HS	LS	HS	E	NA	S	S	NA	S	HS	PU	S	NA	HS	S	2
BRAZIL/BLISS	HS	HS	S	S	LS	E	HS	HS	E	NA	HS	HS	NA	LS	S	PoI	E	NA	HS	NA	1
BRAZIL/HAGEDORN	S	LS	S	UA	LS	HS	UA	S	LS	NA	LS	NA	NA	LS	NA	L	S	NA	LS	UA	3
CAMEROON	LS	LS	S	LS	UA	HS	LS	HS	HS	NA	LS	S	NA	LS	S	PoI	S	S	S	UA	3
DR/COYNE	S	HS	HS	HS	HS	HS	E	S	HS	S	HS	HS	NA	HS	S	PoI	S	NA	S	HS	1
DR/LÓPEZ-ROSA	S	HS	HS	E	HS	HS	E	S	HS	S	HS	HS	NA	HS	HS	AI	S	NA	S	HS	1
ECUADOR	S	S	HS	HS	S	S	HS	LS	S	HS	LS	S	S	HS	HS	HP	HS	S	S	HS	2
GUATEMALA	HS	S	S	S	HS	HS/UA	HS	LS	E	UA	S	S	LS	LS	HS	WW	S	S	HS	S	2
HONDURAS	LS	S	S	LS	LS	S	LS	S	S	LS	S	S	NA	UA	S	PoI	S	S	S	S	3
INCAP	S	S	S	S	E	HS	S	S	HS	S	S	S	HS	LS	S	PoI	S	S	HS	HS	1
KENYA	UA	LS	S	LS	S	HS	LS	S	S	NA	S	S	NA	S	S	PU	S	S	S	LS	3
MALAWI	S	S	S	S	HS	HS	HS	HS	HS	HS	HS	S	S	HS	HS	LTP	HS	S	S	NA	1
MEXICO	HS	HS	NA	HS	HS	HS	HS	S	HS	NA	S	S	NA	S	HS	PoI	S	NA	S	NA	1
NIGERIA/MARKAKIS	S	S	S	S	S	S	LS	S	S	S	S	LS	S	S	S	PoI	UA	NA	S	S	2
NIGERIA/MC WATTERS	HS	S	S	S	HS	HS	LS	S	HS	LS	S	HS	HS	S	S	PoI	LS	NA	S	S	2
SENEGAL	HS	HS	HS	HS	HS	HS	E	S	HS	NA	HS	HS	NA	S	HS	AI	HS	HS	HS	NA	1
TANZANIA	S	HS	S	S	S	HS	HS	S	S	HS	HS	S	S	HS	HS	PoI	HS	S	S	NA	1

KEY:

E - Exceptional
HS - Highly Satisfactory
S - Satisfactory
LS - Less Than Satisfactory

UA - Unacceptable
NA - Not Applicable
L - Limited
PL - Potentially Limited

PU - Potentially Useful
PoI - Potentially Important
AI - Already Important
HP - Highly Promising

LTP - Long-Term Potential
WW - Worldwide

*See text of individual project profiles for clarification of additional issues considered in this evaluation.

Summary of ERP Recommendations and Followup

PROJECT	RECOMMENDATION BY ERP--1983	ACTIONS TAKEN
BOTSWANA/CSU	Coordination with USAID supported Agricultural Technology Improvement Program needs to be improved. Training initiatives need to be intensified. Development of social science component has been slow.	Issues have been communicated to US PI. Further discussions will be held while US team is on home leave in US in summer of 1984.
BRAZIL/BTI	Lack of a HC PI who is a working researcher inhibits the full institutionalization of the project.	A HC PI (Mr. Bonifacio Magalhaes) has been identified, who is a working researcher.
BRAZIL/BLISS	Post-graduate training needs to be increased. Women should be more directly involved in the project research and training.	Studies are in process to address these problems.
BRAZIL/HAGEDORN	Brazil needs to designate a HC PI prepared to contribute directly to research objective of project. A technical assessment is required of the relationship of the project to the overall program of CNPAF with attention to existing work on varietal development. An assessment needs to be made of the methodology, its appropriateness, and its likely effectiveness in Brazil. A small group of disciplinary peers should be identified to assess present research strategy.	New peer panel identified. Wisconsin administrator & MO director joined Pathologist's Review Panel (PRP)for on-site visit to assess the project from disciplinary perspective. With PRP report TC reviewed project again. New US PI (Dr. Maxwell) has been named. Broader institutionalization of project at Wisconsin. Dr. Blumenschein (CNPAF Director) visited US and new work plan was developed focusing on simultaneous innoculation, general resistance, etc. Dr. Blumenschein reaffirmed project commitment & new direction at BOD presentation.
CAMEROON/UGA	HC PI needs to be provided by the Government of Cameroon within an arrangement that will provide training for personnel & move toward the institutionalization of the research. In the US some public relations work may be in order.	HC PI has been named (Mr. Zachee Boli Baboule). New HC PI and AID Mission Director invited to US institutions for discussion of work plan, & budget. BOD invited AID Mission Director to Sept. '84 meeting for discussion of project. Broader institutionalization of project at Georgia with participation of additional researchers and administrative support.

PROJECT	RECOMMENDATIONS BY ERP--1983	ACTIONS TAKEN
DOM. REP./UNE	A comprehensive graduate training plan should be constructed which lays out 1) a broader array of disciplines which can contribute to the national bean research program & 2) opportunities for the professional advancement of DR women.	Studies are in process to address these problems.
DOM. REP./UPR	There is a serious need for more training in plant breeding.	Activities in process to address this problem.
ECUADOR/COR	Weaknesses must be corrected in 1) the project's Logical Framework 2) the training component and 3) failure to have yet identified the technical personnel it had planned to place in Ecuador.	The project Log Frame is being updated. An agronomist (Wesley Klein) and sociologist (Dr. Kris Merschrod) have been named and will begin work in HC immediately. Weaknesses in training component are being studied.
GUATEMALA/COR	Progress with respect to sociological objectives is unacceptable. Requires implementation or attention to procedures for adjusting project objectives.	Broader institutionalization of project at Cornell. New sociologist (Dr. Capener) named to address ERP issues.
HONDURAS/UPR	High turnover of HC PIs and inadequate HC institutionalization are weaknesses which have compromised the value of the project. US PI collaboration with HC inadequate.	New HC PI has been named (Mr. Rafael Diaz). Director of HC institution (EAP) attended May '84 BOD meeting and reaffirmed commitment to project. Previous HC contributions now recognized. New US PI named (Dr. James Beaver).
INCAP/WSU	Contributions & coordination among the five US institutions, particularly the cost effectiveness of the current arrangement, needs to be assessed.	US PI has increased level of communication with participants. Special attention being paid to coordinating research objectives & procedures.
KENYA/UCD	The approaches being used to assess drought tolerance should be reviewed by TC. Level of project activities & accomplishments by HC in relation to level of financial support used should also be reviewed by TC. HC financial reporting to Univ. of CA is unsatisfactory.	US PI and MO finance officer joined project team for on-site review & meeting. Univ. of Nairobi controller has supplied all financial reports. New fiscal procedures in place with UN controller in charge of all finances. HC PI (Dr. Mukunya) replaced by Dr. David Ngugi. Dr. Ngugi visited UCD and developed

PROJECT	RECOMMENDATIONS BY ERP--1983	ACTIONS TAKEN
KENYA/UCD (continued)		new plan of work, which reorganizes HC team and responsibilities. Dr. Ngugi attended BOD meeting to explain new arrangements. TC has reviewed project closely, including draft plan of work.
MALAWI/MSU	Needs better Agronomic/Social Science integration.	First report now available. More work in process to address this issue.
MEXICO/MSU	Lack of trained personnel at the Ph.D. level for the breeding & physiology research at Durango. Lack of adequate laboratory & greenhouse facilities to supplement field plot research at Durango. Limited involvement of HC women researchers.	Activities are in process to address these problems. Help of AID representative sought.
NIGERIA/MSU	Training component needs strengthening. Domestic & international linkages, including those with other CRSP projects, need to be improved. Communication between US & HC needs improvement.	Activities to address these problems are in process. Closer links with other projects are being developed. Structural problems within Nigeria inhibit communication. Greater resources may be required to maintain required level of communication.
NIGERIA/UGA	Sociological component needs improvement. Special attention should be given to building stronger links between the two Nigeria projects.	Socio-economic surveys will be expanded. Closer links between the two Nigerian projects are being developed. Joint meeting for November 1984.
SENEGAL/UCR	Graduate degree training, especially for women, is limited & should be intensified to include training in the US. Cooperation from Univ. of Arizona is weak.	Activities are in process to address these problems. TC requested ERP evaluation of Arizona project.
TANZANIA/WSU	Absence on HC side of any single person who devotes more than 20% to the CRSP, leading the day-to-day work of the group is a weakness. Poor linkages in HC between the agricultural & social sciences. Physical facilities & organization for managing & conserving the genetic resource material need to be developed.	Activities are in process to address these problems. US researcher to go to Tanzania being sought.

PROJECT	RECOMMENDATIONS BY ERP--1983	ACTIONS TAKEN
MANAGEMENT OFFICE	1. An early warning system, appropriate to the model, needs to be set up so that MO identification of potential problems & better communication between US & HC PIs are facilitated. 2. An open line of communication among all the components of the CRSP shoud be maintained. 3. Attention should be directed to building a stronger sense of community within the CRSP across projects. This includes: research-sharing workshops; sharing publications; increasing the dissemination of CRSP information through publications which are made available to US & HC participants; adding publications listings to Pulse Beat, the newsletter of the CRSP; involving HC graduate students in more cross-project activities which will encourage them to continue working with the CRSP projects when they return home. 4. More open communication with the CGIAR system should be established. Existing co-operation with IARCs should be strengthened.	These recommendations are in the process of being implemented.
PROGRAM EVALUATION evaluated.	1. The CRSP collegial & financial activity may alter the balance of priorities within HCs, not in their own best interest. 2. Collaboration with other overseas development programs & agricultural research efforts is inadequate. Especially important is cooperation with other US bilateral efforts within the same HCs. 3. Economic analyses of production systems & the acquisition of baseline data are lagging behind biological research. 4. Linkages with other development agencies and institutions in the HCs such as extension are weak. Dissemination of research findings therefore is likely to be poor. 5. Some HC PIs are administrators rather than working researchers. While administrative support is critical to project success, having a PI who is an administrator inhibits the progress of the actual research, the building of professional collegial relationships among peers & the institutionalization of the project research at the operational level.	These recommendations are in the process of being

BOARD OF DIRECTORS EXTENSION EVALUATIONS

On May 10, 1984 the BOD reviewed the eighteen CRSP projects, considering the appropriateness of each for a three-year extension beyond the initial five-year period. Utilizing all documentation, the BOD members engaged in lengthy discussions of the information available as follows:

1. Progress reports by individual projects.

2. ERP evaluations and recommendations.

3. TC review and recommendations.

4. Reports from MO, lead institutions' and HC institutions' actions taken in response to those recommendations.

5. Current and projected status of each project based on the resolutions accomplished.

General performance, importance of the research to the CRSP Global Plan and current potential for making the promised contribution as a result of the recent changes were issues receiving particular attention in those projects previously judged as less than satisfactory by the ERP.

BOD Rating Scale:

1 The project is making important contributions to the CRSP goals and is therefore appropriate for extension.

2 The project has potential importance for the CRSP goal but is appropriate for extension only if, after one year, the major changes made result in significant progress.

3 The project is inappropriate for extension beyond the original commitment.

SUMMARY 1983 BOARD OF DIRECTORS EXTENSION RATING

	Comments	Rating
BOTSWANA	Interest expressed in monitoring project strengthening as identified by ERP.	1
BRAZIL/ROBERTS	Planned change important and will be monitored for effectiveness.	1
BRAZIL/BLISS	Service role in CRSP significant.	1
BRAZIL/HAGEDORN	Significant changes, indicated by ERP, PRP and TC and madeas a result of commitment and great effort on parts of US and HC administrators, are impressive.	2
CAMEROON	Identification of HC PI plus greater institutionalization of this project within UGA have addressed concerns identified by ERP.	2
DOM. REP./COYNE	This project will provide important foundation for disease research in several projects.	1
DR/LOPEZ-ROSA	Existing level of coordination should magnifiy the contributions from this group.	1
ECUADOR	Sociologist and agronomist on site are expected to move project forward rapidly.	2
GUATEMALA	Initiation of socio-agronomic research planned FY 84 is expected to bring this component more closely in line with successful agronomic component.	2
HONDURAS	Identification of HC PI and clarification of significant HC contributions give promise of rapid movement in objectives. Reports of farmers already growing the new lines impressive.	2
INCAP	Improved coordination/communications among project researchers, service role in CRSP significant.	1
KENYA	All ERP-identified problems vigorously addressed by changes in HC PI, financial reporting, improvements in research design and new plan of work. US and HC administrative efforts promise project turn around.	2
MALAWI	Important contribution to CRSP anticipated.	1
MEXICO	Important contribution to CRSP anticipated.	1
NIGERIA/MARKAKIS	New HC PI anticipated will move research more quickly. Promised closer cooperation and improved communications among researchers will be monitored for effectiveness.	2
NIGERIA/MCWATTERS	Important contribution to CRSP goal evolving.	1
SENEGAL	Important contribution to CRSP goal evolving.	1
TANZANIA	Important contribution to CRSP goal evolving.	1

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COUNTRY RESEARCH PROJECT REVIEW PROFILES

The following pages present for each of the eighteen projects, a one-sheet profile which gives a brief overview of the important information on goals, achievements, evaluations and problem resolutions. These project review profiles are useful as a quick summary of project flow, which are supplemented by the expanded reports on each project in Section II of this document. The reader is encouraged to refer to the latter section for the details.

The Profiles presented here present both the success stories as well as the CRSP projects that have received a less than satisfactory evaluation. Brief statements of what major changes have been made demonstrate (1) the level of response to the evaluations and (2) the extent of efforts made to maintain the viability and integrity of the original research objectives still judged by the TC, BOD and ERP to be important for the achievement of CRSP goals. The projected status of each project following all of the indicated adjustments is described as the concluding category of information.

Thus for each project, information is given as follows:

Goal

Description

Achievements

Contributions
- To HC
- To US

Role in Global Plan

Major Problems as Identified by ERP
- ERP Rating

Actions Taken

Resolution

Projected Status

PROJECT REVIEW PROFILE

BOTSWANA • COLORADO STATE UNIVERSITY (Initiated July 1982) • COWPEAS
deMooy

DEVELOPMENT OF INTEGRATED COWPEA PRODUCTION SYSTEMS IN SEMIARID BOTSWANA

GOAL: Provide small farmers with an acceptable package of integrated practices for cowpea growing and harvesting including improved varieties and implementation as required to realize increased yields.

DESCRIPTION: This project adopts a comprehensive cropping systems approach to improving yields. Attention is given to tillage practices, planting practices and moisture conservation as well as variety testing, cultural practices and harvesting techniques. An expatriate research couple has been in place in Botswana although the wife will return to the US for graduate work in the fifth year of the CRSP.

ACHIEVEMENTS:

1. A newly introduced variety, surpassing the nationally recognized variety in yields, has been accepted for release by the Botswana Ministry of Agriculture (MAG).
2. A cowpea germ plasm collection was established, seeds available upon request. A Botswana Cowpea Germ Plasm Catalog, with a description of 180 local varieties, is being published by the MAG and a second volume is in preparation.
3. A once-over cultivating/planting procedure for minimum tillage implements and reduction in draft animal power is being designed. Demonstration plots on farmers' fields were arranged.

CONTRIBUTIONS:

To HC--Making a unique contribution to production practices, intercropping systems and harvesting techniques, the project will contribute practical solutions to the problems of low yield characteristic of small farms.

To US--Some of the problems characteristic of cowpea production in Botswana, such as soil crust formation, are characteristic of semiarid zones in the US and elsewhere in the world, hence an investigation of these issues has potential widespread ramifications. In addition, the cowpea germ plasm collection is a valuable resource to US agriculture.

ROLE IN GLOBAL PLAN: This is the major comprehensive cropping systems project. Dominant constraint #4 (farming practices limitations).

MAJOR PROBLEMS IDENTIFIED BY ERP (RATED 1): None. However, US PI in Botswana needs to coordinate better with AID Farming Sytems Project there.

ACTIONS TAKEN: This issue communicated to US PI. Further discussions to be held while team is on home leave in US summer 1984.

RESOLUTION:

1. In process.
2. SUBSEQUENT BOD EXTENSION RATING 1.

PROJECTED STATUS:

1. No change in US PI presently resident in Botswana.
2. HC PI will be in place after completion of graduate program.
3. Expanded plant screening activities will be initiated, breeding assistance identified.

PROJECT REVIEW PROFILE

BRAZIL • BOYCE THOMPSON INSTITUTE (Initiated October 1981) • COWPEAS
Roberts

INSECT PATHOGENS IN COWPEA PEST MANAGEMENT SYSTEMS FOR DEVELOPING NATIONS

GOAL: Develop insect pathogens as pest management tools compatible with other insect control practices for small farms.

DESCRIPTION: This project is advancing technology for biological insect control in small farmer cowpea production. Short-term training courses in insect pathology have generated considerable interest. An expatriate scientist is in place in Brazil (Dr. Richard Daoust).

ACHIEVEMENTS:
1. More than one hundred fungal isolates have been identified in Brazil and many have been evaluated in the laboratory.
2. Methods for fungal mass production and bioassay have been developed and refinements of insect-rearing methods have made some cowpea insect species available for pathology and non-pathology studies.
3. Short courses in insect pathology have been held in Goiania, Brazil to provide an overview of the current status of microbial control and to demonstrate simple techniques in laboratory sessions.

CONTRIBUTIONS:

To HC--This project will directly benefit Brazil through the development of cowpea pest microbial control agents that can be produced in-country and can be used by small farmers.

To US--Fungal isolates from Brazil have been distributed to interested scientists in the US for possible use as insect control agents. Methods for fungal mass production and bioassay are directly applicable to other studies of entomopathogenic fungi worldwide.

ROLE IN GLOBAL PLAN: This is the only CRSP project directed totally to biological control of insects. Dominant Constraint #1 (limitations due to pests).

MAJOR PROBLEMS AS IDENTIFIED BY ERP (RATED 2): None. However, the ERP was concerned about the absence of a HC PI in Brazil who is a working researcher.

ACTIONS TAKEN: Regular trips to Brazil by the senior US PI support effective communication and provide necessary research materials.

RESOLUTION:
1. HC PI, who is a working researcher, was established.
2. SUBSEQUENT BOD EXTENSION RATING 1 (with planned changes).

PROJECTED STATUS:
1. No change in US PI.
2. The Brazilian working counterpart PI who has been identified will further institutionalize the project in Brazil (Mr. Bonifacio Magalhaes).
3. The possibility of extending the work to include insect pathogens of beans will be explored.

PROJECT REVIEW PROFILE

BRAZIL • UNIVERSITY OF WISCONSIN (Initiated February 1982) • BEANS
Bliss

IDENTIFICATION OF SUPERIOR BEAN-RHIZOBIA COMBINATIONS FOR UTILIZATION IN CROPPING SYSTEMS SUITABLE TO SMALL FARMS IN BRAZIL

GOAL: To develop superior N_2 fixing cultivars that in association with superior strains of R. phaseoli produce high yields under bean-only and bean-maize cropping systems without supplemental nitrogen fertilizers.

DESCRIPTION: The focus has been on identifying and field testing black bean breeding lines with high biological nitrogen fixation (BNF) and on developing methods to transfer characters favoring enhanced BNF into standard cultivars. An expatriate scientist is in place in Brazil (Dr. Robert Henson).

ACHIEVEMENTS:

1. Black bean breeding lines with potential for enhanced BNF (UW 22-34) ready to be entered into regional trials.
2. Breeding methods facilitating transfer of enhanced BNF characters are available for immediate use and improved methods of inoculation are being developed.
3. Information on the effects of mixed cropping on bean plant BNF is being gathered and isolates of Rhizobium phaseoli selected for superior competitive ability and BNF potential have been obtained.
4. A BNF Student Trainee Workshop was held at the University of Wisconsin, July 18-20, 1983 with fourteen students from developing countries in attendance.

CONTRIBUTIONS:

To HC--Given the often prohibitive cost of nitrogen fertilizer for small farmers, the development of improved cultivars that incorporate high N_2 fixation represents an efficient means of increasing yields.

To US--Success of this project will allow US bean breeders to obtain breeding lines with enhanced BNF potential, thus considerably reducing fertilizer N_2 requirements.

ROLE IN GLOBAL PLAN: This is one of only two bean projects which have BNF enhancement as a major focus. The HC provides some unique ecology for this work.

MAJOR PROBLEMS AS IDENTIFIED BY ERP (RATED 1): None.

ACTIONS TAKEN: None required.

RESOLUTION:

1. None required.
2. SUBSEQUENT BOD EXTENSION RATING 1.

PROJECTED STATUS:

1. No change in US PI.
2. The HC PI will return to CNPAF after completion of an M.S. program.
3. Sponsorship of workshops will continue stressing methodology in breeding and improving field performance of beans inoculated with rhizobia.

PROJECT REVIEW PROFILE

BRAZIL • UNIVERSITY OF WISCONSIN (Initiated June 1982) • BEANS
Hagedorn

IMPROVED TECHNIQUES FOR DEVELOPMENT OF MUTLIPLE DISEASE RESISTANCE IN BEANS

GOAL: Improved strategies and methods for attaining multiple disease resistance.

DESCRIPTION: Research focused on sequential inoculation especially the production and use of dry inoculum. Predominant research to date conducted at Wisconsin.

ACHIEVEMENTS:
Preliminary progress on long-term research on disease resistance techniques.

CONTRIBUTIONS:
To HC--Long-term potential good as bean production in Brazil severely constrained by severe multiple disease pressures. Short-term work to date unclear as dry inoculum technique strongly questioned by other professionals.
To US--More efficient multiple disease resistance screening methods will allow all bean improvement centers to make faster progress in developing and releasing new varieties. Such techniques will provide for increased stability of germ plasm across environments in the US.

ROLE IN GLOBAL PLAN: This is the only CRSP project concentrating on improved low technology disease resistance screening methods for breeders. Dominant constraint #1 (limitations due to diseases).

MAJOR PROBLEMS AS IDENTIFIED BY ERP (RATED 3):
1. Administrative and scientific communication between US and HC unacceptable.
2. Appropriateness of focus of specific strategy questioned by two review teams.
3. Appropriateness of both original HC and US PIs questioned.

ACTIONS TAKEN:
1. Personnel adjustment requested in Brazil.
2. Personnel adjustment requested at Wisconsin.
3. Per ERP and Board recommendation, Wisconsin administrator and MO director joined with second review team for on-site visit to assess the project's
   a. Relationship to HC's existing program.
   b. Current methodology, its appropriateness and effectiveness in Brazil.

RESOLUTION:
1. HC PI removed (Mr. Aloisio Sartorato).
2. US PI removed (Dr. Donald Hagedorn).
3. Wisconsin and Brazil made administrative commitment to solving problems above.
4. US Post-doc requested by Brazil identified and approved by HC.
5. SUBSEQUENT BOD EXTENSION RATING 2.

PROJECTED STATUS:
1. New HC PI named (Dr. Josias Faria).
2. New US PI named (Dr. Douglas Maxwell).
3. Michael Havey, at completion of joint pathology/breeding Ph.D. degree in summer of 1984, will become the project's resident expatriate at CNPAF.
4. New plan of work written incorporating other parameters of original research goal--simultaneous inoculation including research on resistance maintenance.

PROJECT REVIEW PROFILE

CAMEROON • UNIVERSITY OF GEORGIA (Initiated September 1981) • COWPEAS
Chalfant

PEST MANAGEMENT STRATEGIES FOR OPTIMIZING COWPEA YIELDS IN CAMEROON

GOAL: Develop methods for optimizing yield and quality of cowpeas through pest management research.

DESCRIPTION: Project has concentrated on varietal screening for pest resistance, insecticide use research and research on life-cycle and breeding habits of cowpea insects. An expatriate scientist is in place in Cameroon.

ACHIEVEMENTS: Important preliminary progress on long-term integrated pest management research. Project works closely with IITA and builds on prior integrated pest management work funded by AID.

CONTRIBUTIONS:

To HC--Devastating cowpea losses from insects both pre- and post-harvest underscore the importance of this project to Cameroon.

To US--Findings will contribute to integrated pest management resources in US cowpea industry.

ROLE IN GLOBAL PLAN: This is the only comprehensive cowpea pest management project in the CRSP. Dominant constraint #1 (limitations due to pests).

MAJOR PROBLEMS AS IDENTIFIED BY ERP (RATED 3):

1. Lack of HC PI who is working researcher.
2. Lack of adequate US/HC communication and US/AID Mission communication.
3. Project management weak.

ACTIONS TAKEN:

1. New HC PI requested.
2. Georgia administration encouraged to participate.
3. Georgia administrator and MO director joined project team meeting in the HC.
4. Georiga administrators met in Georgia to discuss and resolve the problems.

RESOLUTION:

1. New HC PI named (Mr. Zachee Boli Baboule).
2. New HC PI and the AID Mission Director invited to Georgia and Boyce Thompson.
3. Georgia administrator assuming greater role in management of project.
4. A second researcher at Georgia being integrated into the CRSP.
5. SUBSEQUENT BOD EXTENSION RATING 2.

PROJECTED STATUS:

1. New plan of work to be developed when HC PI comes to US in summer 1984.
2. Georgia work on encapsulated pyrethum and bacillus thuringiensis to be integrated with project and increased work on control of storage insects.
3. BTI work to concentrate on chemistry of aphid and bruchid resistance.

PROJECT REVIEW PROFILE

DOMINICAN REPUBLIC • UNIVERSITY OF NEBRASKA (Initiated June 1981) • BEANS
Coyne

BIOLOGY, EPIDEMIOLOGY, GENETICS AND BREEDING FOR RESISTANCE TO BACTERIAL AND RUST PATHOGENS OF BEANS (PHASEOLUS VULGARIS L.)

GOAL: To develop biological, epidemiological, genetic and breeding information on rust and bacterial pathogens, primarily rust and common blight of beans.

DESCRIPTION: The focus of this project is on character enhancement. Significant emphasis is placed on knowledge of bacterial blight and rust in the tropics and the genetics of inherited resistance to these diseases.

ACHIEVEMENTS:
1. Germ plasm with resistance to common blight and rust has been identified.
2. The importance of plant genotype x bacterial strain interaction has been demonstrated.
3. The inheritance of resistance in leaf and pod to common blight has been determined.
4. Pathogenic variation has been determined.
5. One white resistant line (Arroyo Loro) has been developed for increase and release in the DR.
6. New sources of resistance to common blight and rust have been identified.
7. Laboratory and screenhouse facilities have been constructed in the DR.

CONTRIBUTIONS:

To HC--The incorporation of high levels of more stable and durable resistance to bacterial blight and rust pathogens of the main DR bean types will increase yields and hence lessen dependence on imports. Recent food riots reinforce the importance of this crop.

To US--The genetic material and information generated by the project will benefit bean-producing areas of the US that have conditions favoring common blight and rust diseases. Increased understanding of the genetics of the inheritance of diseases will assist all breeding programs.

ROLE IN GLOBAL PLAN: This project, well integrated with the other two disease projects in Latin America, is contributing important basic information for enhancing genetic material useful in cultivar development of the other projects. Dominant constraint #1 (limitations due to diseases).

MAJOR PROBLEMS AS IDENTIFIED BY ERP (RATED 1): None. Focus on character enhancement encouraged.

ACTIONS TAKEN: None required.

RESOLUTION:
1. None required.
2. SUBSEQUENT BOD EXTENSION RATING 1.

PROJECTED STATUS:
1. No change in US PI.
2. An improved nitrogen fixation component may be incorporated to test lines developed by the Brazil/University of Wisconsin (Bliss) CRSP project for blight and rust resistance.

PROJECT REVIEW PROFILE

DOMINICAN REPUBLIC • UNIVERSITY OF PUERTO RICO (Initiated June 1981) • BEANS
Lopez-Rosa

IMPROVEMENT OF BEAN PRODUCTION IN THE DOMINICAN REPUBLIC THROUGH BREEDING FOR MULTIPLE DISEASE RESISTANCE (MDR) IN THE PREFERRED STANDARD CULTIVARS

GOAL: Produce a MDR bean germ plasm base in order to provide cropping security over time in the DR. Preserve or improve the agronomic characteristics, yield and quality of the preferred Dominican cultivars to assure economic and efficient production that will meet the acceptance and fulfill the nutritional requirements of the population.

DESCRIPTION: This project focuses primarily on cultivar development and builds on work begun under the auspices of an AID/USDA/MITA project. Five new breeding lines with good yield potential and high levels of MDR were released in 1983.

ACHIEVEMENTS:

1. Breeding lines L-226-10, L-227-1, 3M-150, 3M-152 and 4M-99 were made available through official release to other breeding programs for use as parents in crossing schemes. White-seeded line 2W-33-2 is being considered for release in 1984.
2. Articles on the incidence of bean diseases in the DR, the practical applications of bacterial blight research and the identification of genotypes with stable yield traits are in preparation.
3. There is a notable high level of cooperation and complementarity with the Nebraska project.

CONTRIBUTIONS:

To HC--Release of the new lines is a significant contribution toward increasing bean yields in the DR.

To US--Research results will also help strengthen the Puerto Rico winter nurseries of the US bean industry.

ROLE IN THE GLOBAL PLAN: This is one of two projects in Latin America (the second with same US PI) concentrating on MDR cultivar development for this region. Dominant constraint #1 (limitations due to diseases).

MAJOR PROBLEMS IDENTIFIED BY ERP (RATED 1): None.

ACTIONS TAKEN: None required.

RESOLUTION:

1. None requir...
2. SUBSEQUENT E EXTENSION RATING 1.

PROJECTED STATUS:

1. US PI changed (to Dr. James Beaver) with the promotion of Dr. Lopez-Rosa.
2. There is an expected change in HC PI as Dr. C. Paniagua has indicated his intention to leave the project when he has located a suitable replacement.

PROJECT REVIEW PROFILE

ECUADOR • CORNELL UNIVERSITY (Initiated September 1981) • BEANS
Wallace

AGRONOMIC, SOCIOLOGICAL AND GENETIC ASPECTS OF BEAN YIELD AND ADAPTATION

GOAL: Examine the agronomic and socio-economic aspects of bean production by small farmers. Adapt appropriate farming systems research (FSR).

DESCRIPTION: Agronomic and genetic research is to be developed but emphasis to date has been on the sociological work. Through testing various types of interview schedules and microcomputer techniques, a methodology for FSR is being developed for this site. This methodology and the information it generates will be used to identify agronomic problems. A US researcher has been on site in this country.

ACHIEVEMENTS:
1. An outline for structured interviews was developed and tested in which respondents report farm-related practices in the region. The interview guide is available in three languages; a team report and three specialized reports on the zone also have been prepared.
2. From a list of all landowners in one zone, a microcomputer program was used to pull a stratified random sample. An applied questionnaire was designed and used to interview the sample families.
3. Work is progressing on a microcomputer methodology which will strengthen INIAP's and similar institutions' abilities to conduct FSR. A manual for the analysis of agricultural census data has been prepared.

CONTRIBUTIONS:
To HC--The emphasis on FSR methodology will allow INIAP to better direct its agronomic research to the needs of various categories of small farmers.
To US--The methodology developed has similar applications in the US. The agronomic-genetic component will advance the work being done by the same team in Guatemala but in a different ecology.

ROLE IN THE GLOBAL PLAN: This is one of four CRSP projects with a major socio-economic component. It is the only one taking this particular FSR perspective. Dominant constraints #3 (limitations of the physical environment) and #8 (socio-cultural factors).

MAJOR PROBLEMS AS IDENTIFIED BY ERP (RATED 2): None. There was a delay in the identification of technical personnel for residence in Ecuador.

ACTIONS TAKEN: Interviews were held with names submitted to HCs.

RESOLUTION:
1. A US agronomist and a social scientist were named.
2. SUBSEQUENT BOD EXTENSION RATING 2.

PROJECTED STATUS:
1. No change in US PI.
2. Expatriates for HC residency are Mr. Wesley Kline (agronomist) and Dr. Kris Merschrod (sociologist).
3. Surveys provided guidance and priorities for the agronomic research component to begin with the arrival of the Cornell agronomist and sociologist.
4. The project Log Frame updated.

PROJECT REVIEW PROFILE

GUATEMALA • CORNELL UNIVERSITY (Initiated September 1981) • BEANS
Wallace

AGRONOMIC, SOCIOLOGICAL AND GENETIC ASPECTS OF BEAN YIELD AND ADAPTATION

GOAL: Improve the production of beans by small subsistence farmers through agronomic and socio-economic investigations. Conduct research aimed at understanding the agricultural systems in the Highlands and to identify the daylength, temperature and genetic bases for variations in days to maturity and of adaptation of bean cultivars.

DESCRIPTION: Research has focused on bean plant adaptation to temperature and day-length. Until recently socio-agronomic studies have been hampered somewhat by the unsettled conditions in the Highlands. Work at the experiment station proceeded well.

ACHIEVEMENTS:

1. Project findings regarding bean plant adaptation of temperature and daylength have wide significance: separate genes for early and late flowering plus for minimal days and optimal temperature interact with daylength and/or temperature to divide the world into zones.
2. Farming systems studies are commencing in three contiguous but vertically ordered zones managed by indigenous farmers. These investigations complement the agronomic research by providing information on the social and economic aspects of bean production.
3. This project is working with INCAP to make maximum use of human and financial resources.

CONTRIBUTIONS:

To HC--Information yielded to date provides a better understanding of plant adaptation which will assist in bean breeding all over the world.
To US--Research findings represent a significant contribution to scientific understanding of the physiological genetics of bean plant maturity.

ROLE IN GLOBAL PLAN: This is one of four CRSP projects integrating production and non-production issues. Dominant constraints #3 (limitations of the physical environment) and #8 (socio-cultural factors).

MAJOR PROBLEMS IDENTIFIED BY ERP (RATED 2): None. Unsettled political situations in some areas and the reticence of the US Co-PI (sociologist) to participate there have slowed some aspects.

ACTIONS TAKEN: New sociologist Co-PI from Cornell requested.

RESOLUTION:

1. New sociologist from Cornell named.
2. SUBSEQUENT BOD EXTENSION RATING 2.

PROJECTED STATUS:

1. No change in US PI although a new US Co-PI is in charge of the sociological component (Dr. Harold Capener).
2. Links between this project and the CRSP INCAP/Washington State University project being forged, especially with regard to socio-economic research.

PROJECT REVIEW PROFILE

HONDURAS • UNIVERSITY OF PUERTO RICO (Initiated March 1982) • BEANS
Lopez-Rosa

IMPROVEMENT OF BEAN PRODUCTION IN HONDURAS THROUGH BREEDING FOR MULTIPLE DISEASE RESISTANCE

GOAL: Increase the tropical production of beans and cowpeas through improved varieties resistant to major diseases and pests.

DESCRIPTION: Most of the work has been done in Puerto Rico although there has been performance testing in HC at the experiment station and on farmers' fields of the new breeding lines developed.

ACHIEVEMENTS:
1. Collaborated with other CRSP programs in development of five new breeding lines.
2. Field trials in Honduras have also been most effective.
3. One of the five new lines (black beans) already being planted by growers.

CONTRIBUTIONS:
To HC--Multiple disease resistant lines important for HC consumption and sale.
To US--Multiple disease resistant lines have already been requested by US breeding programs.

ROLE IN GLOBAL PLAN: This project is one of the three CRSP projects focusing on disease resistance in beans in Latin America and provides an ecology different from the other two. Its excellent undergraduate host institution provides another CRSP perspective and resource. Dominant constraint #1 (limitations due to diseases).

MAJOR PROBLEMS AS IDENTIFIED BY ERP (RATED 3):
1. High turnover in HC PIs.
2. Inadequate HC/US communication.
3. Inadequate HC institutionalization.
4. Inadequate level of US PI participation in HC.

ACTIONS TAKEN:
1. US administrator and MO joined US/HC team meeting per ERP and Board recommendation.
2. Permanent HC PI requested.
3. Adjustment in US PI contribution requested.

RESOLUTION:
1. New HC PI committed.
2. US PI promoted and new US PI experienced with this project identified.
3. HC institution commitment obtained.
4. SUBSEQUENT BOD EXTENSION RATING 2.

PROJECTED STATUS:
1. New HC PI (Mr. Rafael Diaz).
2. New US PI (Dr. Jim Beaver).
3. EAP contributing financially to project.
4. New work expanding work on farmers' fields. CIAT invited to collaborate.

PROJECT REVIEW PROFILE

INCAP • WASHINGTON STATE UNIVERSITY (Initiated November 1981) • BEANS
Swanson

IMPROVED BIOLOGICAL UTILIZATION AND AVAILABILITY OF DRY BEANS

GOAL: Improve the utilization, availability and nutrient quality of dry beans. Integrate post-harvest physiology, food technology and nutritional research with genetic and breeding programs for dry beans.

DESCRIPTION: A standardized methodology for evaluating bean quality has been developed and nutritional standards for bean breeders are being set. Constraints to bean utilization in the areas of handling/storage, utilization/-consumption and nutrition are being addressed.

ACHIEVEMENTS:

1. Methods to reliably estimate <u>in vivo</u> digestibility of common beans, to determine the procyanidins in testa and cotyledon of dry beans, and to estimate biological activity of lectin of kidney beans were developed as was a sophisticated Instron method to determine the optimum bean cooking time.
2. Means to reduce the hard-to-cook phenomena were discovered.
3. A survey of the array of professional techniques for assessing bean quality well underway.
4. A bean quality assessment service to other CRSP projects is being provided.

CONTRIBUTIONS:

To HC--Because of the limited availability of animal protein, increasing the nutritional value and digestibility of beans and hence contributing to improved nutritional status is important in Latin America and Africa.

To US--This research, especially the efforts to improve biological utilization and to reduce the hard-to-cook phenomena in dry beans, will result in a better nutritional commodity for the US market as well.

ROLE IN GLOBAL PLAN: This project addresses significant post-harvest issues in its own right and also helps to link these issues with the breeding and production-oriented research in the total CRSP. Dominant constraint #7 (nutrition, food preparation and health factors).

MAJOR PROBLEMS AS IDENTIFIED BY ERP (RATED 1): None. Because of the size of the project, participants have had to pay special attention to maintaining communication among the five US institutions.

ACTIONS TAKEN: None required.

RESOLUTION:

1. US PI has increased level of communication with participants.
2. SUBSEQUENT BOD EXTENSION RATING 1.

PROJECTED STATUS:

1. No change in US PI.
2. Increased level of cooperation and communications among investigators.
3. Problems in funds transfer to INCAP resolved.
4. Plans to hold a CRSP-wide workshop on nutritional guidelines for bean breeders being developed.

PROJECT REVIEW PROFILE

KENYA • UNIVERSITY OF CALIFORNIA, DAVIS (Initiated August 1981) • BEANS
Webster

IMPROVEMENT OF DROUGHT AND HEAT TOLERANCE OF DISEASE RESISTANT BEANS IN SEMIARID REGIONS OF KENYA

GOAL: Develop improved bean cultivars for growth in semiarid zones which will contribute to food availability and bean improvement programs of national and international organizations throughout the world.

DESCRIPTION: Most of the research has taken place in California. Germ plasm exchanges between Kenya and California and the subsequent generations of crosses provided the material for massive screenings.

ACHIEVEMENTS:

1. Bean x tepary crosses developed which are fertile.
2. Additional cultivars identified with morphological characteristics related to drought and heat tolerance.

CONTRIBUTIONS:

To HC--Technology developing for stabilization of bean yield in semiarid regions.
To US--Beans with identified genes will be able to be grown under more stressful conditions by US growers.

ROLE IN GLOBAL PLAN: This is the only CRSP project emphasizing heat as well as drought resistance in beans. The HC provides some ecology unique in the CRSP. It is also developing greater collaboration with CIAT, which is stationing a person in Kenya and has requested the crosses from this project. Dominant constraint #3 (limitations of the physical environment).

MAJOR PROBLEMS AS IDENTIFIED BY ERP (RATED 3):

1. Financial management in Kenya has been unacceptable.
2. Research management in Kenya has been unacceptable.
3. Drought tolerance research not sufficiently inclusive.

ACTION TAKEN:

1. Requested PI and team adjustment in Kenya.
2. University of California, Davis administrator and MO finance officer joined project team for on-site review and meeting.
3. Requested new plan of work.
4. TC reviewed project closely including draft new plan of work.

RESOLUTION:

1. HC PI removed (Dr. Daniel Mukunya).
2. University of Nairobi controller going over all accounts and making all available to University of California, Davis.
3. New HC PI travelled to UCD to develop new plan of work with US PI.
4. SUBSEQUENT BOD EXTENSION RATING 2.

PROJECTED STATUS:

1. New HC PI named (Dr. David Ngugi).
2. New plan of work which reorganizes HC team and responsibilities.
3. New fiscal procedures in place with UN controller in charge of all finances.
4. Ph.D.-level UCD researcher (Ms. Cynthia Cory) to be placed at UN.

PROJECT REVIEW PROFILE

MALAWI • MICHIGAN STATE UNIVERSITY (Initiated February 1982) • BEANS
Adams

GENETIC, AGRONOMIC AND SOCIO-CULTURAL ANALYSIS OF DIVERSITY AMONG BEAN LAND-RACES IN MALAWI

GOAL: Contribute to a viable bean improvement program for small farmers through analysis of biological/social bases for the maintenance of bean diversity.

DESCRIPTION: Project focuses on the natural survival needs of important, irreplaceable germ plasm and on understanding the maintenance and importance of mixtures in the farm family system. Experiments carried out on frequency of heterozygosity, heterozygote superiority, yield stability, outcrossing and genetic variation in beans. Socio-economic data collected on bean-producing households in Northern Zone emphasize women's roles in agricultural production. Two expatriate researchers (Dr. E. Ayeh and Mr. G. Martin) in the HC.

ACHIEVEMENTS:
1. Extensive germ plasm collections were made in identified areas.
2. Evidence for heterozygosity found in some bean seed collections.
3. Data generated on importance/contributions of mixtures in yield stability.
4. Socio-economic research instruments tested and refined.
5. Agronomic and social baseline data collected.

CONTRIBUTIONS:
To HC--The study of bean preferences, growing practices of small farmers and the means by which bean land-races are maintained will contribute valuable information to the bean improvement program in Malawi.
To US--Many of the issues raised as well as the germ plasm collected will eventually contribute to US researchers and to the US bean industry.

ROLE IN GLOBAL PLAN: This is one of the projects with agronomic/socio-economic integration. Dominant constraints #2 (plant response limitations) and #8 (socio-cultural factors).

MAJOR PROBLEMS IDENTIFIED BY ERP (RATED 1): None. Agronomic/social science integration of interest to ERP.

ACTIONS TAKEN: A second expatriate researcher (a social scientist) sought.

RESOLUTION:
1. The name of a female social scientist submitted to the GOM for approval.
2. SUBSEQUENT BOD EXTENSION RATING 1.

PROJECTED STATUS:
1. No change in US PI.
2. Two expatriate (horticulturalist and sociologist) to be stationed in Malawi.
3. Socio-economic studies in the Northern Zone will be expanded and interwoven more fully with the agronomic research.

PROJECT REVIEW PROFILE

MEXICO • MICHIGAN STATE UNIVERSITY (Initiated March 1983) • BEANS
Adams

IMPROVING RESISTANCE TO ENVIRONMENTAL STRESS IN BEANS THROUGH GENETIC SELECTION FOR CARBOHYDRATE PARTITIONING AND EFFICIENCY OF BIOLOGICAL NITROGEN FIXATION

GOAL: Assist INIA Mexico in the development of bean varieties and associated rhizobial systems which perform better than existing varieties under conditions of low rainfall and low soil N status prevailing on the small farms of the semiarid zones of the country.

DESCRIPTION: The research is concerned with breeding for combined drought resistance and N fixation in bean seed and plant types.

ACHIEVEMENTS:

1. A rain-out shelter has been constructed, making possible the imposition of drought stress to coincide with particular bean developmental stages.
2. Fifteen hundred bean genotypes have been screened preliminarily for drought tolerance in Mexico.
3. A series of some sixty crosses have been made among lines tolerant to drought and nitrogen stress and four bean strains were identified that show promise as stress resistant or tolerant lines.

CONTRIBUTIONS:

To HC--Research on combined drought resistance and high nitrogen fixing capability will contribute to the development of more resistant bean varieties for small farmers in the Mexican Highlands.

To US--The research and the resulting bean genotypes will be of use in similar environmental conditions in the US.

ROLE IN GLOBAL PLAN: This project is complementary to those in Kenya, Senegal and Brazil, adding the dimension of carbohydrate storage and remobilization and combining it with selection for N fixing efficiency. This configuration of research issues is unique in the CRSP. Dominant constraint #2 (plant response limitations).

MAJOR PROBLEMS IDENTIFIED BY ERP (RATED 1): None.

ACTIONS TAKEN: None required.

RESOLUTION:

1. None required.
2. SUBSEQUENT BOD EXTENSION RATING 1.

PROJECTED STATUS:

1. No change in US PI.
2. HC PI (Ing. Jorge Acosta) to be replaced by Dr. Rogelio Lepiz as Ing. Acosta will be coming to the US to pursue doctoral studies.

PROJECT REVIEW PROFILE

NIGERIA • MICHIGAN STATE UNIVERSITY (Initiated November 1981) • COWPEAS
Markakis

MEDICAL ASPECTS OF FEEDING COWPEAS TO CHILDREN

GOAL: Stimulate the development of programs to realize the nutritional benefit of cowpeas in the diets of young children in developing countries and hence enhance their growth, development and resistance to disease.

DESCRIPTION: This study explores the possible relationship between cowpea consumption and the high incidence of diarrhea and other adverse effects in weanling children. If this relationship is confirmed, the factors in cowpeas that cause the problems will be identified and, if possible, removed. Study of cowpea use in rehabilitating under- and mal-nourished children will be examined.

ACHIEVEMENTS:
1. Two surveys were conducted in Nigeria (Jos and Ibadan areas) to explore the relationship between cowpea consumption and GI disturbances in children 6-24 months of age. Results indicate that cowpeas are associated with GI symptoms in aproximately ten percent of the sample populations.
2. Six Nigerian cowpea varieties have been analyzed for stachyose and raffinose, two oligosaccharides implicated in the incidence of flatulence in adults.

CONTRIBUTIONS:
To HC--Studies to realize better utilization of cowpeas and other legumes high in protein are increasingly important in Nigeria because the current dependence on milk as a source of protein for children may have to be reduced as the cost of its importation grows.
To US--New knowledge about cowpeas may contribute to an increase in the small US market for black-eyed peas. A study of cowpea anti-nutritional factors will ultimately result in better utilization.

ROLE IN GLOBAL PLAN: This project is unique in the CRSP in that it focuses on infant nutrition. Dominant constraint #7 (nutrition, food preparation and health factors).

MAJOR PROBLEMS IDENTIFIED BY ERP (RATED 2): None. However, communications within Nigeria continue to be structural problem which makes significant demands on team resources.

ACTIONS TAKEN: None required.

RESOLUTION:
1. None required.
2. SUBSEQUENT 30D EXTENSION RATING 2.

PROJECTED STATUS:
1. No change in US PI.
2. HC PI (Dr. A. Omolulu) changed to Dr. M. A. Hussain. Dr. Omolulu on extended sabbatical leave.
3. Linkages between this project and other CRSP projects to be strengthened.

PROJECT REVIEW PROFILE

NIGERIA • UNIVERSITY OF GEORGIA (Initiated April 1981) • COWPEAS
McWatters

APPROPRIATE TECHNOLOGY FOR COWPEA PRESERVATION AND PROCESSING AND A STUDY OF ITS SOCIO-ECONOMIC IMPACT ON RURAL POPULATIONS IN NIGERIA

GOAL: Develop appropriate technology to increase cowpea processing efficiency and encourage increased utilization among Nigeria's rural population and urban poor.

DESCRIPTION: Appropriate technology packages for dry dehulling and milling cowpeas to be used at the village level are being developed. Nutritional, sensory quality and storage studies are underway as are socio-economic surveys.

ACHIEVEMENTS:

1. It was found that cowpeas have a high protein content compared to other legumes and that processing further improved the quality.
2. Wet and dry cowpea decortication techniques and a method to quantify the extent to testa removal were devised. Milling procedures producing cowpea meal with similar particle size distribution to traditional cowpea paste were devised. Various storage studies were undertaken to reduce damage done by fungi and weevils. An electronic device to monitor cooking time of seeds was developed.
3. Cowpea products developed of commercial interest to restaurant industry in Georgia.

CONTRIBUTIONS:

To HC--Reduced losses during storage and appropriate technology to facilitate processing will result in increased utilization of cowpeas.

To US--Many techniques and methodologies developed as a result of this research program directly relevant to the US food and livestock industries.

ROLE IN GLOBAL PLAN: Through its focus on cowpea storage and processing issues, this project makes a unique contribution. Dominant constraint #7 (nutrition, food preparation and health).

MAJOR PROBLEMS AS IDENTIFIED BY ERP (RATED 2): None. However, structural problems within Nigeria inhibit communication.

ACTIONS TAKEN: Greater resources used to maintain required level of communication.

RESOLUTION:

1. None required.
2. SUBSEQUENT BOD EXTENSION RATING 1.

PROJECTED STATUS:

1. No change in US PI.
2. Socio-economic surveys identifying the role of cowpeas in the nutritional, social and cultural milieu will be expanded.
3. A complete package of cowpea flour manufacturing technology in prototype to be developed and tested at the village level with attention to impact on women.
4. Closer links between this project and the Nigeria/Michigan State University project will be developed and efforts made to strengthen US-HC communications.

PROJECT REVIEW PROFILE

SENEGAL • UNIVERSITY OF CALIFORNIA, RIVERSIDE (Initiated August 1981) • COWPEAS
Hall

A PROGRAM TO DEVELOP IMPROVED COWPEA CULTIVARS FOR PRODUCTION AND UTILIZATION IN SEMIARID ZONES

GOAL: Increase seed production and yield stability of cowpeas grown in hot semiarid zones by subsistence farmers.

DESCRIPTION: This project is developing cowpea cultivars with improved drought and heat resistance and improved management methods that will result in increased seed production and yield for small farmers in the semiarid zone of Senegal.

ACHIEVEMENTS:

1. Results include innovations in the areas of improved drought adaptation, heat tolerance and insect resistance. Among these are several extremely early cowpea strains, developed at the University of California, Riverside and tested for three years in Senegal, that have been found to give high yields.
2. Heat tolerance has also been discovered in certain cowpea strains and is being incorporated into cowpeas from Senegal.

CONTRIBUTIONS:

To HC--The Senegalese cowpea research capability has been increased, and improved cowpea production systems are being developed for subsistence farmers in the semiarid zone.

To US--New cowpea varieties are of benefit to the US industry because the variety presently most relied upon is sensitive to heat and to fusarium wilt.

ROLE IN GLOBAL PLAN: This is the only project on cowpea improvement for semiarid zones. Dominant constraint #3 (limitations of the physical environment).

MAJOR PROBLEMS IDENTIFIED BY ERP (RATED 1): None.

ACTIONS TAKEN: None required.

RESOLUTION:

1. None required.
2. SUBSEQUENT BOD EXTENSION RATING 1.

PROJECTED STATUS:

1. No change in US PI.
2. HC PI changed to Dr. M. Ndoye with the promotion of previous HC PI, Dr. M. Mbodj.
3. Links between this and other CRSP projects are being strengthened.

PROJECT REVIEW PROFILE

TANZANIA • WASHINGTON STATE UNIVERSITY (Initiated June 1981) • BEANS
Silbernagel

BREEDING BEANS FOR DISEASE AND INSECT RESISTANCE AND DETERMINATION OF ECONOMIC IMPACT ON SMALLHOLDER FARM FAMILIES

GOAL: Develop high yielding, widely adapted disease and insect resistant bean cultivars for the smallholder family. Estimate the economic viability of the new cultivars and their impact on women's roles in the production, consumption and marketing process.

DESCRIPTION: Socio-economic information on small farming households was acquired to provide baseline data against which to measure the impact of introduced changes. Work is moving ahead on the development of insect resistant, high yielding, widely adapted bean cultivars acceptable to farmers and consumers.

ACHIEVEMENTS:

1. A cultivar (Kabanmina) has been identified that out-yields most cultivars at cool high elevations. Growing mixed bean cultivars reduces rust and angular leaf spot and increases yield. Cleaning seed lots reduces seed transmission of disease and increases yield, oil treatment of seeds reduces storage losses by bruchids, and extracts from pepper and neem reduce injury from insects.
2. Socio-economic surveys help situation bean production in the farming systems and clarify women's roles in agricultural production.
3. A monoclonal antibody technique for detection and identification of international seed borne viruses in beans developed.

CONTRIBUTIONS:

To HC--The production of high yielding, multiple disease and insect resistant bean cultivars will assist this food deficit country toward food self-sufficiency and will contribute to the alleviation of hunger and malnutrition through increasing and stabilizing a vital food protein source.

To US--Materials developed in this project will have potential utilization in the US by domestic bean breeders. Selections will be made for adaptation to the Northwest seed-producing areas. The antisera technique will facilitate international use of potentially useful germ plasm in bean improvement programs.

ROLE IN GLOBAL PLAN: This project integrates micro-economics with cultivar development for Tanzania. Dominant constraints #6 (production-consumption economics) and #1 (limitations due to pests and diseases).

MAJOR PROBLEMS AS IDENTIFIED BY ERP (RATED 1): None.

ACTIONS TAKEN: A food scientist in the HC has been added to the team to assess bean quality of the lines being developed.

RESOLUTION:

1. None required.
2. SUBSEQUENT BOD EXTENSION RATING 1.

PROJECTED STATUS:

1. No change in US PI.
2. Screening methods for drought tolerance will be developed because many beans are grown in dry areas of Tanzania. Attention will be given to integrating this work with the Kenya project as appropriate.
3. A methodology for nutritional improvement in beans is under study.

Bean/Cowpea Collaborative Research Support Program
Summary Program Budget by Distribution Categories
Cumulative Year 3 (FY 1983) through Year 8 (FY 1988) Projections

	US CONTRIBUTION								
	AID CONTRIBUTION						TOTAL	TOTAL	TOTAL
CRSP Program Year	Mgmt Entity Cost (a)	Country Research Projects (b)	Total AID Contri. (c) (a+b)	Spent in HC's (d)	Total Non-Fed. Contri. (e)	Total US Fed/Non-Fed (f) (c+e)	HC Contri. (g)	US Fed/Non-Fed & HC (h) (f+g)	Spent in HC's (i) (d+g)
Cumulative through Year 3 (9-30-83)	1,190,423	3,763,621	4,954,044	1,840,740	1,145,674	6,099,718	756,615	6,856,333	2,597,355
Estimated Year 4	585,840	3,104,134	3,689,974	1,549,711	887,784	4,577,758	616,938	5,194,696	2,166,649
Estimated Year 5	1,031,165	4,756,330	5,787,495	2,948,409	749,744	6,537,239	781,495	7,318,734	3,729,904
Subtotal Est. Actual Expenses	2,807,428	11,624,085	14,431,513	6,338,860	2,783,202	17,214,715	2,155,048	19,369,763	8,493,908
Pipeline--Year 6	30,322	2,238,165	2,268,487	1,141,464	537,160	2,805,647	417,437	3,223,084	1,558,901
Subtotal Initial Grant	2,837,750	13,862,250	16,700,000	7,480,324	3,320,362	20,020,362	2,572,485	22,592,847	10,052,809
Projected Year 6	643,000	2,834,250	3,477,250	1,443,688	463,524	3,940,774	507,430	4,448,204	1,951,118
Projected Year 7	683,000	3,061,000	3,744,000	1,559,326	500,753	4,244,753	548,335	4,793,088	2,107,661
Projected Year 8	727,000	3,305,890	4,032,890	1,683,051	540,953	4,573,843	591,885	5,165,728	2,274,936
Sub-total Ext. Request	2,053,000	9,201,140	11,254,140	4,686,065	1,505,230	12,759,370	1,647,650	14,407,020	6,333,715
TOTAL PROGRAM	4,890,750	23,063,390	27,954,140	12,166,389	4,825,592	32,779,732	4,220,135	36,999,867	16,386,524

6069B

Bean/Cowpea Collaborative Research Support Program
Summary AID Contributions by Project
Cumulative Year 3 (FY 1983) through Year 8 (FY 1988) Projections

	Act Exp Thru Year 3	Est Exp Current Year 4	Est Exp Year 5	Total Initial Grant	Projected Year 6	Projected Year 7	Projected Year 8	Total Ext Request	Total Grant & Extension
Botswana/CSU	153,724	192,626	295,330	641,680	193,230	208,690	225,385	627,305	1,268,985
Brazil/BTI	280,878	194,490	278,210	753,578	240,685	261,540	284,065	786,290	1,539,868
Brazil/Bliss	72,273	142,685	228,370	443,328	78,570	82,455	86,650	247,675	691,003
Brazil/Hagedorn	66,702	94,645	144,330	305,677	63,660	67,150	70,925	201,735	507,412
Cameroon/UGA	281,440	165,728	253,880	701,048	200,130	216,140	233,430	649,700	1,350,748
Dom. Rep./UNE	247,390	175,936	329,610	752,936	194,780	211,165	228,860	634,805	1,387,741
Dom. Rep./UPR	312,411	152,687	273,780	738,878	198,600	215,290	233,315	647,205	1,386,083
Ecuador/CORNELL	181,049	159,035	253,560	593,644	114,190	123,325	133,190	370,705	964,349
Guatemala/CORNELL	180,020	142,481	218,050	540,551	114,190	123,325	133,190	370,705	911,256
Honduras/UPR	137,254	168,779	258,580	564,613	176,260	190,360	205,590	572,210	1,136,823
INCAP/WSU	325,726	196,344	301,060	823,130	102,995	108,035	113,480	324,510	1,147,640
Kenya/UCD	350,999	172,088	313,680	836,767	226,420	242,935	260,770	730,125	1,566,892
Malawi/MSU	154,358	166,281	254,730	575,369	103,160	111,415	120,330	334,905	910,274
Mexico/MSU	60,567	103,724	158,320	322,611	75,170	80,385	86,015	241,570	564,181
Nigeria/UGA	183,939	155,370	237,910	577,219	105,930	120,005	135,205	361,140	938,359
Nigeria/MSU	85,363	116,155	177,480	378,998	56,465	60,985	65,865	183,315	562,313
Senegal/UCR	350,904	323,107	346,420	1,020,431	281,320	303,825	328,130	913,275	1,933,706
Tanzania/WSU	338,624	281,973	433,030	1,053,627	308,495	333,975	361,495	1,003,965	2,057,592
TOTAL	3,763,621	3,104,134	4,756,330	11,624,085	2,834,250	3,061,000	3,305,890	9,201,140	20,825,225

Bean/Cowpea Collaborativ[redacted]esearch Support Program
Management Office Expenditures by Function*
Year 1 (FY 1981) through Year 8 (FY 1988) Projections

	FY 81	FY 82	FY 83	FY 84	FY 85	Total Initial Grant	FY 86	FY 87	FY 88	Total Extension Request	Total Grant
Management Office[1]	374,798	346,179	334,373	416,890	419,145	1,891,385	434,500	457,500	483,500	1,375,500	3,266,885
Board of Directors											
- Travel	6,533	5,525	5,107	13,400	15,000	45,565	16,500	18,000	20,000	54,500	100,065
- Meeting Expense	1,733	1,356	4,019	3,200	4,000	14,308	4,500	5,000	5,500	15,000	29,308
Total BOD	8,266	6,881	9,126	16,600	19,000	59,873	21,000	23,000	25,500	69,500	129,373
Technical Committee											
- Travel	14,167	30,718	19,650	17,500	20,000	102,035	22,500	25,000	27,500	75,000	177,035
- Meeting Expense	1,165	2,454	4,478	5,400	6,000	19,497	6,500	7,000	7,500	21,000	40,497
Total TC	15,332	33,172	24,128	22,900	26,000	121,532	29,000	32,000	35,000	96,000	217,532
External Review Panel											
- Travel	-0-	863	19,538	41,200	40,000	101,601	44,000	48,000	52,500	144,500	246,101
- Meeting Expense	-0-	-0-	1,212	1,250	1,500	3,962	2,000	2,500	3,000	7,500	11,462
- Consultant Fee	-0-	870	8,340	25,000	30,000	64,210	35,000	40,000	45,000	120,000	184,210
Total ERP	-0-	1,733	29,090	67,450	71,500	169,773	81,000	90,500	100,500	272,000	441,773
Technical Assistance	875	1,142	937	40,000	450,000	492,954	50,000	50,000	50,000	150,000	642,954
Publications											
Exec. Sum/Ann. Rep.	-0-	189	3,081	5,000	6,000	14,270	6,500	7,000	7,500	21,000	35,270
Technical Summary	-0-	-0-	-0-	2,000	3,000	5,000	3,500	4,000	4,500	12,000	17,000
ERP Report	-0-	-0-	334	3,000	4,000	7,334	4,500	5,000	5,500	15,000	22,334
Other[2]	-0-	-0-	787	12,000	32,520	45,307	13,000	14,000	15,000	42,000	87,307
Total Publications	-0-	189	4,202	22,000	45,520	71,911	27,500	30,000	32,500	90,000	161,911
Total	399,271	389,296	401,856	585,840	1,031,165	2,807,428	643,000	683,000	727,000	2,053,000	4,860,428

Excludes Year 6 estimated pipeline expenses

Includes Staff Salaries, Fringes, Equipment, Material and Supplies, Staff Travel, Other Direct Costs and MSU Indirect Costs

Includes Pulse Beat, Research Highlights and Vanguard Publications

SECTION II

PROGRAM REVIEW AND EXTENSION REQUEST

PROGRAM REVIEW AND EXTENSION REQUEST

INTRODUCTION

The problems being addressed by the Bean/Cowpea CRSP by their nature are systemic, rooted deep in a complex of interacting variables and will require long-term research and training to adequately address. To maintain the momentum generated in the initial stage of this Program, the first three-year extension is requested.

The overall goal of this Program remains the same: To make a significant contribution to improving the living conditions of small farm producers in developing countries and to increase the availability of low-cost nutritious foodstuffs in the marketplace for the rural and urban poor.

As was the case with the initial grant, the purpose of this grant is "to provide for the organization and mobilization of financial and human resources necessary for mounting a major multi-institutional US/HC collaborative effort of research and training in bean and cowpea related areas. This effort is expected to provide the knowledge base necessary to achieve significant advances in alleviating the principal constraints to improved production, marketing and utilization of beans and cowpeas in developing countries. A subpurpose is to improve the capabilities of appropriate HC institutions to generate, adopt and apply improved knowledge to local conditions."

YEARS ONE THROUGH THREE REFERENCE GUIDE

The information referred to here has been compiled in separate documents included in Sections I and III of this report.

Three-Year Progress Report

1983 Annual Report: See Section III, Technical Summary, pages 1-10.

Research Publications and Presentations: See Section III, Pulse Beat, Spring 1984, Insert, page 6.

The MO is responsible for compiling, editing and publishing the following documents:

- CRSP Brochure
- Annual Report: Executive Summary
- Annual Report: Technical Summary
- Detailed Annual Report
- External Review Panel Report
- Pulse Beat
- Vanguard
- Research Highlights
- Women-in-Agriculture Resource Guides
- WID Pamphlet

Program Evaluation

1983 Annual Report: See Section III, External Review Panel Report, pages 50-55, and Follow-Up Chart Insert.

Programmatic Review

Annual programmatic reviews are done by the appropriate CRSP management groups. To aid in this process, annual reports both detailed and in summary form are made available to the MO by all projects. This material is distributed to all CRSP participants including AID and BIFAD on an annual basis. Additional reports are forwarded to AID as requested. No change is proposed in these procedures.

Additional reviews of the CRSP by AID are done and may coincide with other regularly scheduled reviews. As a result of these AID reviews, adjustments in the program and/or the funding level may be required by AID. All documents are distributed to AID and BIFAD and are available from the MO on request.

Fiscal Review

Major audits of both the US and HC institutions will be the responsibility of AID. However, the Management Entity, through the MO and the MSU Contracts and Grants Office, will closely monitor the accounts and assign new funds annually in accord with good management practices, BOD policy and the level of AID CRSP allocations.

In order to facilitate this process, quarterly fiscal reports are required of all projects. HC institutions are therefore required to make prompt reports to the US lead institutions. Distributed to AID, TC, BOD and ERP, a composite fiscal report is updated quarterly and is available from the MO. No change is proposed in the management of these responsibilities.

YEARS FOUR THROUGH EIGHT

The Management Entity (ME)

The Management Entity for the Bean/Cowpea CRSP is Michigan State University (MSU). There is no change proposed in this designation. MSU will continue to accept program and fiscal responsibility for the performance of this CRSP, performing the functions as detailed in the original grant.

The Management Office (MO)

The Management Entity maintains an office to carry out most of the operational responsibilities. There is no change proposed in the structure of that office which is composed of:

Program Director
Deputy Program Director
Women-in-Development/Program Specialist
Administrative Officer
Secretarial Staff

This office will continue to monitor and facilitate the work of the Country Research Projects and provide support for the management advisory groups of the CRSP (TC, Board, ERP). In addition, the Management Office will increase communication among the projects and with other outside organizations through regular publications, workshops and conferences. An active level of CRSP-wide communication is demonstrated by the MO whose documented average daily output is twenty-five phone communications (local and long distance), one telex/cable (incoming or outgoing), twenty-five incoming pieces of mail handled, fifty pieces of mail outgoing, and two visitors (local or from out of town). There are multiple phone and mail communications between the MO and the AID program officer weekly.

The Board of Directors (BOD)

The BOD is comprised of five members representing the nine lead institutions of the CRSP. The members come from among the Institutional Representatives of the lead institutions so designated by the Presidents of those institutions. The group invites consulting members from among the administrators of CRSP Host Country institutions. No change is proposed in this structure.

The BOD reviews the activities of the CRSP and recommends policy to the Management Entity. It also reviews the annual budgets of the CRSP and monitors the overall fiscal management.

Because of the significant role of the BOD and the limited number of meetings held per year (average three), the BOD requests a change in terms of office from two years to three years. The change is justified because experience has shown that it requires nearly a year for a Board member to totally grasp the complex CRSP operations. The involvement in time and learning reinforce the appropriateness of term extension. All insitutions have now been represented on the Board. This change was communicated to all of the Institutional Representatives and concurrence was received. The chart below displays the pattern of representation as a result of the change in terms.

MANAGEMENT OFFICE RECOMMENDATION
INSTITUTIONAL PARTICIPATION ON THE BEAN/COWPEA CRSP BOARD OF DIRECTORS

	FY 81	FY 82	FY 83	FY 84	FY 85	FY 86	FY 87	FY 8
Colorado State University		X	X				0	0
Cornell University	X	X				0	0	0
Michigan State University	X	X	X	X	X	X	X	X
University of California		X	X				0	0
University of Georgia	X			X	X	0		
University of Nebraska	X			X	X	0		
University of Puerto Rico			X	X	0			
University of Wisconsin	X	X				0	0	0
Washington State University			X	X	0			

X = prior or existing terms

0 = proposed terms based on proposed pattern of three years on and three years off

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The Technical Committee (TC)

The TC is made up of seven researchers, five from the US institutions, one from the International Agricultural Research Centers and one from the Host Country institutions. It functions as the internal project review and coordination panel and acts as the principal advisory group on technical operations. No change is proposed in the organization or operations of this group.

The External Review Panel (ERP)

The ERP is made up of seven eminent scientists, representing an array of disciplines, who serve the CRSP by conducting annual external reviews of the projects and general management. The group organizes its reviews as it deems appropriate at both US and HC sites, utilizing the many written materials provided. No change is proposed in the structure of the group.

The ERP will conduct its third CRSP-wide review in 1984. At that time it is proposed that members begin rotating-off the Panel in a way that will allow for continuity and appropriate heterogeniety in the group. Using a 2-2-2-1 pattern would establish a four-year term for the members of the group. This plan, originally suggested by the ERP, has been approved by the CRSP Board of Directors.

WOMEN-IN-DEVELOPMENT STRATEGY

Recognizing the significant role played by women in many developing countries in bean and cowpea production, this CRSP has incorporated a strong Women-in-Development focus and has included a WID Specialist on its Management Office staff. This was originally a quarter-time appointment but effective September, 1983 it became a full-time position with half of the work effort given to WID and the remainder to more general program-related tasks such as editing the CRSP newsletter and annual reports. A Women-in-Development pamphlet that provides an overview of women's roles in bean and cowpea production in the HCs and outlines Bean/Cowpea CRSP strategies to incorporate women as agricultural producers, researchers and students has been prepared and is included in Section III. A work plan has also been developed and is being implemented. Briefly, three areas of concentration are identified: those with a project focus, those related to the program as a whole and those that address broader policy issues of concern to the WID field.

Project-Centered Areas of Concentration

The major purpose is to increase awareness of how the role played by HC women and children in agriculture may affect, and be affected by, project activities. This input is tailored to the individual projects and takes various forms:

A. For those projects identified by the External Review Panel as needing greater concentration on WID issues the following plan has been adopted:
   1. The Project Paper, Annual Reports, Trip Reports, ERP Reports and other relevant materials are reviewed in order to document the extent to which goals and accomplishments have addressed WID issues.

2. Planning discussions are held with the PI so as to better identify where WID inputs may be most appropriate.
3. A <u>Women-in-Agriculture Resource Guide</u> is prepared. This includes:
   a. A description of women's roles in the farming systems of the HC drawn largely from secondary source materials.
   b. An examination of the implications of this literature for project activities.
   c. Information on women's organizations in the HC and, where possible, identification of US and HC researchers who could serve as consultants to the project.
   d. An annotated bibliography on farming systems and women's roles in agricultural production in the HC.

   This guide is made available to US and HC project researchers.
4. Once a specific strategy is agreed upon, efforts are made to assist in implementation.

B. A slightly different approach is used with regard to those projects the ERP judged as demonstrating adequate attention to WID:
   1. By reading the Project Paper, Annual Reports, Trip Reports and other relevant information, the WID Specialist identifies WID concerns that have been successfully addressed and documents the methodologies used.
   2. This information is disseminated to the other projects. For example, copies of articles where WID concerns are well addressed are circulated and PIs are familiarized with successful data collection techniques used in their geographic/cultural areas.
   3. Project researchers are encouraged to make mention of WID issues in their publications and to further expand their efforts to incorporate women through:
      a. Hiring competent female researchers and technicians, both in the US and in the HCs. Where possible, the WID Specialist assists in this process by providing lists of relevant organizations and individuals for consideration.
      b. Training of HC and US females in both degree and non-degree programs.

Program-Centered Areas of Concentration:

In addition to project-centered activities, a number of program-wide activities are carried out by the WID Specialist:

A. Workshops and Training: Training of HC nationals is an important component of the Bean/Cowpea CRSP. Many projects include opportunities for individuals to pursue graduate degree studies and/or participate in non-degree programs. As the Training Tables in Section I, pages 23-25, indicate, efforts to recruit women have been successful and will be continued in the future. Attention will also be paid to familiarizing researchers and students with women's roles in agricultural production in developing countries. The feasibility of locating existing WID curricula, or designing short seminars which could be held either separately or in conjunction with other Bean/Cowpea CRSP programs or workshops, is being investigated. Where possible, those individuals in degree programs may also be encouraged to take a course or participate in some formal offering related to Women-in-Development. In a related vein, students who have conducted research addressing women's roles in agricultural production and/or processing may be encouraged to present their findings at appropriate professional association meetings (AWID and others). Training is of particular importance because many of the HC students will command top research and administrative positions when they return home. In these policy making roles they may significantly influence training and research opportunities for women and build WID concerns into development efforts.

B. While the Bean/Cowpea CRSP newsletter, Pulse Beat, is already an important means of disseminating information, it can be used to address WID concerns in a more systematic fashion. For example, brief reviews of relevant books and articles can be included, female researchers and students highlighted and WID-related findings from the various projects reported.

C. Being well acquainted with the eighteen projects, the WID Specialist identifies areas of concern to women that are not currently receiving attention in the Program. Recommendations are made as to how these can be incorporated in future planning efforts.

Documenting the Effectiveness of WID

As the program evolves, an increasingly important responsibility will be to demonstrate the effects of having incorporated females as researchers, students and agriculturalists in the projects. This will be done through writing articles, participating in conferences and seminars and other appropriate means.

This plan of work was presented to the Technical Committee on April 26, 1984 and to the Board of Directors on May 10, 1984 where it received a positive endorsement. One Women-in-Agriculture Resource Guide (on Cameroon) has been prepared to date and is included in Section III.

BEAN/COWPEA CRSP LOG FRAME

Program Goal	Objectively Verifiable Indicators	Verifiers	Assumptions
Make a significant contribution to the improvement of living conditions of small farm producers in developing countries and increase the availability of low cost, nutritious food in the marketplace for the rural and urban poor.	Development of important research results addressing identified constraints. Stronger national research program addressing identified constraints. CRSP products accepted by farmers, extension agents, HC private initiatives in ways which will advance goal. Increased participation of women.	Annual reports and positive TC/ERP reviews of progress. Increased overall size of national program research team with greater multidisciplinary competence and HC investment in the project. Adaptation of findings by external agents: farmers, IARCs, extension agents, commercial interests. Increased male and especially female CRSP graduates in the professional pipeline.	Food and nutrition problems in the developing nations can be solved in part through research. Collaboration between US and HC can be of mutual benefit. Achievement from this program can reach the rural and urban poor. Achievements of this Program can contribute to development in ways which do not increase the marginalization of women and their families.

Purpose	Objectively Verifiable Indicators	Verifiers	Assumptions
Organize and mobilize financial and human resources necessary for mounting a major multi-institutional US/HC collaborative effort in research and training. Provide the knowledge base necessary to achieve significant advances in alleviating the principal constraints to improved production, marketing and utilization of beans and cowpeas in HCs. Improve the capabilities of HC institutions to generate, adopt and apply improved knowledge to local conditions.	US/HC administrations' support of projects. HC and US teams functioning with good working relationships established. Research teams operating with effective level of equipment, supplies and technical support. Effective communications among all participants especially among those working on the same constraints across projects. Mechanism established for the identification and support of US and HC male and female CRSP students. Useful secondary data identified. Improved research infrastructure with laboratory and field research in process.	Smooth management with good communication with MO. US/HC quarterly and annual reports. Formal commitment of participants. Consistent pattern of student training established. Documentation of secondary data. Primary data analyses available in reports and publications. HC contributions to CRSP documented in each year's budget analysis.	HC will maintain interest in the commodity and in CRSP participation. Coups and other forms of political or social disturbances will not be of a magnitude at project sites as to severely and insurmountably affect progress. Necessary basic equipment, facilities and supplies will be available or acquirable within reasonable time frame. There is a sufficiently large pool of students from which to draw for advanced training at least at the secondary school graduate level.

Outputs	Objectively Verifiable Indicators	Verifiers	Assumptions
Strong, better quality yields produced under stressful conditions. Greater understanding by US and HC collaborators of the socio-cultural and the agri-cultural environment. Products of research packaged appropriately for consumer use. Information dissemination for a variety of audiences. Production and utilization research findings useful for the wider research community. Many male and female graduates of training programs.	Yield increase under an array of stressful conditions to which produced varieties are resistant. Multidisciplinary research generated. Informational materials available. Interest of wider international and national research and development community in products. Better health among those making use of project outputs. Male and especially female graduates returning to HC research institutions.	Yield data from local and national census. Reports of projects incorporate and integrate socio-cultural with agri-cultural information. Materials acknowledged as received by many groups and increased consumer demand. Requests from professional community for information and products increased. Site visits. CRSP graduates identified in HC research positions. Increased numbers of male and female students continually in short-term and long-term training.	There exists in the HC at least a skeletal infrastructure for information dissemination. There are HC and US women sufficiently interested in advanced education and professional employment to work their way through the system when it is opened to them.

Inputs	Objectively Verifiable Indicators	Verifiers	Assumptions
Necessary long-term/short-term personnel from HC/US institutions who can communicate with each other. Financial contributions from AID and US and HC institutions. Equipment such as vehicles, lab, field and office equipment. Facilities and supplies for HC/US teams. Management support from MO, US and HC institution administrations. Information and support from external groups.	Annual allocation from AID. CRSP funds flowing on regular bases to US and HC research teams. Annual plan of work and budget document with US/HC contributions. Frequent and regular communication among AID, MO, US and HC. Participation in CRSP research and training activity by external groups (i.e., AID-sponsored FSR teams, IARCs, USAID missions).	Increase in communications initiated by participants with one another. Review of annual documents by TC and BOD. AID letter of credit authorizing funds. Regular reimbursement requests with quarterly reports. AID approvals to purchase indicated equipment received. Site visits. Meetings and other forms of communication with external agents.	AID will generate necessary approvals in timely fashion. AID will have funds available for use by the CRSP. All parties making input will continue to feel the mutual benefits worth the investments.

Bean/Cowpea Collaborative Research Support Program
Financial Summary of Country Research Projects, Years 1-3

Project	FY 81 + 82			81-82 Carry Forward	FY-83				FY-83 Act Carry Forward
	Alloc.	Spent	%		Alloc.	Balance	Spent	%	
Botswana/CSU	133,120	26,498	20%	106,622	110,442	217,064	127,226	59%	89,838
Brazil/BTI	175,420	138,815	79%	36,605	139,950	176,555	142,063	80%	34,492
Brazil/U-WI/B	128,027	8,886	7%	119,141	91,520	210,661	63,387	30%	147,274
Brazil/U-WI/H	91,520	9,877	11%	81,643	62,612	144,255	56,825	39%	87,430
Cameroon/U-GA	176,304	67,928	39%	108,376	153,195	261,571	213,511	89%	48,060
D. Republic/U-NE	188,030	133,127	71%	54,903	117,043	171,946	114,263	66%	57,683
D. Republic/UPR	188,030	177,901	95%	10,129	147,790	157,919	134,511	85%	23,408
Ecuador/COR	187,148	83,886	45%	103,262	97,898	201,160	97,163	48%	103,997
Guatemala/COR	187,148	79,741	43%	107,407	97,898	205,305	100,279	49%	104,556
Honduras/UPR	100,420	42,557	42%	57,863	109,435	167,298	94,697	57%	72,601
INCAP/WSU	326,100	109,358	34%	216,742	206,077	422,819	216,369	51%	206,450
Kenya/UC-D	284,160	149,897	53%	134,263	117,982	252,245	201,101	80%	51,144
Malawi/MSU	138,503	36,737	27%	101,766	147,788	249,554	117,622	47%	131,932
Mexico/MSU	70,719	0	0%	70,719	70,940	141,659	60,567	43%	81,092
Nigeria/U-GA	143,080	52,837	37%	89,243	107,356	196,599	131,102	66%	65,497
Nigeria/MSU	142,080	47,619	34%	93,888	48,411	142,299	37,743	26%	105,129
Senegal/UC-R	294,480	121,741	41%	172,739	244,712	417,451	229,162	55%	188,289
Tanzania/WSU	250,580	124,602	50%	125,978	189,615	315,593	214,022	68%	101,571
TOTAL	3,203,869	1,412,007	44%	1,791,289	2,260,664	4,051,953	2,351,613	58%	1,700,340

The Bean/Cowpea CRSP document on Distribution of Direct and Indirect Costs and Contributions was originally prepared at the request of the External Review Panel in January, 1984. The data were compiled from project quarterly financial reports that had been received in the Management Office through the end of December, 1983 (but not necessarily expended through that date). The report now has been updated to include all data reported as expended through the end of FY 83. The updated information has resulted in a few minor changes to the data in the ERP report, but the important points highlighted in that report remain unchanged, and are listed below:

1. The distribution of direct/indirect costs in the country research projects is 83%/17%. Thus 83% of AID expenditures in country research projects are placed directly in the hands of research personnel. Of the 83% direct costs, 53% are spent in or on behalf of the host country and 47% in the U.S. This is in compliance with a CRSP policy that a minimum of one-half of the project funds, excluding indirect costs, be spent in or directly on behalf of the host country.

2. If the Management Office is included as an overhead expense, the direct/indirect cost split is 63%/37% with the HC/US distribution of the 63% direct costs unchanged at 53/47. The indirect cost rate of 37% is considered acceptable in that it is comparable to the negotiated indirect cost rates of individual US institutions.

3. Through year 3, total CRSP contributions were comprised of AID 72%, US institution contributions 17% and HC contributions 11%. The cost sharing component of the US portion of the CRSP was split 63% AID and 37% US institutions. US institutions thus contributed the equivalent of 59% ($1,145,674 $1,922,822) of AID contributions to US project costs. In addition, HC institutions contributed the equivalent of 41% ($756,615 $1,840,739) of AID contributions to HC project costs. US & HC institutions are making substantial contributions to CRSP resources.

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Bean/Cowpea Collaborative Research Support Program
Distribution of Direct and Indirect
Costs and Contributions through 1983

Last Qtrly Report	Country	U.S. Direct Costs (A)	U.S. Indirect Costs (B)	H.C. Direct Costs (C)	H.C. Indirect Costs (D)	Total U.S. Costs (E)	Total H.C. Costs (F)	Total U.S. & H.C. Indirect Cost (G)	U.S. Direct Cost (H)	H.C. Direct Cost (I)	U.S. Contr. (M)	H.C. Contri. (N)	Total Contri. (O)	Total Cost
9-30-83	Botswana/CSU	5,133 (77%)	1,523 (23%)	122,154 (83%)	24,914 (17%)	6,656 (4%)	147,068 (96%)	26,437 (17%)	5,133 (3%)	122,154 (80%)	2,176	28,678	30,854	184,578
9-30-83	Brazil/BTI	94,055 (70%)	40,867 (30%)	145,956 (100%)	-0- (0%)	134,922 (48%)	145,956 (52%)	40,867 (15%)	94,055 (33%)	145,956 (52%)	105,951	111,218	217,169	498,047
9-30-83	Brazil/Bliss	31,802 (66%)	16,413 (34%)	24,058 (100%)	-0- (0%)	48,215 (68%)	24,058 (33%)	16,413 (23%)	31,802 (44%)	24,058 (33%)	19,037	5,293	24,330	96,603
9-30-83	Brazil/Hagedorn	47,695 (78%)	13,117 (22%)	5,890 (100%)	-0- (0%)	60,812 (91%)	5,890 (9%)	13,117 (20%)	47,695 (71%)	5,890 (9%)	34,353	-0-	34,353	101,055
9-30-83	Cameroon/UGA	51,190 (79%)	13,549 (21%)	173,470 (80%)	43,231 (20%)	64,739 (23%)	216,701 (77%)	56,780 (20%)	51,190 (18%)	173,470 (62%)	47,180	86,680	133,860	415,300
9-30-83	Dom. Rep./U-N	60,077 (78%)	16,987 (22%)	164,576 (97%)	5,750 (3%)	77,064 (31%)	170,326 (69%)	22,737 (9%)	60,077 (24%)	164,576 (67%)	114,712	26,678	141,390	388,780
9-30-83	Dom. Rep./UPR	172,731 (100%)	-0- (0%)	133,879 (96%)	5,801 (4%)	172,731 (55%)	139,680 (45%)	5,801 (2%)	172,731 (55%)	133,879 (43%)	96,915	33,523	130,438	442,849
9-30-83	Ecuador/COR	67,440 (74%)	24,132 (26%)	79,770 (89%)	9,707 (11%)	91,572 (51%)	89,477 (49%)	33,839 (19%)	67,440 (37%)	79,770 (44%)	57,344	14,647	71,991	253,040
9-30-83	Guatemala/COR	70,061 (72%)	27,869 (28%)	69,585 (85%)	12,505 (15%)	97,930 (54%)	82,090 (46%)	40,374 (22%)	70,061 (39%)	69,585 (39%)	63,812	33,655	97,467	277,487
9-30-83	Honduras/UPR	88,254 (100%)	-0- (0%)	41,384 (84%)	7,616 (16%)	88,254 (64%)	49,000 (36%)	7,616 (6%)	88,254 (64%)	41,384 (30%)	48,776	20,090	68,866	206,120
9-30-83	INCAP/WSU	137,159 (70%)	58,986 (30%)	91,080 (70%)	38,501 (30%)	196,145 (60%)	129,581 (40%)	97,487 (30%)	137,159 (42%)	91,080 (28%)	141,026	43,405	184,431	510,157
9-30-83	Kenya/UC-D	180,547 (77%)	52,837 (23%)	112,690 (96%)	4,925 (4%)	233,384 (66%)	117,615 (34%)	57,762 (17%)	180,547 (51%)	112,690 (32%)	66,438	89,387	155,825	506,824
9-30-83	Malawi/MSU	59,968 (66%)	30,902 (34%)	63,488 (100%)	-0- (0%)	90,870 (59%)	63,488 (41%)	30,902 (20%)	59,968 (39%)	63,488 (41%)	12,343	24,125	36,468	190,826
9-30-83	Mexico/MSU	22,104 (64%)	12,601 (36%)	25,862 (100%)	-0- (0%)	34,705 (57%)	25,862 (43%)	12,601 (21%)	22,104 (36%)	25,862 (43%)	16,813	9,828	26,641	87,208
9-30-83	Nigeria/U-GA	79,159 (83%)	16,560 (17%)	88,220 (100%)	-0- (0%)	95,719 (52%)	88,220 (48%)	16,560 (9%)	79,159 (43%)	88,220 (48%)	48,484	98,806	147,290	331,229
9-30-83	Nigeria/MSU	30,135 (58%)	21,380 (42%)	33,848 (100%)	-0- (0%)	51,515 (60%)	33,848 (40%)	21,380 (25%)	30,135 (35%)	33,848 (40%)	16,310	13,877	30,187	115,550
9-30-83	Senegal/UC-R	141,049 (71%)	57,182 (29%)	129,525 (85%)	23,148 (15%)	198,231 (56%)	152,673 (44%)	80,330 (23%)	141,049 (40%)	129,525 (37%)	179,444	62,595	242,039	592,943
9-30-83	Tanzania/WSU	119,646 (67%)	59,772 (33%)	152,581 (69%)	6,625 (4%)	179,418 (53%)	159,206 (47%)	66,397 (20%)	119,646 (35%)	152,581 (45%)	74,560	54,130	128,690	467,314
Total Country Research Projects		1,458,205 (76%)	464,677 (24%)	1,658,016 (90%)	182,723 (10%)	1,922,882 (51%)	1,840,739 (49%)	647,400 (17%)	1,458,205 (39%)	1,658,016 (44%) [J]	1,145,674	756,615	1,902,289	5,665,910
Cost Sharing AID/US						63%					37%			
Management Office								1,190,423						1,190,423
Total Grant								1,837,823 (27%)	1,458,205 (21%)	1,658,016 (24%)			1,902,289 (28%) [K]	6,856,333
Distribution of Grant Direct Cost									47%	53% (L)				
Distribution of AID/US Contribution/ HC Contribution									4,954,044 (72%)		1,145,674 (17%)	756,615 (11%) [P]		
Distribution of AID Indirect Cost/ AID Direct Cost & US/HC Contribution								1,837,823 (27%)			5,018,510 (73%) [Q]			

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Explanation of Data Components

COMPARISON OF US DIRECT/INDIRECT COSTS

(A) US Direct Costs
Direct Costs reported by US institutions

(B) US Indirect Costs
Indirect Costs reported by US institutions

COMPARISON OF HC DIRECT/INDIRECT COSTS

(C) HC Direct Costs
Direct Costs reported by HC institution

(D) HC Indirect Costs
Indirect Costs reported by HC institution

COMPARISON OF US/HC TOTAL COSTS (DIRECT AND INDIRECT)

(E) Total US Costs
Total Direct and Indirect Costs reported by US institutions

(F) Total HC Costs
Total Direct and Indirect Costs reported by HC institution

COMPARISON OF TOTAL INDIRECT COSTS; US DIRECT COSTS; AND HC DIRECT COSTS

(G) Total US and HC Indirect Costs
Total Indirect Costs reported by US and HC institutions

(H) US Direct Cost
Total US Direct Cost reported by US institution

(I) HC Direct Cost
Total HC Direct Cost reported by HC institution

(J) DISTRIBUTION OF COUNTRY RESEARCH PROJECT INDIRECT COST; US DIRECT COST; HC DIRECT COST

(K) DISTRIBUTION OF TOTAL GRANT (INCLUDING MGMT OFFICE) INDIRECT COST; DIRECT COSTS; AND US/HC COST SHARING

(L) DISTRIBUTION OF GRANT DIRECT COSTS

COMPARISON OF COST SHARING

(M) US CONTRIBUTION
Cost sharing reported by US institution on Quarterly Reporting Form

(N) HC CONTRIBUTION

Estimates of HC cost sharing from approved budgets ($\frac{\text{HC Contribution}}{\text{HC AID Budget}}$ x Total Reported HC costs)

(O) Total US and HC Cost Sharing

DISTRIBUTION OF TOTAL GRANT COST

(P) DISTRIBUTION OF AID CONTRIBUTION; US COST SHARING; HC COST SHARING

(Q) DISTRIBUTION OF AID INDIRECT COSTS; AID DIRECT COSTS + US/HC COST SHARING

Bean/Cowpea Collaborative Research Support Program
Project Expenditures in or on behalf of Host Countries Cumulative Year 3 (FY 1983) through Year 8 (FY 1988) Projections

	FY 81-83 Act.	FY 84 Est.	FY 85 Est.	Total Initial Grant	FY 86 Proj.	FY 87 Proj.	FY 88 Proj.	Total Ext. Req.	Total Grant
Botswana--AID	147,068	73,922	112,390	333,380	96,357	104,630	112,380	313,367	646,747
HC Contri.	28,678	18,445	21,915	69,038	18,760	20,260	21,880	60,900	129,938
TOTAL	175,746	92,367	134,305	402,418	115,117	124,890	134,260	374,267	776,685
Brazil--AID	175,904	180,012	295,673	651,589	178,366	191,010	204,713	574,089	1,225,678
HC Contri.	116,511	70,420	84,730	271,661	58,000	62,400	67,200	187,600	459,261
TOTAL	292,415	250,432	380,403	923,250	236,366	253,410	271,913	761,689	1,684,939
Cameroon--AID	216,701	118,080	189,995	524,776	149,770	161,750	174,690	486,210	1,010,986
HC Contri.	86,680	47,230	72,355	206,265	59,900	64,700	69,900	194,500	400,765
TOTAL	303,381	165,310	262,350	731,041	209,670	226,450	244,590	680,710	1,411,751
Dom. Rep.--AID	310,006	161,441	298,788	770,235	191,570	207,690	225,095	624,355	1,394,590
HC Contri.	60,201	39,830	42,235	142,266	36,850	39,960	43,350	120,160	262,426
TOTAL	370,207	201,271	308,163	912,501	228,420	247,650	268,445	744,515	1,657,016
Ecuador--AID	89,477	76,139	120,780	286,396	54,265	58,595	63,300	176,160	462,556
HC Contri.	14,647	16,795	18,950	50,392	8,885	9,600	10,370	28,855	79,247
TOTAL	104,124	92,934	139,730	336,788	63,150	68,195	73,670	205,015	541,803
Guatemala--AID	211,671	178,381	330,947	720,999	114,760	122,335	130,535	367,630	1,088,629
HC Contri.	77,060	45,403	70,160	192,623	30,380	32,590	35,170	98,140	290,763
TOTAL	288,731	223,784	401,107	913,622	145,140	154,925	165,705	465,770	1,379,392
Honduras--AID	49,000	91,822	131,876	272,698	95,305	102,950	111,140	309,395	582,093
HC Contri.	20,090	36,730	52,750	109,570	38,120	41,200	44,400	123,720	233,290
TOTAL	69,090	128,552	184,626	382,268	133,425	144,150	155,540	433,115	815,383
Kenya--AID	117,615	55,250	195,010	367,875	106,930	114,688	123,063	344,681	712,556
HC Contri.	89,387	87,500	90,000	266,887	85,000	90,000	95,000	270,000	536,887
TOTAL	207,002	142,750	285,010	634,762	191,930	204,688	218,063	614,681	1,249,443
Malawi--AID	63,489	107,740	147,975	319,204	48,045	51,890	56,045	155,980	475,184
HC Contri.	24,125	14,800	13,000	51,925	5,500	5,900	6,400	178,000	69,725
TOTAL	87,614	122,540	160,975	371,129	53,545	57,790	62,445	173,780	544,909
Mexico--AID	25,862	52,228	79,190	157,280	37,590	40,195	43,010	120,795	278,075
HC Contri.	9,828	29,180	33,500	72,508	15,900	17,000	18,200	51,100	123,608
TOTAL	35,690	81,408	112,690	229,788	53,490	57,195	61,210	171,895	401,683
Nigeria--AID	122,068	150,611	263,400	536,079	82,420	91,823	101,965	276,208	812,287
HC Contri.	112,683	108,675	168,150	389,508	59,480	66,700	74,200	200,380	589,888
TOTAL	234,751	259,286	431,550	925,587	141,900	158,523	176,165	476,588	1,402,175
Senegal--AID	152,673	161,553	170,050	484,276	137,140	148,110	159,960	445,210	929,486
HC Contri.	62,595	64,620	65,000	192,215	54,800	59,300	63,990	178,090	370,305
TOTAL	215,268	226,173	235,050	676,491	191,940	207,410	223,950	623,300	1,299,791
Tanzania--AID	159,206	142,532	212,335	514,073	151,170	163,660	177,155	491,985	1,006,058
HC Contri.	54,130	37,310	48,750	140,190	35,855	38,725	41,825	116,405	256,595
TOTAL	213,336	179,842	261,085	654,263	187,025	202,385	218,980	608,390	1,262,653
Uganda--AID	-0-	-0-	300,000	300,000	-0-	-0-	-0-	-0-	300,000
West Indies--AID	-0-	-0-	100,000	100,000	-0-	-0-	-0-	-0-	100,000
Total Program--AID	1,840,740	1,549,711	2,948,409	6,338,860	1,443,688	1,559,326	1,683,051	4,686,065	11,024,925
HC Contri.	756,615	616,938	781,495	2,155,048	507,430	548,335	591,885	1,647,650	3,802,698
TOTAL	2,597,355	2,166,649	3,729,904	8,493,908	1,931,118	2,107,661	2,274,936	6,333,715	14,827,623

* Host Country Expenditures only--excludes Management Office and US Institution expenses
Host Country contributions are based on actual reported for FY 81-83, approved budgets for FY 84, and historical ratio of AID HC expenditures/HC contributions for FY 85-88.

Bean/Cowpea Collaborative Research Support Program
Summary AID Contributions by Budget Line Item--Projects Only
Cumulative Year 3 (FY 1983) through Year 8 (FY 1988) Projections

	Act Exp Thru Year 3	Est Exp Current Year 4	Est Exp Year 5	Total Initial Grant	Projected Year 6	Projected Year 7	Projected Year 8	Total Ext Request	Total Grant & Extension
Salaries	1,481,493	1,144,249	1,255,940	3,881,682	1,148,795	1,232,135	1,322,165	3,703,095	7,584,777
Fringe Benefits	81,532	94,687	111,905	288,124	100,875	108,305	116,325	325,505	613,629
Equip & Fac	381,913	397,929	948,965	1,728,807	220,095	245,990	272,870	738,955	2,467,762
Dom Travel	149,735	114,989	172,735	437,459	104,300	112,650	121,660	338,610	776,069
Intnl Travel	373,101	255,907	371,860	1,000,868	242,655	262,065	283,020	787,740	1,788,608
Materials & Supplies	362,204	224,619	415,000	1,001,823	200,685	216,855	235,400	652,940	1,654,763
Other Direct Costs	286,245	425,002	827,715	1,538,962	420,835	455,305	492,540	1,368,680	2,907,642
Total Direct Costs	3,116,223	2,657,382	4,104,120	9,877,725	2,438,240	2,633,305	2,843,980	7,915,525	17,793,250
Indirect Costs	647,398	446,752	652,210	1,746,360	396,010	427,695	461,910	1,285,615	3,031,975
Total Costs	3,763,621	3,104,134	4,756,330	11,624,085	2,834,250	3,061,000	3,305,890	9,201,140	20,825,225

* AID Contribution to Country Research Projects--Excludes Management Office and Year 6 Estimated Pipeline Expenses

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Bean/Cowpea Collaborative Research Support Program
Summary AID Contribution by Line Item--Projects and MO
Year 5 (FY 1985) through Year 8 (FY 1988)

	Year 5			Year 6			Year 7			Year 8		
	Projects	MO	Total	Projects	MO	Total	Projects	MO	Total*	Projects	MO	Total
Salaries	1,255,940	173,000	1,428,940	1,148,795	182,000	1,330,795	1,232,135	191,000	1,423,135	1,322,165	200,000	1,522,165
Fringe Benefits	111,905	32,000	143,905	100,875	34,000	134,875	108,305	36,000	144,305	116,325	38,000	154,325
Consultant Fees-ERP	-0-	30,000	30,000	-0-	35,000	35,000	-0-	40,000	40,000	-0-	45,000	45,000
Equip & Fac	948,965	15,000	963,965	220,095	5,000	225,095	245,990	2,500	248,490	272,870	2,000	274,870
Dom Travel	172,735	64,000	236,735	104,300	70,500	174,800	112,650	77,500	190,150	121,660	85,500	207,160
Intnl Travel	371,860	35,000	406,860	242,655	39,000	281,655	262,065	43,000	305,065	283,020	47,000	330,020
Materials & Sup.	415,000	8,000	423,000	200,685	9,000	209,685	216,855	10,000	226,855	235,400	11,000	246,400
Technical Assistance	-0-	450,000	450,000	-0-	50,000	50,000	-0-	50,000	50,000	-0-	50,000	50,000
Meeting Expenses	-0-	11,500	11,500	-0-	13,000	13,000	-0-	14,500	14,500	-0-	16,000	16,000
Other Direct Costs	827,715	77,665	905,380	420,835	61,000	481,835	455,305	65,000	520,305	492,540	69,000	561,540
Total Direct Costs	4,104,120	896,165	5,000,285	2,438,240	498,500	2,936,740	2,633,305	529,500	3,162,805	2,843,980	563,500	3,407,480
Indirect Costs	652,210	135,000	787,210	396,010	144,500	540,510	427,695	153,500	581,195	461,910	163,500	625,410
Total Costs	4,756,330	1,031,165	5,787,495	2,834,250	643,000	3,477,250	3,061,000	683,000	3,744,000	3,305,890	727,000	4,032,890

* Excludes Year 6 estimated pipeline expenses

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Management Office Budget Detail

	FY 81 Actual	FY 82 Actual	FY 83 Actual	FY 84 Est.	FY 85 Est.	Total Initial Grant	FY 86 Projected	FY 87 Projected	FY 88 Projected	Total Extension Request	Total Grant
Salaries	102,952	141,917	132,881	167,165	173,000	717,915	182,000	191,000	200,000	573,000	1,290,915
Fringe Benefits	16,929	26,755	26,101	32,835	32,000	134,620	34,000	36,000	38,000	108,000	242,620
Equip. & Fac.	21,603	8,442	12,775	20,000	15,000	77,820	5,000	2,500	2,000	9,500	87,320
Dom. Travel--MO	28,793	28,852	18,358	12,900	14,000	102,903	15,000	16,500	18,000	49,500	152,403
--BOD	6,533	5,525	5,107	13,400	15,000	45,565	16,500	18,000	20,000	54,500	100,065
--TC	14,167	17,820	15,810	17,500	20,000	85,297	22,500	25,000	27,500	75,000	160,297
--ERP	-0-	863	14,597	1,200	15,000	31,660	16,500	18,000	20,000	54,500	86,160
Total Dom. Travel	49,493	53,060	53,872	45,000	64,000	265,425	70,500	77,500	85,500	233,500	498,925
Intnl Travel--MO	80,447	11,524	6,103	15,000	10,000	123,074	11,500	13,000	14,500	39,000	162,074
--BOD	-0-	-0-	-0-	-0-	-0-	-0-	-0-	-0-	-0-	-0-	-0-
--TC	-0-	12,898	3,840	-0-	-0-	16,738	-0-	-0-	-0-	-0-	16,738
--ERP	-0-	-0-	4,941	40,000	25,000	69,941	27,500	30,000	32,500	90,000	159,941
Total Intnl Travel	80,447	24,422	14,884	55,000	35,000	209,753	39,000	43,000	47,000	129,000	338,753
Mat. & Supplies	4,856	2,826	3,397	7,000	8,000	26,079	9,000	10,000	11,000	30,000	56,079
Technical Assistance	875	1,142	937	40,000	450,000	492,954	50,000	50,000	50,000	150,000	642,954
Consultant Fees-ERP	-0-	870	8,340	25,000	30,000	64,210	35,000	40,000	45,000	120,000	184,210
Pub.--Exec. Sum./Ann. Rep.	-0-	189	3,081	5,000	6,000	14,270	6,500	7,000	7,500	21,000	35,270
--Tech. Summary	-0-	-0-	-0-	2,000	3,000	5,000	3,500	4,000	4,500	12,000	17,000
--ERP Report	-0-	-0-	334	3,000	4,000	7,334	4,500	5,000	5,500	15,000	22,334
--Other	-0-	-0-	787	12,000	32,520	45,307	13,000	14,000	15,000	42,000	87,307
Total Publications	-0-	189	4,202	22,000	45,520	71,911	27,500	30,000	32,500	90,000	161,911
Meeting Expenses--BOD	1,733	1,356	4,019	3,200	4,000	14,308	4,500	5,000	5,500	15,000	29,308
--TC	1,165	2,454	4,478	5,400	6,000	19,497	6,500	7,000	7,500	21,000	40,497
--ERP	-0-	-0-	1,212	1,250	1,500	3,962	2,000	2,500	3,000	7,500	11,462
Total Meeting Expenses	2,898	3,810	9,709	9,850	11,500	37,767	13,000	14,500	16,000	43,500	81,267
Other Direct Costs	17,571	16,375	25,233	32,675	32,145	123,999	33,500	35,000	36,500	105,000	228,999
Total Direct Costs	297,624	279,808	292,331	456,525	896,165	2,222,453	498,500	529,500	563,500	1,591,500	3,813,953
Indirect Costs	101,647	109,488	109,525	129,315	135,000	584,975	144,500	153,500	163,500	461,500	1,046,475
Total Costs	399,271	389,296	401,856	585,840	1,031,165	2,807,428	643,000	683,000	727,000	2,053,000	4,660,428

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COUNTRY RESEARCH PROJECT REVIEW AND EXTENSION PLANS

The individual projects are presented below with information on the expectations for years four and five, followed by proposed work for extension years six, seven and eight. Following the existing projects, a short section on new initiatives is presented.

Presented below are project review information and extension plans for each project presented in individual project subsections. The format for each subsection follows.

Introduction

Years One Through Three Reference Guide to: Three-Year Progress Report, Evaluations and Follow-Up.

Years Four and Five

Extension Years Six Through Eight

Log Frame
Institutional Response to Recommendations for Projects Rated "Less Than Satisfactory" by ERP.

Letter from the Lead Institution

Letter from USAID in the Host Country

Budget Review and Extension Request

In the case of evaluations and follow-up action, additional information is presented in Section III in the formal 1983 Annual Report: External Review Panel. Overall, a more succinct presentation of the activity of each project is available as Project Evaluation and Review Profiles, Section I of this document.

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BOTSWANA • COLORADO STATE UNIVERSITY (Initiated July 1982) • COWPEAS
deMooy

DEVELOPMENT OF INTEGRATED COWPEA PRODUCTION SYSTEMS IN SEMIARID BOTSWANA

PROJECT REVIEW AND EXTENSION PLAN

BOTSWANA • COLORADO STATE UNIVERSITY (Initiated July 1982) • COWPEAS
deMooy

DEVELOPMENT OF INTEGRATED COWPEA PRODUCTION SYSTEMS IN SEMIARID BOTSWANA

INTRODUCTION

Project objectives are to increase cowpea grain yields and returns on labor input. During this first year of the Botswana Cowpea Project, progress was made on all objectives. The major emphasis was on the screening of 327 varieties, both local germplasm and exotic lines, confirming the urgency of Botswana's need. More than 400 local lines were catalogued and 180 were evaluated in the field. Seed from a number of lines was distributed to IITA and the Plant Introduction Station, Beltsville, MD. Volume I of the Botswana Cowpea Germplasm Guide was prepared for publication.

A minimum tillage cultivator/planter, which will permit draft animal reduction from six to two oxen, was developed in collaboration with EFSAIP, a British-funded agency. Cultural practices involving intercropping, plant population, time of planting, micronutrient application and efficiency of rhizobial strains were studied. A new harvesting technique was devised involving varieties suitable for pulling whole plants and machine threshing.

Arrangements were made for testing project findings in farmers' fields in collaboration with the agricultural extension service of Botswana and several farming systems groups. Four graduate students, two from Botswana and two from the US, were selected. Three of them have begun their programs.

YEARS ONE THROUGH THREE REFERENCE GUIDE

The information referred to here has been compiled in separate documents included in Sections I and III of this report.

Three-Year Progress Report

1983 Annual Report: See Section III, Technical Summary, page 11.

Research Publications and Presentations: See Section III, Pulse Beat, Spring 1984, Insert, page 1.

Project Evaluations

1983 Annual Report: See Section III, External Review Panel Report, page 13, and Follow-Up Chart Insert.

1983 Board of Directors Extension Rating: See Section I, page 25.

YEARS FOUR AND FIVE

The research plan is unchanged and work is on schedule per original objectives, which are still valid. Accomplishments are on target and the additional two years will allow for further accomplishments and their integration into a package appropriate for small farm use.

It should be noted that years four and five for the CRSP are years three and four for the Botswana project, which got underway in Botswana in September, 1982.

It is anticipated that the project will have to request funding for an entomologist and plant pathologist because the people presently holding these positions at the DAR will be pursuing higher degrees in the US. The Station entomologist will be specializing in sorghum entomology and presumably will devote all his time to that crop upon returning to Botswana. Having no entomologist could hurt the program.

The regional SADCC program is to take effect in year four or five and may alleviate the financial problem. The required inputs, however, will remain approximately the same. The DAR is satisfied with the direction in which the project is developing. At this time no research is envisioned on the US campus.

EXTENSION YEARS SIX THROUGH EIGHT

Concerning new activities for years six, seven and eight, it may be said that crop breeding should receive more attention. During the first few years the project can count on the unselfish collaboration of IITA and SAFGRAD scientists. The resident US PI is doing the field testing of F_2 material himself this year. This is getting to be too much and a full-time breeder will be needed in addition to the existing professional staff for best results. SADCC should have a legume breeder stationed in Malawi by that time who could be of some assistance. However, that will not be the same as someone located in Botswana. In Malawi the breeder will be involved in work with groundnuts and other legume species as well.

In CRSP year five, an assessment will be made of progress. At that time, the results will be integrated into packages of recommended practices covering the scope of the project. Beginning no later than year six, we look forward to an expansion of crop breeding activities.

LOG FRAME - COLORADO STATE UNIVERSITY/ BOTSWANA

June 1, 1983

Narrative Summary	Objectively verifiable Indicators	Means of Verification	Assumptions
Program or Sector Goals: Increase in yield per ha and yield stability of cowpeas under specific semi-arid conditions	Measures of Achievement: Yields consistently in excess of base line survey records.	Means of field trials for certain regions under various seasonal conditions compared with standard varieties and traditional production methods.	Assumptions for Goal Achievement: Minimum of 3 years of project operation. Continuing field support from DAR and USAID. Sufficient level of interest from GOB Agricultural Field Services personnel in various regions of the country.
Increased returns in cowpea production per unit of labor and/ or financial input on sample farms.	Greater production per farm family unit compared with previous statistical records.	Socio-economic data recorded for cooperating farmers in field trials.	Base line survey data exist or will be made available. Small farmers willing to follow up on agricultural extension recommendations and interested in progressing beyond minimum subsistence production.
Project Purpose: 1. Identification of constraints in cowpea production process stemming from a combination of: tillage/ cultivation, planting, spacing, and intercropping practices, choice of variety, draft power supply, insect and disease infestation, harvesting, threshing, storage, labor or other resource input factors.	Conditions Indicating Project Achievement: Packages of improved cultural practices adepted to specific sets of environmental or socio-economic conditions.	Results of experiments. Published reports.	Assumptions for Project Achievement: Continuation of H.C. administrative and technical support
2. Finding solutions for constraints. 3. Testing of solutions for acceptability in farmers' fields. 4. Institutionalization of research techniques and capacity.	Acceptance of project recommendations by more than one-half of the farmers in sample having identified constraints.	Survey of rate of acceptance of recommended practices by cooperating farmers and their neighbors.	Continued interest of farmers to cooperate with project. Participation of Agricultural Field Services regional staff and Farming Systems groups.
Project Outputs: 1. Selection of HYV from local and international germplasm collection and trials; better adapted varieties than those presently grown.	Magnitude of Outputs: Number of varieties identified, quantities of seed produced.	Consistent superior performance of introduced varieties in regional field trials. Amount of seed produced by Seed Multiplication Unit.	Output Assumptions: Continued cooperation with IITA and SAFGRAD Research Centers.

LOG FRAME (cont.)

Narrative Summary	Objectively Verifiable Indicators	Means of Verification	Assumptions
2. Packages of cultural practices for higher production/ha ,and yield stability through better stands, insect and weed control and other cultural practices for specific environments, socio-economic resource levels, and type of draft power availability. 3. Faster methods of harvesting, threshing, and winnowing with greater returns per unit labor.	Variety of situations covered by improved practices adequate to make substantial progress over current status. Economic returns.	Measured and recorded observations in field trials on Agricultural Research Station, Outlying Research Farms, and privately owned farms. Recorded comparisons of harvesting, threshing, and winnowing labor and time, using hand labor or machine.	Cooperationwith EFSAIP in development of appropriate tillage/planting implements. Appointment of active cowpea researcher as H.C. professional counterpart. Presence of suitable cowpea lines in germplasm collection
4. Training of H.C. research personnel at MS degree level at U.S. university for cowpea research career.	Number of H.C. personnel trained and remaining involved in cowpea research.	Same	H.C. students capable of fulfilling academic requirements at U.S. university.
Project Inputs: 1. CSU research personnel in H.C: U.S Project Leader, 2 graduate students on continuing basis, 1 P.C.volunteer agronomist. 2. CSU personnel on campus: Program administrator and part-time technical backstop. 3. H.C. research personnel: H.C.Project Leader, 2 graduate students on continuing basis. 1 Technical Assistant, 1/4 time R.O. in entomology and two 1/4 time assistants, 1/4 time R.O. in phytopathology and two 1/4 time assistants, clerical support and supplies. 4. H.C. administrative support: Program administrator. 5. DAR office/ laboratory facilities, suitable land & research facilities, equipment and materials, vehicle for official transportation.	Current project roster for personnel involvement. Availability of input resources recorded in progress reports.	Project files containing progress reports, annual reports, official correspondance and memo's, project expense accounting.	The negotiated project input resources to be sustained throughtout life of project. All positions on the project filled within reasonable time

CSU

Department of Agronomy
303/491-6517

Colorado State University
Fort Collins, Colorado
80523

May 4, 1984

Dr. Pat Barnes-McConnell, Director
Bean/Cowpea CRSP Management Office
200 Center for International Programs
Michigan State University
East Lansing, Michigan 48824

Dear Pat:

This letter is written in answer of your request concerning the Review and Extension Guidelines for the Bean/Cowpea CRSP. I doubt if it will be in your possession to be of any value. Sorry for the delay - just too many crises here!

1. Benefits to Host Country (Botswana) Agriculture -

Dr. C. J. deMooy, CSU Professor of Agronomy, has acquired over the years an outstanding reputation as an international agricultural scientist. His great expertise has provided a significant benefit to Botswana. Barbara deMooy, with a B.S. degree in Agronomy from CSU, has added a new dimension with her enthusiasm, vigor, and knowledge of agronomic practices and plant breeding methods. Karen Conniff, an American graduate student, will also provide valuable knowledge and competence to the program when she arrives soon. Dr. D. R. Wood, CSU bean breeder, is a scientist of great skills over a long and productive career. He serves as the campus backup for the project and has provided Dr. deMooy with needed information and materials.

2. Benefits to U.S. Agriculture -

Matching with CSU San Juan Research Center funds to identify chickpea (Cicer arietinum L.) germplasm as a new legume grain crop for southwestern Colorado. Chickpea yield data when compared to the dry bean (Phaseolus vulgaris L.) data have surprised us with the yield advantage toward the chickpea. Studies currently are in progress to study adaptation, seeding and stand establishment, and seedling emergence.

Dr. Pat Barnes-McConnell, Director
Page Two
May 4, 1984

The coordinating aspects of bean research in Washington, Idaho, and California are an important benefit to U.S. Agriculture. Germplasm is frequently and regularly exchanged among bean breeders.

Our researchers are studying factors important in cropping systems such as shading.

3. Extent to which your regular domestic research programs reinforce, complement, or otherwise relate to the goals of CSRP.

   Our research programs on beans have the specific objectives of developing new cultivars and identifying cultural practices for increased production in semi-arid regions.

4. Impact or influence of CSRP existence on your regular on-going domestic research program.

   There exists a stimulatory effect with colleagues involved on similar research problems. Also important is graduate-student training; it provides an international experience for which there is no substitute. It also stimulates the demand for increased course work locally in international agriculture. Students and faculty with CSRP experience exude enthusiasm for international agricultural activity which rubs off on inexperienced students. Another important aspect is the common use of excerpts from the CSRP Annual Report in teaching international agriculture at CSU.

5. Impact or influence of CSRP existence on your regular on-going international research program

   It adds to an increased understanding of cropping systems programs. It also enhances our status with IITA.

I hope these points can be used for your report. Don't write me off as always being as tardy as I was this time.

Regards.

Sincerely,

Wayne

W. F. Keim
Professor and Head

cs

Agency for
International
Development

Embassy of the United States of America
Post Office Box 90
Gaborone, Botswana
Tel. 53382 and 52401 Telex BD 2336

March 13, 1984

Dr. Pat Barnes-McConnell
Director
Michigan State University
Bean/Cowpea CRSP Management Office
200 Center for International
Programs
East Lansing, Michigan 48824

Dear Dr. Barnes:

Thank you very much for your letter of Febru
preparing a formal request to Washington for a three year extension of the CRSP FY 86 - FY 88, I would like to make the following comments on the performance of the Bean/Cowpea CRSP project in Botswana:

1. Opinion of CRSP Project

During the initial 18 months of the project, it has made an aggressive start on tackling all four areas of the project purpose as listed in the Log Frame. The severe drought experienced in Botswana during both growing seasons has hampered progress. During the 1982/83 season only 190 tons of beans/pulses were produced in all of Botswana, and for the present season, 1983/84, the tonnage is expected to be lower.

The outstanding achievements of the project to date are seen as: the initial results on trials of the short-season variety of ER 7, the collection and description of 180 local cowpea lines, and the satisfactory progress made in the training of host country nationals. The areas in which it is hoped improvements can take place include: the failure of the Agricultural Research Station to identify a local counterpart to the COP, the lack of entomological input and the marginal staffing given the ambitious research program of 11 different types of trials and 20 experiments.

2. Contribution to Development

Cowpeas could make a major contribution to improving nutrition in Botswana. Their potential as a drought and heat tolerant crop is only being realized with the good yields being demonstrated by the project with the short season varieties, and good start has been made on variety trials. Further work is needed on disease resistant early varieties, and additionally the degree of infestation with thrips was an unexpected problem encountered. Close cooperation with the Farming Systems projects will be needed to evaluate the economic returns to spraying if this is required.

The minimum tillage cultivator/planter which was developed in collaboration with EFSAIP and which reduced the number of draft animals required may have a major contribution to women farmers. They plan an important role in cowpea production and have been handicapped by lack of access to draft oxen and their inability to handle large teams. If an implement requiring only 2 oxen or 4 donkeys can be used on a wide variety of soils, it will have an impact on small farmers' practices.

3. The staff at the Agricultural Research Station have been pleased with the large number of research trials which have given useful data, especially in view of the limited staff working on the CRSP. Considerable ingenuity has been demonstrated by the CRSP team in overcoming constraints imposed by local conditions. Project staff have demonstrated their willingness to work long hours under difficult conditions to get results. The CRSP funding has enabled the project to break through locally imposed barriers to get results. The forceful use of innovative techniques to allow work to continue will always cause concern among other station staff who do not have access to these resources, and this has occurred at the Station.

A good start has been made towards the development of working relationships with some of the farming systems teams (FSR), and more emphasis needs to be placed on utilizing all the teams' resources. Consideration of the additional workloads imposed by the CRSP related trials, their costs and potential benefits should be further discussed among members of the FSR and CRSP teams, so that the most important foci can be determined. The cooperation of the FSR teams is essential if the economic and social aspects of cowpea production are to be given appropriate attention. The work with EFSAIP has given important initial results.

Excellent bridges have been built to the Field Staff (extension services) Many of the extension officers (AD's) have undertaken cooperative variety and insect control trials on farmers' fields. The training circulars and crop research bulletins developed by the Project will be useful documents. The importance of cowpeas as a drought resistant crop has been recognized by the AD's, and they will support any improved varieties or practices found by the CRSP project.

4. Appropriateness of Project Extension

No agricultural research can be expected to achieve widely applicable findings after only two seasons, and this is no exception. However, it has achieved important short-term goals and is making excellent progress on achieving longer-term goals. The potential returns to Botswana of developing a short season, disease and insect resistant cowpea variety could have an enormous impact on both nutrition and economic returns when produced as a cash crop. While the extreme drought conditions of the past 2 years are deplorable, they have demonstrated the ability of a 60 day cowpea to yield a crop when planted either early or late according to moisture conditions. This ability was not recognized in prior years and gives the cowpea an advantage over the less drought resistant and longer growing season crops. Another reason to extend the research is the wide acceptance of farmers in all areas of the country to growing cowpeas and their popularity in the diet. Beans and cowpeas are universally popular, with little preference being shown to varied seed coat colors or shapes. This means that high yielding varieties will not encounter consumer resistance, irrespective of their characteristics.

The work on cowpeas is seen as an important component to the Agriculture Technology Improvement Project in north-eastern Botswana. Cowpeas, with their potential to improve human nutrition, yield fodder crops for livestock, and give cash returns to farmers, can provide a three-pronged attack on Botswana's cropping problems.

Best Regards,

Anita Mackie

Dr. Anita Mackie
Agricultural Development
Officer

SUMMARY OF BEAN/COWPEA CRSP COSTS

Sub-Grantee: Botswana/CSU

	US CONTRIBUTION				TOTAL	TOTAL	Total
	AID Contri.	Spent in HC	Non-Federal Contri.	Total US Contri.	HC Contri.	US & HC Contri.	Spent in HC
Cumulative through Year 3 (9-30-83)	153,724	147,068	2,176	155,900	28,678	184,578	175,746
Estimated Year 4	192,626	73,922	47,300	239,926	18,445	258,371	92,367
Estimated Year 5	295,330	112,390	60,980	365,310	21,915	57,525	134,305
SUB-TOTAL INITIAL GRANT	641,680	333,380	110,456	752,136	69,038	500,574	402,418
Projected Year 6	193,230	96,357	32,291	225,521	18,760	244,281	115,117
Projected Year 7	208,690	104,060	34,877	243,567	20,260	263,827	124,320
Projected Year 8	225,385	112,380	37,668	263,053	21,880	284,933	134,260
SUB-TOTAL EXTENSION	626,305	312,797	104,836	732,141	60,900	793,041	373,697
TOTAL PROGRAM	1,268,985	646,177	215,292	1,484,277	129,938	1,293,615	776,115

6062B

Bean/Cowpea Collaborative Research Support Program
Sub-Grantee: Botswana/CSU

	Act Exp Thru Year 3	Est Exp Current Year 4	Est Exp Year 5	Total Initial Grant	Projected Year 6	Projected Year 7	Projected Year 8	Total Ext Request	Total Grant & Extension
Salaries	69,969	88,068	107,730	265,767	88,800	95,905	103,580	288,285	554,052
Fringe Benefits	10,350	9,052	8,950	28,352	9,130	9,860	10,650	29,640	57,992
Equip & Fac	8,907	7,774	21,980	38,661	7,840	8,470	9,145	25,455	64,116
Dom Travel	1,017	778	1,200	2,995	785	850	920	2,555	5,550
Intnl Travel	16,156	19,452	29,980	65,588	19,615	21,185	22,880	63,680	129,268
Materials & Supplies	2,213	2,767	14,260	19,240	2,795	3,020	3,260	9,075	28,315
Other Direct Costs	18,675	26,536	52,360	97,571	25,750	27,810	30,035	83,595	181,166
Total Direct Costs	127,287	154,427	236,460	518,174	154,715	167,100	180,470	502,285	1,020,459
Indirect Costs	26,437	38,199	58,870	123,506	38,515	41,590	44,915	125,020	248,526
Total Costs	153,724	192,626	295,330	641,680	193,230	208,690	225,385	627,305	1,268,985

Equipment and Facilities included in Extension Budget Request:

1. Irrigation Facilities--
   - Drill Hole $ 4,000
   - Pump & Assoc. Equipment - 6,000
   - $10,000
2. Toyota Land Cruiser Station Wagon - $13,000
3. Electronic Balance - $2,000

6026B

PROJECT REVIEW AND EXTENSION PLAN

BRAZIL • BOYCE THOMPSON INSTITUTE (Initiated October 1981) • COWPEAS
Roberts

INSECT PATHOGENS IN COWPEA PEST MANAGEMENT SYSTEMS FOR DEVELOPING NATIONS

INTRODUCTION

Insect pests are major constraints to production of cowpeas, a principal subsistence crop in poverty-stricken northeastern and northern Brazil. Insect pathogens are being examined as cowpea-pest management tools compatible and integrated with other insect control practices. These pathogens are particularly attractive for use in cowpea-insect-pest control because they are likely to be safer than most chemical insecticides. In addition, they can be produced within Brazil and other cowpea-producing nations without expenditure of hard currency. Both basic and applied studies are underway in Brazil and the United States. Surveys for diseased insects in Brazil have provided more than 100 fungal isolates for further investigations. Collaborative research projects have been established with scientists at the Brazilian Research Center for Rice and Beans (CNPAF) and with several other groups within Brazil. These activities have generated data and concurrently increased the Brazilian scientists' awareness of insect diseases. Approximately 35 Brazilians have received short-term, non-degree training by Boyce Thompson Institute staff in Brazil. Two post-B.S. persons have received long-term training in Brazil and three have received such training in the United States. One M.S. student from the US has commenced research on phenomena which will help in understanding the spread of insect diseases in Brazil.

YEARS ONE THROUGH THREE REFERENCE GUIDE

The information referred to here has been compiled in separate documents included in Sections I and III of this report.

Three-Year Progress Report

1983 Annual Report: See Section III, Technical Summary, page 18.

Research Publications and Presentations: See
Section III, Pulse Beat, Spring 1984, Insert, page 1.
Section III, Research Highlights Vol. 1, No. 3, 1984.

Project Evaluations

1983 Annual Report: See Section III, External Review Panel Report, page 15, and Follow-Up Chart Insert.

1983 Board of Directors Extension Rating: See Section I, page 25.

YEARS FOUR AND FIVE

Project objectives and US personnel remain unchanged. Outdoor trials will be conducted primarily in screenhouses where temperature and other factors can be carefully monitored. The search for new and/or more virulent entomopathogenic micro-organisms will be continued through surveys in Brazil and, if finances and other conditions permit, in West Africa following the October cowpea meeting in Nigeria. Training will include conducting a one-week course on insect pathology and microbial control in Brazil and completing preparations for a similar course in October, 1984 in Nigeria. Training of research interns (B.S. level) will continue in Brazil with the expectation that one or more of the interns will commence graduate training during the year. The US graduate student (Ph.D.) will commence field research on epizootiology of Erynia radicans in Fabae empoasca populations. Informal exchange of insect pathology information will continue with the Brazilian colleagues through discussions, collaborative research and visits. Overall, training may include more HC degree training as qualified candidates are developed through our non-degree (intern and short-course) programs in Brazil.

EXTENSION YEARS SIX THROUGH EIGHT

The original research plan is still satisfactory.

1. Develop insect pathogens as pest management tools compatible (integrated) with other insect control practices.

2. Train LDC scientists in insect pathology so they can function independently in microbial control projects in cowpeas and other crops.

3. The US PI will further strengthen his long-term ties with Brazil through his teaching, collaborative research and administrative activities in and in behalf of Brazil.

Adjustments from prior years:

1. The Brazilian researcher assigned recently as HC PI has more expertise in parasitic and predatory insects attacking pest insects than in microbial control; therefore, there will be a slight expansion of the project to accommodate his interests in what was originally designed as an insect pathology/microbial control project.

2. The title of the project restricts the work to cowpeas. Some of the target insects also occur on beans and some interesting insect pathogens have been found on beans. Accordingly, it is proposed that the project (and thus the title) be changed authorizing the inclusion of both beans and cowpeas in the research.

3. The project currently emphasizes insect control and, with the funds available, such emphasis seems appropriate. To include a major social science component as has been suggested, the financial support will require a significant increase to hire new staff with the appropriate expertise.

4. No additional change is anticipated in the HC. It is desirable to retain the Brazil/BTI project with no change in the US PI or institution. It would be possible, however, for the team to initiate a second related project, perhaps in Costa Rica or Mexico, if it is appropriate.

Log Frame Matrix

Narrative Summary	Objectively Verifiable Indicators	Means of Verification	Important Assumptions
Outputs: (1) Isolation, taxonomic determination, and screening of candidate microbial control agents.	Magnitude of Outputs: (1) A number of promising microbial control candidates are found which show potential for control of important cowpea pests.	(1) Data will be obtained from laboratory screening of microbes obtained from pathogen surveys in Brasil and elsewhere. Tests will utilize colonies of important cowpea pest insects established at IPRC (Brasil and Boyce Thompson Institute).	(1) Promising pathogens will be found and isolated.
(2) Identification and small scale production of efficacious pathogens.	(2) Small and large scale test plot applications are carried out and result in significant reductions in target insect pest populations.	(2) Data will be obtained from replicated insect control trials.	(2) Efficacious pathogens will be discovered.
(3) Development of cost effective, low technology, mass production and formulation methodologies.	(3) Sufficient quality is produced to meet demands of operational control programs.	(3) Control programs are carried out.	(3) Efficacious pathogens are economically mass reproducible by subsistence farmers or grower associations.
(4) Development of operational field application and/or introduction strategies (including rates, timing, and integration with other control methods).	(4) Field applications or introduction result in significant reductions in insect pest numbers thereby reducing crop damage and producing significant yield and quality increases.	(4) Data will be obtained from replicated yield and insect control trials and from surveys of small farms where microbial control methods are applied.	(4) a) Effective insect pest control can be achieved under the conditions of large scale, operational control programs. b) Small farmers are able and interested in working with technical extension personnel. c) Continued enthusiastic and effective technical and administrative leadership in Brasil.
(5) IPRC and working data base established, maintained, and operated by trained insect pathologists.	(5) High quality program of on-going research in the fields of insect pathology and microbial control established and maintained by Brasilian scientists.	(5) Published papers and reports.	(5) Training of students and technical staff is continued and excellence in scholarship is encouraged.

Log Frame Matrix

Narrative Summary	Objectively Verifiable Indicators	Means of Verification	Important Assumptions
Inputs: (1) Insect Pathology Resource Center, Boyce Thompson Institute, USA. Project leader/principal investigator, co-principal investigator, research associate (residing in Brasil), postdoctoral fellow, technical personnel, office, laboratory, greenhouse, and insect rearing facilities, field test plots, project vehicle (assigned to Brasil), and equipment and supplies. (2) CNPAF/EMBRAPA, Brasil. Corresponding principal investigator, three co-investigators, technical personnel, student and scientist trainees, office, laboratory, greenhouse, and insect rearing facilities, and field plots, equipment, and labor.	Inspection of current project roster to verify continued personnel involvement, and examination of annual reports to determine if facilities and other listed resources have been available to the project.	Annual project, budget, and trip reports.	(a) The present AID/USA and host country institution financial contributions are sustained at the planned level. (b) The positions listed under inputs in USA and host country will be sustained. (c) Administrative support will be sustained. (d) Student and scientist trainees will be available/involved in the project. (e) Facilities, resources, services and equipment listed under inputs will remain available and in working condition.

EMBASSY OF THE
UNITED STATES OF AMERICA
Brasilia, Brazil

February 24, 1984

Dr. Pat Barnes-McConnell
Michigan State University
Bean/Cowpea CRSP Management Office
200 Center for International Programs
East Lansing, Michigan 48824

Dear Dr. Barnes-McConnell:

In response to your letter of February 9, 1984 about the Bean/Cowpea CRSP Project, we feel that this project is well suited for Brazil and even more so now that the Brazilian Government is investing every effort in agriculture in order to improve and increase food production.

There are many important points in this project such as the exchange of information between Brazilian and American technicians as well as the training of Brazilian researchers. As a weakness we can point out that no phytopathology specialist has come so far.

This project is highly respected by Brazilian officials and its extension is necessary and recommended in order to meet its objectives since it started more than a year later than was planned.

If there is anything we can do please do not hesitate to contact us.

Sincerely,

R. Nonato Rocha Fº
Program Specialist

AGENCY FOR INTERNATIONAL DEVELOPMENT
AMERICAN EMBASSY
PASEO DE LA REFORMA No. 305
06500 MEXICO, D. F.

March 1, 1984

Pat Barnes-McConnell, Ph.D.
Director
Michigan State University
Bean/Cowpea CRSP Management Office
200 Center for International Programs
East Lansing, Michigan 48824

Dear Dr. Barnes-McConnell:

I am happy to respond to your letter of February 9 requesting comments with regard to the Bean/Cowpea CRSP projects. I was associated with the Bean/Cowpea CRSP in Brazil from the projects inception in that country; thus, my comments will be based on my perceptions of these projects.

1. In my opinion, the Bean/Cowpea CRSP projects in Brazil were and are highly effective mechanisms for the U.S. Government and U.S. universities to continue to have a positive influence on the direction of agricultural development in the more advanced developing countries such as Brazil, Mexico, and Colombia. The key to the success of the activities was the truly collaborative nature of the projects; i.e. the jointly planned projects were in areas of priority concern for the Brazilians and in most instances, the U.S. scientists worked as equals, not as "gringos" who dictated the terms of the research activities.

   One of the weaknesses of the project was that the lead institution sometimes went out on the street and hired scientists who were not previously associated with the university. These newly hired scientists often had problems in dealing with the administration of the lead institution. Another weakness was that some of the scientists, at least initially, did not have adequate Portuguese language training to begin working.

2. The projects' contribution to the host countries' development can be measured in terms of the specific outputs and scientific accomplishments. Besides the useful scientific information that has come out of the projects, which will help to increase the production of beans and cowpeas in Brazil and other LDC's, the projects also benefit the U.S.institutions by expanding their capability to conduct research overseas. It is my observation that most U.S. universities do not have the experience and expertise to assist overseas development activities unless key members of the staff have participated in developmental projects such as CRSPs. I view the CRSP project as a long-term investment in the development of the expertise and scientific process for sustained attention to development problems in the LDCs.

3. I have frequently discussed the Bean/Cowpea CRSP projects with the host country government officials and can say that "without exception" the Brazilians are most pleased with the CRSP activities and would welcome increased participation in research projects with U.S. universities.

4. I do not hesitate to recommend the extension of the Bean/Cowpea CRSP projects through FY 88.

Sincerely,

Sam Taylor

Samuel Taylor
AID Representative

ST:mc
cc: P. Farley, LAC/SA

SUMMARY OF BEAN/COWPEA CRSP COSTS

Sub-Grantee: Brazil/BTI

	US CONTRIBUTION				TOTAL	TOTAL	TOTAL
	AID Contri.	Spent in HC	Non-Federal Contri.	Total US Contri.	HC Contri.	US & HC Contri.	Spent in HC
Cumulative through Year 3 (9-30-83)	280,878	145,956	105,951	386,829	111,218	498,047	257,174
Estimated Year 4	194,490	80,126	43,040	237,050	46,000	283,050	126,126
Estimated Year 5	278,210	111,938	55,424	333,634	44,400	378,034	156,338
SUB-TOTAL INITIAL GRANT	753,578	338,020	204,415	957,993	201,618	1,159,611	539,638
Projected Year 6	240,685	106,395	44,764	285,449	42,100	327,549	148,495
Projected Year 7	261,540	115,705	48,612	310,152	45,800	355,952	161,505
Projected Year 8	284,065	125,763	52,768	336,833	49,700	386,533	175,463
SUB-TOTAL EXTENSION	786,290	347,863	146,144	932,434	137,600	1,070,034	485,463
TOTAL PROGRAM	1,539,868	685,883	350,559	1,890,427	339,218	2,229,645	1,025,101

6062B

Bean/Cowpea Collaborative Research Support Program
Sub-Grantee: Brazil/BTI

	Act Exp Thru Year 3	Est Exp Current Year 4	Est Exp Year 5	Total Initial Grant	Projected Year 6	Projected Year 7	Projected Year 8	Total Ext Request	Total Grant & Extension
Salaries	99,526	72,109	74,130	245,765	77,145	84,915	93,310	255,370	501,135
Fringe Benefits	13,135	7,244	9,170	29,549	9,765	10,545	11,390	31,700	61,249
Equip & Fac	17,532	12,622	34,500	64,654	17,045	18,410	19,880	55,335	119,989
Dom Travel	1,551	2,664	4,100	8,315	3,585	3,870	4,180	11,635	19,950
Intnl Travel	57,617	30,858	38,600	127,075	41,610	44,940	48,535	135,085	262,160
Materials & Supplies	25,831	15,654	24,000	65,485	20,980	22,660	24,475	68,115	133,600
Other Direct Costs	24,819	32,636	61,800	119,255	42,660	46,070	49,755	138,485	257,740
Total Direct Costs	240,011	173,787	246,300	660,098	212,790	231,410	251,525	695,725	1,355,823
Indirect Costs	40,867	20,703	31,910	93,480	27,895	30,130	32,540	90,565	184,045
Total Costs	280,878	194,490	278,210	753,578	240,685	261,540	284,065	786,290	1,539,868

Equipment included in Extension Budget Request:
1. Fiat Station Wagon--alcohol burning - $6,500
2. WILD Dissecting Microscope & Assoc. Equip. - $6,000

0268

PROJECT REVIEW AND EXTENSION PLAN

BRAZIL • UNIVERSITY OF WISCONSIN (Initiated February 1982) • BEANS
Bliss

IDENTIFICATION OF SUPERIOR BEAN-RHIZOBIA COMBINATIONS FOR UTILIZATION IN CROPPING SYSTEMS SUITABLE TO SMALL FARMS IN BRAZIL

INTRODUCTION

The technical objectives include selection of superior bean plants and *Rhizobium phaseoli* strains for enhanced biological nitrogen fixation (BNF) and studies of factors limiting BNF in field plantings of beans in Brazil. Breeding lines and Brazilian cultivars of different market types which show good nodulation and fixation have been identified in field trials. Superior lines are being studied in monoculture and relay cropping with maize. Isolates of *R. phaseoli* were collected from Brazilian sites and are being evaluated at Michigan State University (MSU) for superior fixation and at the Brazilian Research Center for Rice and Beans (CNPAF) for competitive ability.

Experimental results suggest that the superior bean selections can fix at least 30-40 Kg/ha of nitrogen, which is adequate to produce commercially acceptable seed yields on small farms that employ traditional cropping systems. Scientists at CNPAF are working with Brazilian farmers to promote use of rhizobium inoculum for bean production, which will facilitate acceptance and performance of superior new high fixing cultivars when they become available.

Under the auspices of this project, one Brazilian and one Tanzanian student are currently enrolled in M.S. degree programs at the University of Wisconsin (UW). A second Brazilian has received training in rhizobiology at MSU. In addition, eighteen students from other Bean/Cowpea CRSP projects took part in a workshop on BNF at UW during July 1983.

YEARS ONE THROUGH THREE REFERENCE GUIDE

The information referred to here has been compiled in separate documents included in Sections I and III of this report.

Three-Year Progress Report

1983 Annual Report: See Section III, Technical Summary, page 25.

Research Publications and Presentations: See Section III, Pulse Beat, Spring 1984, Insert, page 1.

Project Evaluations

1983 Annual Report: See Section III, External Review Panel Report, page 17, and Follow-Up Chart Insert.

1983 Board of Directors Extension Rating: See Section I, page 25.

YEARS FOUR AND FIVE

The long-range goal and overall objectives of this project will remain unchanged. In research, the following areas will be emphasized:

1. Breeding of important classes of Brazilian beans, e.g. black, carioca, rosinha etc., for enhanced BNF potential and yield performance.

2. Identification of superior indigenous strains of *R. phaseoli* for inoculation of superior new lines.

3. Performance of superior bean/rhizobia combinations under prevailing cropping systems, e.g. maize/bean, relay, etc.

4. Determination of environmental/physical/biological factors that restrict yield potential of beans grown in specific production systems.

Training will continue in three areas; graduate degree training in plant breeding, post-graduate non-degree training in rhizobiology. Workshops in the US and Brazil will stress methodology in breeding and testing aimed at improving field performance of beans inoculated with rhizobia.

EXTENSION YEARS SIX THROUGH EIGHT

Breeding research will be aimed at combining high levels of BNF potential with other traits, e.g. disease resistance, yield stability into popular well-adapted local cultivars. Primary focus will continue to be in Brazil, but work with other CRSP Host Countries will receive more attention.

Identification and use of superior *R. phaseoli* strains will receive more emphasis as better hosts are identified.

The primary thrust in training at the graduate degree level will likely be of students from CRSP projects, particularly in breeding and to a lesser extent in rhizobiology. Additional workshops will be conducted in the US and in various CRSP Host Countries to provide guidance for improving N_2-fixation in ongoing bean/cowpea breeding programs.

Log framework Matrix - University of Wisconsin/Brazil - N_2-Fixation/Bliss
July 1982

Narrative Summary	Objectively Verifiable indicators	Means of Verification	Important Assumptions
rogram or Sector Goal: ncrease production of dry beans vailable to small/subsistence armers.	Measure of Goal Achievements Yields of dry beans on small farms with low nitrogen soils will increase without use of N fertilizer. Improved breeding lines will be released by 1988.	(1) Comparisons of yields of new cultivars with old cultivars on small farms with low soil N. (2) Improvement of other bean lines in National program, Bean/cowpea CRSP projects, CIAT etc. for BNF. (3) Improved availability of food beans to small farmers	Assumptions for achieving goal targets: (1) Needs for dry beans produced on small farms with increase or remain the same. (2) Beans will continue to be produced on poor soils. (3) Cost of N fertilizer will increase or remain high. (4) Incentives for bean production are positive (5) Continuing market at attractive prices remains.
oject Purpose:) Increase dry bean production on nitrogen-poor soils without reliance on chemical fertilizer) Develop methods that allow plant breeders to incorporate selection for N_2-fixation into improvement programs.) To educate/train Brazilian scientists in plant breeding and rhizobiology.) To elucidate the plant/rhizobia and ecological factors that limit and/or enhance N_2-fixation.	Conditions that will indicate purpose has been achieved: (1) Incorporation of enhanced BNF traits into Brazilian regional cultivars, e.g. blacks, carioca, whites, canario will lead to increased yields on low N fields. (2) Other bean breeders in Bean/cowpea CRSP and National programs select for enhanced BNF. (3) Brazilian students begin advanced training.	(1) Demonstration of value of enhanced BNF in improved cultivars in trials at experiment stations and demonstration plots and on small farms. (2) Use of cultural practices/new cultivars to enhance BNF. (3) Brazilian students complete training.	Assumptions for achieving purpose: (1) Low soil N fertility continues to be a major problem. (2) Other limiting factors e.g. pest resistance are minimized by other research. (3) Effective interaction between CRSP components continues. (4) Budget becomes more predictable.

<u>Outputs</u>: (1) Identification of new plants with enhanced BNF potential. (2) Production of new breeding lines and cultivars with enhanced BNF potential and adapted to Brazil. (3) New methodology to allow bean breeders to select routinely for enhanced BNF. (4) Improved knowledge of agronomic/ecological factors that reduce/increase BNF under small farm conditions. (5) Brazilian breeders/microbiologists trained in N_2-fixation research.	<u>Magnitude of outputs</u>: (1) Yields of new cultivars without added N fertilizer are 90% of old cultivars with added N fertilizer. (2) Reduced amounts of N fertilizer required for bean production. (3) Cultural practices for intercropping are developed that enhance BNF and yields of beans grown with corn. (4) Complete training of Brazilian students.	(1) Yield and production data obtained from trials demonstration plots, farmers fields to show superiority of new lines over standard cultivars. (2) Comparison to baseline data.	<u>Output Assumptions</u>: (1) Continued enthusiastic and effective cooperation between U.S. and Host country personnel. (2) Interest in cooperation by/with small farmers. (3) Interchange with breeders/agronomists at CNPAF and within CRSP continue.
<u>Inputs</u>: (1) Univ. of Wisconsin. Project leader/Principal Investigator. Lab, greenhouse, fields. Research Associate in residence in Brazil (2) Michigan State Univ. Project sub-principal investigator, labs. (3) CNPAF, Brazil. H.C. Principal Investigator. National program personnel. Support for student trainee (1983-1986). Office, lab, research facilities, transportation in Brazil. Cooperation with other BNF researchers and extension personnel.	Use of project reports, budgets, etc. to determine ongoing input.	Annual Project Budget and trip reports.	<u>Input Assumptions</u>: (1) AID/U.S. and H.C. financial and technical contributions remain at planned levels. (2) Administrative support remains consistent. (3) U.S. Research Associate will work in Brazil 1983-1985. (4) Brazilian student training completed as planned. (5) Interaction between CRSP and National Programes is effective.

University of Wisconsin-Madison

Department of Horticulture
1575 Linden Drive
Madison WI 53706
(608) 262-1490

April 25, 1984

Dr. Pat Barnes-McConnell
Michigan State University
Bean/Cowpea CRSP Management
200 Center for International Programs
East Lansing, MI 48824

Dear Dr. Barnes-McConnell:

I was pleased to have the opportunity to discuss with you the information requested concerning the Triennial Review and Three-Year Extension. As you are well aware, I am new in the role of CRSP Institutional Representative and have some difficulty in providing you with accurate answers to your five-part question. Dr. Bob Hougas would have been helpful because of his previous commitment to this position, however he is presently unavailable. Dr. Ken Shapiro was also out-of-town, although he indicated a willingness to participate on behalf of the University of Wisconsin. Thus, the following represents an attempt to develop a response based on interaction with Drs. Bliss and Hagedorn.

The response will be in the order stated in your letter of March 6 and reflects collectively on the Wisconsin projects.

1. Benefits to host country agriculture.

Much of the land on which beans are grown is among holdings of small-scale landowners. Frequently the mineral nutrition status of these areas is poor, particularly with regard to nitrogen. Depending on other factors such as pH, other elements may be either insufficient (e.g. phosphorus) or in excess (e.g. aluminum). Improvement of the biological nitrogen fixation (BNF) potential of beans is an attractive approach to minimizing a yield constraint without the added need for expensive fertilizer, particularly where fertilizer may be too expensive or difficult to obtain.

Increasing the potential for BNF of bean cultivars adapted to Brasilian small farm conditions will reduce the need for fertilizer (N) while simultaneously raising the potential for increased yields. However, preliminary research results suggest that some genotypes may respond to added N in situations where fertilization is feasible and/or desirable. It must be emphasized that the maximum potential of enhanced BNF will be realized when it is combined with other desirable traits, e.g. high yields, disease resistance, improved nutritional quality.

The host country will also benefit from the development of improved techniques that allow identification of germplasm with multiple disease resistance. Disease resistance will be necessary to reach maximum yield and quality potentials.

These research projects will provide the host country with the trained scientists, information, plant materials and rhizobial strains to allow continued effective breeding for. enhanced BNF in the national and regional programs.

2. Benefits to U.S. agriculture.

Currently the BNF research program is the only U.S. program directed specifically at breeding beans for enhanced potential. In fact there are few other breeding programs of such objectives for any of the grain legumes including soybean.

Success of this breeding effort will allow U.S. bean breeders to obtain breeding lines with enhanced potential for BNF. If these traits are incorporated into commercial bean cultivars, our estimates suggest that fertilizer N requirements for dry bean production could be reduced by at least one-half, depending on local growing conditions.

Likewise the development of improved techniques for screening for multiple disease resistance provides for increased stability of bean germplasm across environments. Ultimately this translates to greater yields.

3. The UW domestic research programs interface directly with the goals of the CRSP projects and probably indirectly with several others. Students work on inter-related projects with complementary goals.

4. The impact of CRSP existence on regular on-going domestic research program is both positive and negative.

Because of the CRSP, we have broader programs that encompass more problems and opportunities. We also have the opportunity to breed for a broader range of growing conditions.

The biggest negative influence is the incredible amount of paper work required for the rather modest (net) research support. The domestic programs move much faster than the CRSP project with less time requirements.

5. The impact of CRSP on our international research program is rather minimal, since our programs are extensive and multi-faceted without CRSP and it really hasn't changed them much.

Additional documentation regarding the research programs of Bliss and Hagedorn have undoubtedly been presented at the time of their involvement in CRSP and also in subsequent reviews. Therefore, we do not have anything to add at this time. Suffice it to say that the programs are indeed productive and the relationship between them and CRSP projects mutually beneficial. Finally, your office is well aware of any "issues and problems" pertaining to UW/CRSP projects. Your recent report on the Bean/Cowpea CRSP project documents very clearly a problem area.

A copy of this report is going to Dr. Ken Shapiro, Director for International Affairs. I am sure Dr. Shapiro will contact you directly in the event he wants to change or add to the contents of this letter.

Thank you.

Sincerely,

R. L. Lower
Chairman

RLL/jea

cc: Ken Shapiro

EMBASSY OF THE
UNITED STATES OF AMERICA
Brasilia, Brazil

February 24, 1984

Dr. Pat Barnes-McConnell
Michigan State University
Bean/Cowpea CRSP Management Office
200 Center for International Programs
East Lansing, Michigan 48824

Dear Dr. Barnes-McConnell:

In response to your letter of February 9, 1984 about the Bean/Cowpea CRSP Project, we feel that this project is well suited for Brazil and even more so now that the Brazilian Government is investing every effort in agriculture in order to improve and increase food production.

There are many important points in this project such as the exchange of information between Brazilian and American technicians as well as the training of Brazilian researchers. As a weakness we can point out that no phytopathology specialist has come so far.

This project is highly respected by Brazilian officials and its extension is necessary and recommended in order to meet its objectives since it started more than a year later than was planned.

If there is anything we can do please do not hesitate to contact us.

Sincerely,

R. Nonato Rocha F°
Program Specialist

AGENCY FOR INTERNATIONAL DEVELOPMENT
AMERICAN EMBASSY
PASEO DE LA REFORMA No. 305
06500 MEXICO, D. F.

March 1, 1984

Pat Barnes-McConnell, Ph.D.
Director
Michigan State University
Bean/Cowpea CRSP Management Office
200 Center for International Programs
East Lansing, Michigan 48824

Dear Dr. Barnes-McConnell:

I am happy to respond to your letter of February 9 requesting comments with regard to the Bean/Cowpea CRSP projects. I was associated with the Bean/Cowpea CRSP in Brazil from the projects inception in that country; thus, my comments will be based on my perceptions of these projects.

1. In my opinion, the Bean/Cowpea CRSP projects in Brazil were and are highly effective mechanisms for the U.S. Government and U.S. universities to continue to have a positive influence on the direction of agricultural development in the more advanced developing countries such as Brazil, Mexico, and Colombia. The key to the success of the activities was the truly collaborative nature of the projects; i.e. the jointly planned projects were in areas of priority concern for the Brazilians and in most instances, the U.S. scientists worked as equals, not as "gringos" who dictated the terms of the research activities.

   One of the weaknesses of the project was that the lead institution sometimes went out on the street and hired scientists who were not previously associated with the university. These newly hired scientists often had problems in dealing with the administration of the lead institution. Another weakness was that some of the scientists, at least initially, did not have adequate Portuguese language training to begin working.

2. The projects' contribution to the host countries' development can be measured in terms of the specific outputs and scientific accomplishments. Besides the useful scientific information that has come out of the projects, which will help to increase the production of beans and cowpeas in Brazil and other LDC's, the projects also benefit the U.S.institutions by expanding their capability to conduct research overseas. It is my observation that most U.S. universities do not have the experience and expertise to assist overseas development activities unless key members of the staff have participated in developmental projects such as CRSPs. I view the CRSP project as a long-term investment in the development of the expertise and scientific process for sustained attention to development problems in the LDCs.

3. I have frequently discussed the Bean/Cowpea CRSP projects with the host country government officials and can say that "without exception" the Brazilians are most pleased with the CRSP activities and would welcome increased participation in research projects with U.S. universities.

4. I do not hesitate to recommend the extension of the Bean/Cowpea CRSP projects through FY 88.

Sincerely,

Samuel Taylor
AID Representative

ST:mc
cc: P. Farley, LAC/SA

SUMMARY OF BEAN/COWPEA CRSP COSTS

Sub-Grantee: Brazil/Bliss

	US CONTRIBUTION				TOTAL	TOTAL	Total
	AID Contri.	Spent in HC	Non-Federal Contri.	Total US Contri.	HC Contri.	US & HC Contri.	Spent in HC
Cumulative through Year 3 (9-30-83)	72,273	24,058	19,037	91,310	5,293	96,603	29,351
Estimated Year 4	142,685	65,007	29,300	171,985	14,300	186,285	79,307
Estimated Year 5	228,370	99,472	42,965	271,335	21,800	293,135	121,272
SUB-TOTAL INITIAL GRANT	443,328	188,537	91,302	534,630	41,393	576,023	229,930
Projected Year 6	78,570	42,141	12,143	90,713	9,300	100,013	51,441
Projected Year 7	82,455	43,905	12,850	95,305	9,700	105,005	53,605
Projected Year 8	86,650	45,815	13,612	100,262	10,200	110,462	56,015
SUB-TOTAL EXTENSION	247,675	131,861	38,605	386,542	29,200	415,742	161,061
TOTAL PROGRAM	691,003	320,398	129,907	820,910	70,593	891,503	390,991

6062B

Bean/Cowpea Collaborative Research Support Program
Sub-Grantee: Brazil/Bliss

	Act Exp Thru Year 3	Est Exp Current Year 4	Est Exp Year 5	Total Initial Grant	Projected Year 6	Projected Year 7	Projected Year 8	Total Ext Request	Total Grant & Extension
Salaries	20,743	45,011	46,360	112,114	43,430	44,665	46,000	134,095	246,209
Fringe Benefits	1,591	4,956	7,640	14,187	3,700	3,835	3,980	11,515	25,702
Equip & Fac	2,906	20,686	46,900	70,492	7,095	7,660	8,275	23,[illegible]30	93,522
Dom Travel	2,708	3,638	5,600	11,946	1,245	1,345	1,450	4,040	15,986
Intnl Travel	3,357	9,460	14,600	27,417	3,250	3,510	3,790	10,550	37,967
Materials & Supplies	13,746	9,875	20,200	43,821	3,380	3,650	3,940	10,970	54,791
Other Direct Costs	10,809	18,152	39,430	68,391	5,880	6,350	6,860	19,090	87,481
Total Direct Costs	55,860	111,778	180,730	348,368	67,980	71,015	74,295	213,290	561,658
Indirect Costs	16,413	30,907	47,640	94,960	10,590	11,440	12,355	34,385	129,345
Total Costs	72,273	142,685	228,370	443,328	78,570	82,455	86,650	247,675	691,003

6026B

PROJECT REVIEW AND EXTENSION PLAN

BRAZIL • UNIVERSITY OF WISCONSIN (Initiated June 1982) • BEANS
Hagedorn

IMPROVED TECHNIQUES FOR DEVELOPMENT OF MUTLIPLE DISEASE RESISTANCE IN BEANS

INTRODUCTION

In Wisconsin, forty-four experiments were conducted in the laboratory, greenhouse and field to develop the techniques needed for the use of naturally-produced dry inoculum of the bean pathogens inciting anthracnose (*Colletotrichum lindemuthianum*), angular leaf spot (*Isariopsis griseola*), common blight (*Xanthomonas phaseoli*) and rust (*Uromyces phaseoli*). As a result, methods have been discovered which demonstrate how to produce, collect, store, quantify and apply dry inoculum. Also, accurate techniques were devised for assessing disease severity. These very promising results need confirmation. In Brazil, field experiments using bean pathogen inoculum from several sources gave less promising results. However, progress was made toward project goals, especially with regard to studies on the disease reaction of collections of bean lines to anthracnose, angular leaf spot and rust. Good resistance was discovered in several bean lines. The techniques for more efficiently determining the reaction of beans to common devastating diseases give hope that breeders will be able to develop more expeditiously new disease resistant beans. Bean production, especially for the subsistence farmer, will be substantially increased and stabilized.

YEARS ONE THROUGH THREE REFERENCE GUIDE

The information referred to here has been compiled in separate documents included in Sections I and III of this report.

Three-Year Progress Report

1983 Annual Report: See Section III, Technical Summary, page 33.

Research Publications and Presentations: See
Section III, Pulse Beat, Spring 1984, Insert, page 2.

Project Evaluations

1983 Annual Report: See Section III, External Review Panel Report, page 19,
and Follow-Up Chart Insert.

1983 Board of Directors Extension Rating: See Section I, page 25.

YEARS FOUR AND FIVE

The 1983 ERP evaluation judged this project to be less than satisfactory and in need of major changes. To address the issues raised, new US and HC PIs have been named and a new plan of work developed which should more directly address CRSP needs relative to multiple disease resistance techniques. The new plan of work follows.

WORKPLAN - BRAZIL/UNIVERSITY OF WISCONSIN (REVISED MAY 9, 1984)

Douglas P. Maxwell, PI-designate
Donald J. Hagedorn, Researcher
Almiro Blumenschein, Host Country Administrator

Introduction

Several bean diseases, including anthracnose, angular leaf spot, common blight, rust, common mosaic, and golden mosaic seriously limit bean production in Brazil and Latin America. The best bean disease control strategy for these areas is the development of multiple resistant cultivars, but such a task is long and laborious if plants are only tested against one pathogen at a time. If plants could be challenged by more than one pathogen in a single generation, however, more rapid and efficient screening of germplasm would be achieved. The identification of resistant genes would subsequently accelerate, and bean breeders could develop cultivars with multiple disease resistance more expeditiously. The resistant varieties, so desperately needed in these areas, would then become available to subsistance farmers sooner.

Before germplasm can be screened against multiple pathogens, superior techniques for multiple disease testing must be developed for greenhouse use. Improved techniques for testing progeny in the field must also be perfected so that lines with multiple disease resistance are assured. Monitoring of pathogen variability and environmental influence on disease development must also be accomplished so better methods for detecting rate reducing resistance and improved strategies for gene deployment are achieved.

Objectives

I. Development of techniques for multiple disease testing of germplasm under controlled conditions.

Prior research done by Dr. Josias Faria at the University of Wisconsin has indicated that bean seedlings can be inoculated simultaneously with *Uromyces phaseoli* (UP) and *Xanthomonas campestris* pv. *phaseoli* (XCP) and evaluated accurately for resistance to both, even though optimum conditions for disease development for the two pathogens are different. Further work also showed that seedlings could be inoculated simultaneously with UP, XCP, and *Isariopsis griseola* (IG) without interfering with the assessment of the disease reaction. Current work has indicated that although selected combinations of the above pathogens (UP and XCP, XCP and IG, and UP and IG) may be inoculated simultaneously on one plant without interference, sequential inoculations may lead to reduced symptom expression. Therefore, the development of reliable techniques for multiple disease testing requires careful experimentation to determine the effects of simultaneous versus sequential inoculations on disease reactions. In addition, the proper sequence of pathogens, the most effective inoculum levels, the correct placement of inoculum on leaves, and the optimum conditions for post-inoculation also need to be determined by experimentation before a multiple inoculation scheme is recommended.

II. Development of methods for field screening of germplasm with selected pathogens.

Improved methodologies for disease screening are being integrated for use in the field and include the use of selected sites at locations where specific diseases naturally occur, the effective use of spreader rows, the use of naturally-occurring or dry inoculum, the use of seed inoculation techniques, and the modification of management practices to create epiphytotics at the site. The following describes efforts in progress for each pathogen:

For Colletotrichum lindemuthianum, anthracnose testing plots have been established at Pelotas, RGS and Irati, Parana; naturally-occurring inoculum has been used effectively in plots in Wisconsin; high relative humidity (RH) for infection and disease development was obtained for plots in Wisconsin by using an early seeding date, high plant densities, and frequent overhead irrigation; spreader row effectiveness is currently being studied by workers in Goiania.

For Isariopsis griseola, an angular leaf spot testing plot has been established at Goiania; naturally-occurring inoculum has been used very successfully in plots in Wisconsin; dry inoculum produced in the laboratory on vermiculite-cornmeal mixtures will be tested for efficacy during the coming field season by workers in Madison.

For Xanthomonas campestris pv. phaseoli, a common blight testing plot has been established at Goiania where spreader row effectiveness is now being studied by researchers using infected seed of susceptible lines; also, seed inoculation has been studied by workers in Madison but with only partially-successful results.

For bean golden mosaic virus (BGMV), and bean common mosaic virus (BCMV), disease testing plots have been established at Rio Verde, Gois and Goiania, respectively. Spreader row research will be emphasized for BGMV and BCMV since insects vector these diseases

III. Determination of pathogen variability.

Collections of isolates of all six pathogens have been made this past year by workers in Goiania and races determined for rust, anthracnose and angular leaf spot. Races of these pathogens will be monitored yearly to determine which races are the most common and if there is a shift in race populations.

IV. Environmental influence on disease development.

Optimum environmental conditions reported for infection and disease development are already known for Colletotrichum, Xanthomonas, Uromyces, and BCMV, and have been confirmed by workers in Madison. However, since contradictory reports exist for Isariopsis, a temperature series was used to determine whether temperature requirements for infection and disease development are different. The conclusion of the study was that although cooler temperatures favor infection and warmer temperatures favor disease development. Additional studies will include the influence of environmental factors on simultaneous and sequential inoculation experiments.

V. Development of methodologies for evaluating rate reducing resistance.

Since numerous races of rust, angular leaf spot, and anthracnose have been detected in Brazil, it is important to investigate the possible use of rate-reducing resistance which may demonstrate greater durability. Reduced infections efficiency, longer latent period, or reduced sporulation capacity are possible traits to be identified and selected. The techniques to be developed would center on the optimum conditions required for assessing these various characteristics. In order to select for rate-reducing resistance, a race with all known virulence genes or a composite of all known races must be used. The results of the pathogen variability studies described above would be incorporated into this study. The field inoculation procedures developed would be used to select the traits listed above or for yield in this project on a single plant basis in a "land race" inoculated with a diverse composite of races. Small plot areas would be utilized so that environmental effects would be minimized.

VI. Development of strategies for resistance gene deployment for control of diseases with multiple races.

Resistance gene deployment strategies require a thorough understanding of (i) the variability for virulence genes in the pathogen population, (ii) prevalence of the sexual cycle, (iii) environmetal conditions required for an epidemic to occur and (iv) the genetic diversity and distribution of the host. Different sources of resistance must also be cataloged. Once the above factors are known, a strategy can be developed to use temporal or spacial deployment of resistance genes in order to reduce selections for new virulence genes for widely cultivated cultivars.

The number of tests will depend on the inheritance genetics of the parent-pathogen combination involved. Also, these techniques could be used to determine the disease reaction of more advanced generation beans which perform in superior manner in the field, or to test the disease reaction of a limited number of promising germplasm accessions from other bean breeding programs such as the one at CIAT.

Large numbers of bean accessions may more efficiently be tested in the field where they will be naturally inoculated by pathogens in spreader rows. The effective use of spreader rows for this purpose requires: (1) timely, uniform and severe infection of the plants in the spreader rows; (2) an adequate number and proper placement of the spreader rows so all test lines are similarly exposed to pathogen inoculum; (3) proper environmental conditions. The use of overhead irrigation would greatly aid this research approach.

Collaboration With Other Scientists

Since CNPAF has general responsibility for coordination of the National Bean Program, this will provide an extensive opportunity for collaboration between CRSP scientists and other scientists in Brazil.

As indicated in previous reports, Dr. D. J. Hagedorn has established professional linkages with plant pathologists and bean breeders at CIAT, Cali, Colombia, Drs. S. K. Mohan and T. Mohan at IAPAP, Parana, Brazil, scientists at University of Puerto Rico and MITA, Drs. J. Steadman and D. Coyne, University of Nebraska, and Dr. M. J. Silbernagel, USDA, Prosser, WA. Besides these contacts, informal discussions have occurred with many other bean pathologists and breeders.

It is proposed in the continuation of this project that additional interactions will occur with other plant pathologists in our Department. Dr. Paul H. Williams has an international reputation in the area of development of techniques for evaluation of multiple disease resistance in cucumber. Methodologies are currently available for evaluation of over five pathogens at the seedling stage. His previous experience will be of immense value as we evaluate methodologies for detection of multiple disease resistance germplasm in beans. Dr. Albert H. Ellingboe has devoted his professional career to an understanding of the genetics of host-parasite interactions. He will be available for consultation on methods for detection of rate reducing resistance and strategies for gene deployment. Additionally, Dr. Luis Sequeira has been involved in breeding beans and potatoes for resistance to bacterial diseases in Central and South America.

Training Component of the Project

It is proposed that a Short Course or Workshop on "Bean Breeding for Multiple Disease Resistance" be organized and presented at CNPAF. It would consist of 6-10 days of lectures, discussions, demonstrations and field trips for the 10-15 young scientists who would attend from Brazil, Latin America or Africa. Instructors would include CNPAF plant breeders and plant pathologists, other Brazilian scientists, and CRSP project collaborators. Hopefully, CRSP funds could provide board and room and a substantial portion of the needed travel expense.

Training of CNPAF scientists at the University of Wisconsin is proposed whereby such persons would receive classroom and research training for 9-12 months in close association with the CRSP scientists in Madison. In some cases a shorter, more intense, research training could involve CNPAF scientists working in Madison for 1-2 months.

Besides the training of Brazilian scientists, it is proposed that a USA postdoctoral person be stationed at CNPAF to work as part of the research team on this project. This person should have experience in breeding for disease resistance.

Justification for Development of Dry Inoculum for Selected Pathogens

The use of dry inoculum can greatly facilitate the evaluation of germplasm for disease resistance in certain instances. The main advantages for using dry inoculum are (i) that it can be produced without specialized laboratory equipment, (ii) that it is easily transportable, (iii) that it is easily stored for long periods of time, (iv) that the pathogen applied is virulent and has not lost virulence due to subculturing in the laboratory and v) that it may have greater versatility in the field where environmental conditions favorable for spore germination and/or infection do not always prevail immediately after inoculation. Besides preparation of dry inoculum from infected leaves, it may be possible to increase some of the pathogens on artificial culture medium, e.g., a vermiculite-cornmeal medium, which can subsequently be dried and powdered. In many developing countries, dry inoculum may be the only type of inoculum of practical use if laboratory facilities are not available for preparations of conidial or cell suspensions in the traditional manner.

This project will evaluate several alternate methods for the preparation, application and storage of dry inoculum. Most of the initial experimentation will be completed at the University of Wisconsin and only the final stages of testing will be done in the Host Country. It is anticipated that cooperative arrangements with other scientists on the CRSP bean breeding projects will be made so that these dry inoculum methods can be evaluated in several countries.

Log Frame Matrix-Univ. of Wis. Hagedorn/Brazil
August 1982

Narrative Summary	Objectively Verifiable Indicators	Means of Verification	Important Assumptions
Program or Sector Goal: Increase quality and productivity of dry bean lines available to small farmers in developing countries.	Measures of Goal Achievements Yield and quality of bean lines, available to small farm families through national programs, will increase.	Comparison of yields, under farm conditions, of new beans with baseline data.	Assumptions for Achieving Goal Targets: Small farmers will continue to be interested in growing beans for consumption and sale.
Project Purpose: Develop reliable and efficient field and greenhouse methods to identify resistance to 6 major pathogens.	Conditions that will Indicate Purpose has been Achieved: Efficient multiple disease resistance screening methods are adopted and used by bean improvement researchers at international and national centers for bean improvement in developing countries.	Communication with and visits to bean improvement centers in developing countries.	More efficient multiple disease resistance screening methods will allow bean improvement centers to make faster gains in developing and releasing new beans which will yield better under pervasive severe disease pressure.
Outputs: 1) Organize a collection of bean lines and pathogen isolates to use in developing screening methods. 2) Develop inoculation methods, and determine environal influences, necessary to observe reactions of beans to several pathogens in field and greenhouse. 3) Locate effective disease-testing sites in Brazil. 4) Study variability of bean pathogens. 5) Provide PhD training to Brazilian student in plant pathology.	Magnitude of Outputs: Researchers at UW and CNPAF, using a diversity of bean lines and pathogen isolates at selected field sites and in greenhouses, have procedures in hand for identifying multiple resistance to major bean pathogens.	A nursery of bean lines, whose reaction to 6 pathogens are known, will be tested at various field and greenhouse sites by the methods developed, and their performance there compared with their known reactions.	Output Assumptions 1) Studying disease reaction of a diversity of bean lines to various isolates of the pathogens undo controlled conditions will result in an efficient method for multiple disease resistance screening. 2) Disease testing sites at Goiania and elsewhere in Brazil will be available.

Narrative Summary	Objectively Verifiable Indications	Means of Verification	Important Assumptions
			for use in this research. 3) PhD training of a Brazilian student will increase expertise for multiple disease resistance research at EMBRAPA/CNPAF.
Imputs: 1) University of Wisconsin Project leader/PI Breeding Collaborator Research Associate Technical personnel Lab, greenhouse, growth chamber and field facilities. 2) CNPAF Co-investigators Lab, screenhouse, greenhouse and field facilities Technical personnel PhD student. 3) Collaborators at CIAT, MITA, University of Nebraska	Continued involvement of project leader and co-investigators in the research, and good support including technical personnel, equipment, supplies, travel, etc.	Annual project, budget and trip reports.	1) Funding for investigators, students, facilities, travel, and technical personnel will continue as planned. 2) PhD student will be available and pursue studies at University of Wisconsin. 3) Co-operation and frequent communication between University of Wisconsin and CNPAF will continue.

University of Wisconsin-Madison

Department of Horticulture
1575 Linden Drive
Madison WI 53706
(608) 262-1490

April 25, 1984

Dr. Pat Barnes-McConnell
Michigan State University
Bean/Cowpea CRSP Management
200 Center for International Programs
East Lansing, MI 48824

Dear Dr. Barnes-McConnell:

I was pleased to have the opportunity to discuss with you the information requested concerning the Triennial Review and Three-Year Extension. As you are well aware, I am new in the role of CRSP Institutional Representative and have some difficulty in providing you with accurate answers to your five-part question. Dr. Bob Hougas would have been helpful because of his previous commitment to this position, however he is presently unavailable. Dr. Ken Shapiro was also out-of-town, although he indicated a willingness to participate on behalf of the University of Wisconsin. Thus, the following represents an attempt to develop a response based on interaction with Drs. Bliss and Hagedorn.

The response will be in the order stated in your letter of March 6 and reflects collectively on the Wisconsin projects.

1. Benefits to host country agriculture.

Much of the land on which beans are grown is among holdings of small-scale landowners. Frequently the mineral nutrition status of these areas is poor, particularly with regard to nitrogen. Depending on other factors such as pH, other elements may be either insufficient (e.g. phosphorus) or in excess (e.g. aluminum). Improvement of the biological nitrogen fixation (BNF) potential of beans is an attractive approach to minimizing a yield constraint without the added need for expensive fertilizer, particularly where fertilizer may be too expensive or difficult to obtain.

Increasing the potential for BNF of bean cultivars adapted to Brasilian small farm conditions will reduce the need for fertilizer (N) while simultaneously raising the potential for increased yields. However, preliminary research results suggest that some genotypes may respond to added N in situations where fertilization is feasible and/or desirable. It must be emphasized that the maximum potential of enhanced BNF will be realized when it is combined with other desirable traits, e.g. high yields, disease resistance, improved nutritional quality.

The host country will also benefit from the development of improved techniques that allow identification of germplasm with multiple disease resistance. Disease resistance will be necessary to reach maximum yield and quality potentials.

These research projects will provide the host country with the trained scientists, information, plant materials and rhizobial strains to allow continued effective breeding for enhanced BNF in the national and regional programs.

2. Benefits to U.S. agriculture.

Currently the BNF research program is the only U.S. program directed specifically at breeding beans for enhanced potential. In tact there are few other breeding programs of such objectives for any of the grain legumes including soybean.

Success of this breeding effort will allow U.S. bean breeders to obtain breeding lines with enhanced potential for BNF. If these traits are incorporated into commercial bean cultivars, our estimates suggest that fertilizer N requirements for dry bean production could be reduced by at least one-half, depending on local growing conditions.

Likewise the development of improved techniques for screening for multiple disease resistance provides for increased stability of bean germplasm across environments. Ultimately this translates to greater yields.

3. The UW domestic research programs interface directly with the goals of the CRSP projects and probably indirectly with several others. Students work on inter-related projects with complementary goals.

4. The impact of CRSP existence on regular on-going domestic research program is both positive and negative.

Because of the CRSP, we have broader programs that encompass more problems and opportunities. We also have the opportunity to breed for a broader range of growing conditions.

The biggest negative influence is the incredible amount of paper work required for the rather modest (net) research support. The domestic programs move much faster than the CRSP project with less time requirements.

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A copy of this report is going to Dr. Ken Shapiro, Director for International Affairs. I am sure Dr. Shapiro will contact you directly in the event he wants to change or add to the contents of this letter.

Thank you.

Sincerely,

R. L. Lower
Chairman

RLL/jea

cc: Ken Shapiro

EMBASSY OF THE
UNITED STATES OF AMERICA
Brasilia, Brazil

February 24, 1984

Dr. Pat Barnes-McConnell
Michigan State University
Bean/Cowpea CRSP Management Office
200 Center for International Programs
East Lansing, Michigan 48824

Dear Dr. Barnes-McConnell:

In response to your letter of February 9, 1984 about the Bean/Cowpea CRSP Project, we feel that this project is well suited for Brazil and even more so now that the Brazilian Government is investing every effort in agriculture in order to improve and increase food production.

There are many important points in this project such as the exchange of information between Brazilian and American technicians as well as the training of Brazilian researchers. As a weakness we can point ou+ hat no phytopathology specialist has come so far.

This project is highly respected by Brazilian officials and its extension is necessary and recommended in order to meet its objectives since it started more than a year later than was planned.

If there is anything we can do please do not hesitate to contact us.

Sincerely,

R. Nonato Rocha F?
Program Specialist

AGENCY FOR INTERNATIONAL DEVELOPMENT
AMERICAN EMBASSY
PASEO DE LA REFORMA No. 305
06500 MEXICO, D. F.

March 1, 1984

Pat Barnes-McConnell, Ph.D.
Director
Michigan State University
Bean/Cowpea CRSP Management Office
200 Center for International Programs
East Lansing, Michigan 48824

Dear Dr. Barnes-McConnell:

I am happy to respond to your letter of February 9 requesting comments with regard to the Bean/Cowpea CRSP projects. I was associated with the Bean/Cowpea CRSP in Brazil from the projects inception in that country; thus, my comments will be based on my perceptions of these projects.

1. In my opinion, the Bean/Cowpea CRSP projects in Brazil were and are highly effective mechanisms for the U.S. Government and U.S. universities to continue to have a positive influence on the direction of agricultural development in the more advanced developing countries such as Brazil, Mexico, and Colombia. The key to the success of the activities was the truly collaborative nature of the projects; i.e. the jointly planned projects were in areas of priority concern for the Brazilians and in most instances, the U.S. scientists worked as equals, not as "gringos" who dictated the terms of the research activities.

   One of the weaknesses of the project was that the lead institution sometimes went out on the street and hired scientists who were not previously associated with the university. These newly hired scientists often had problems in dealing with the administration of the lead institution. Another weakness was that some of the scientists, at least initially, did not have adequate Portuguese language training to begin working.

2. The projects' contribution to the host countries' development can be measured in terms of the specific outputs and scientific accomplishments. Besides the useful scientific information that has come out of the projects, which will help to increase the production of beans and cowpeas in Brazil and other LDC's, the projects also benefit the U.S.institutions by expanding their capability to conduct research overseas. It is my observation that most U.S. universities do not have the experience and expertise to assist overseas development activities unless key members of the staff have participated in developmental projects such as CRSPs. I view the CRSP project as a long-term investment in the development of the expertise and scientific process for sustained attention to development problems in the LDCs.

3. I have frequently discussed the Bean/Cowpea CRSP projects with the host country government officials and can say that "without exception" the Brazilians are most pleased with the CRSP activities and would welcome increased participation in research projects with U.S. universities.

4. I do not hesitate to recommend the extension of the Bean/Cowpea CRSP projects through FY 88.

Sincerely,

Samuel Taylor
AID Representative

ST:mc
cc: P. Farley, LAC/SA

SUMMARY OF BEAN/COWPEA CRSP COSTS

Sub-Grantee: Brazil/Hagedorn

	US CONTRIBUTION				TOTAL	TOTAL	Total
	AID Contri.	Spent in HC	Non-Federal Contri.	Total US Contri.	HC Contri.	US & HC Contri.	Spent in HC
Cumulative through Year 3 (9-30-83)	66,702	5,890	34,353	101,055	-0-	101,055	5,890
Estimated Year 4	94,645	34,879	54,484	149,129	10,120	159,249	44,999
Estimated Year 5	144,330	84,263	20,022	164,352	18,530	182,882	102,793
SUB-TOTAL INITIAL GRANT	305,677	125,032	108,859	414,536	28,650	443,186	153,682
Projected Year 6	63,660	29,830	11,277	74,937	6,600	81,537	36,430
Projected Year 7	67,150	31,400	11,917	79,067	6,900	85,967	38,300
Projected Year 8	70,925	33,135	12,597	83,522	7,300	90,822	40,435
SUB-TOTAL EXTENSION	201,735	94,365	35,791	237,526	20,800	258,326	115,165
TOTAL PROGRAM	507,412	219,397	144,650	652,026	49,450	701,512	268,847

6062B

Bean/Cowpea Collaborative Research Support Program
Sub-Grantee: Brazil/Hagedorn

	Act Exp Thru Year 3	Est Exp Current Year 4	Est Exp Year 5	Total Initial Grant	Projected Year 6	Projected Year 7	Projected Year 8	Total Ext Request	Total Grant & Extension
Salaries	23,785	32,561	32,200	88,546	34,185	35,400	36,715	106,300	194,846
Fringe Benefits	2,498	1,845	2,850	7,193	1,865	1,935	2,010	5,810	13,003
Equip & Fac	3,087	8,775	28,500	40,362	4,085	4,410	4,765	13,260	53,622
Dom Travel	6,572	4,125	6,400	17,097	1,935	2,090	2,260	6,285	23,382
Intnl Travel	5,264	7,875	12,100	25,239	3,660	3,950	4,265	11,875	37,114
Materials & Supplies	10,086	15,900	24,500	50,486	7,410	8,000	8,640	24,050	74,536
Other Direct Costs	2,293	2,908	15,940	21,141	890	960	1,040	2,890	24,031
Total Direct Costs	53,585	73,989	122,490	250,064	54,030	56,745	59,695	170,470	420,534
Indirect Costs	13,117	20,656	21,840	55,613	9,630	10,405	11,230	31,265	86,878
Total Costs	66,702	94,645	144,330	305,677	63,660	67,150	70,925	201,735	507,412

Equipment included in Extension Budget Request:
1. Lab Conco -3- Freeze Dryer & Aux equipment - $7,100
2. Fisher Scientific Accumed Digital PH meter - $750
3. Eberbach Model 6000 Reciprocating variable speed shaker - $1,000
4. Sequoia-Turner Model 340 Spectrophotometer - $1,100
5. Zeiss Microscope Conversion to phase optics--
   Condenser - $2,000
   10x & 40x objectives - $1,000

6026B

PROJECT REVIEW AND EXTENSION PLAN

CAMEROON • UNIVERSITY OF GEORGIA (Initiated September 1981) • COWPEAS
Chalfant

PEST MANAGEMENT STRATEGIES FOR OPTIMIZING COWPEA YIELDS IN CAMEROON

INTRODUCTION

Two medium (70-80 days) maturing cowpea cultivars obtained from IITA, TVX3236 and VITA 7, moderately resistant to insects and diseases, produced acceptable yields with minimum use of insecticides in Cameroon. Cost effective yields increased with up to three insecticidal applications. Other outputs include data on seasonal occurrence and sampling methods for major insect pests, performance of local and improved cultivars at various locations, effective insecticides for control of major cowpea insects and improved application methods including an electrostatic, waterless sprayer. Findings useful for resistance screening include the following: Cowpea weevils prefer to lay eggs on green pods in the field and on smooth, exposed seeds; larvae suffer high mortality when seeds separate easily from pod walls; prevention of cowpea weevil infestations before harvesting or eliminating weevils immediately after harvest is critical for control in storage. It is anticipated that when insect and disease resistant cultivars of acceptable seed color are available, yields with minimum insecticides can be 4-10X that of locals providing both more food and product for sale. Resistance to or control of cowpea weevils in storage will prevent serious food losses and allow the holdover of seed until more desirable markets occur. One participant-trainee recently has enrolled in an M.S. program at the University of Georgia.

YEARS ONE THROUGH THREE REFERENCE GUIDE

The information referred to here has been compiled in separate documents included in Sections I and III of this report.

Three-Year Progress Report

1983 Annual Report: See Section III, Technical Summary, page 39.

Research Publications and Presentations: See
Section III, Pulse Beat, Spring 1984, Insert, page 2.
Section III, Women-in-Agriculture Resource Guide, Cameroon

Project Evaluations

1983 Annual Report: See Section III, External Review Panel Report, page 21, and Follow-Up Chart Insert.

1983 Board of Directors Extension Rating: See Section I, page 25.

YEARS FOUR AND FIVE

For the remainder of the first five years, the research question will not change. Methods researched for optimizing yields are based on the philosophy of integrated pest management in which new and existing tactics are integrated in order to regulate insect pest populations or to reduce the effects caused by insect infestation. During these later years new and existing tactics will continue to be studied in Cameroon. Work with encapsulated pyrithum or bacillus thuringiensis will likely be added. Other biological control tactics which are being developed by other CRSP projects will be included into the program in Cameroon when they are available. Development of new tactics and integrating them into a grower-usable program is a long-term effort.

EXTENSION YEARS SIX THROUGH EIGHT

New tactics come along, existing ones are modified and integration requires continuous updating and evaluation in the field. Thus, research in the extension years six, seven and eight will be mostly a continuation of the on-going research. The research capabilities of the Cameroonian facility in Maroua should be better developed so that more advanced research can be done. Parallel research efforts should also be expanded to the northwestern province.

The training and collaborative research goal of this project is to help build up the institutional and research capabilities of Cameroon. The ERP judged the project to be less than satisfactory predominantly because of the lack of a HC PI and the institutionalization within the HC structure. Now that a HC PI has been named and procedures taken to better integrate the project, a greater impact on cowpea production in Cameroon can be anticipated.

There must be expanded research facilities in Cameroon and continuous and expanded training of scientists and technicians, utilizing facilities both in the US, IITA in Nigeria and the developing University in Cameroon.

No change is expected in the US PI and institution. However, it is likely that there will be greater participation by Georgia in project management and in identifying additional scientists who can contribute to the project goal.

CAMEROON--Chalfant

ADC
2/25/81

NARRATIVE SUMMARY	OBJECTIVELY VERIFIABLE INDICATORS	MEANS OF VERIFICATION	IMPORTANT ASSUMPTIONS
Program or Sector Goal: Increase production and quality of protein-aceous food (cowpeas) available to small/subsistence farmers.	Measures of Goals Achievement: Yield and quality of cowpeas available to small/subsistence farm families will increase significantly by 1986.	Interviews with small/subsistence farmers through extension personnal.	Assumptions for achieving goal targets: a. Need for cowpeas to be consumed on small/subsistence farms remains constant or increases. b. A growing market at attractive prices exists for cowpeas off-farm.
Project Purpose: Reduce cowpea losses due to insects in field production and storage	Conditions that will indicate purpose has been achieved: a. Pest Management tactics used successfully by small/subsistence farmers will increase yield and quality 100% by 1984. b. A second doubling of yield and quality will occur by 1987 through development and application of additional tactics.	Visits to small/subsistence farms with Cameroonian extension workers before, during, and after harvest to assess efficacy of recommended tactics on cowpea yield and quality.	Assumptions for achieving purpose: Insects continue to be a major cause of yield and quality loss.
Outputs: a. Basic scientific knowledge of biology of cowpea insect/host plant relationships. b. Pest management tactics which are usable by small/subsistence farmers. c. Recommendations for cowpea pest management in place in Cameroonian extension training, extension, and advisory services. d. Cameroonian entomologists and technicians trained in entomological research methods.	Magnitude of Outputs: a. Major insect pests, their time of occurence, and nature of damage identified by the end of 1982. b. Pesticide/protectant tactics developed for use in 1983. c. Cowpea lines with resistance to one or more insect pests identified by the end of 1982. d. Recommendations for management of 3 major cowpea pests submitted to extension, training and	a. Insect data from samples collected from field research plots. b. Verification of recommended tactics and resistant lines in demonstration plots conducted by CREFPHY, extension agents, Young Farmers' Schools, the Seed Multiplication Project, and Regional Food Crop Protection trials.	Output Assumptions CREFPHY, extension service, Young Farmers' Schools, Seed Multiplication Project and Retional Food Crop Protection Projects continue.

	advisory agencies for 1983 crop season. e. Non-chemical pest management tactics developed by 1985. f. Cameroonian entomologist completes M.S. degree in 1984. g. Cameroonian technicians trained in field plot technique, data collection, and entomological lab techniques by 1983.	c. Professional training verified by M.S. degree. d. Technical training verified by performance capability judged by U.S. and Cameroonian entomologists. e. Research bulletins and articles in scientific journals. f. Extension bulletins.	
<u>Inputs</u>: a. <u>Univ. of Ga</u> Project Leader/Principal Investigator U.S. entomologist in Cameroon. Vehicle Laboratory and field equipment and supplies. b. <u>BTI</u> Co-investigators (3) Laboratory, growth chamber, and green house facilities. c. <u>IRA</u> Counterpart Principal Investigator student trainee. Office and laboratory facilities. Field research facilities. Cooperation from CREFPHY, extension service, Young Farmers' Schools. d. <u>USAID</u> Logistic support Cooperation from SAFGRAD, Seed Multiplication Project, Regional Food Crop Protection trials.	Salaries & Wages 202,663 Student Expenses 118,130 Expenses 217,150 Equipment 37,950 Supplies 30,705 Travel 85,300 Indirect Costs 232,095 Contingency 15,500 Total 946,693 Budget 957,250	Monthly and annual project and budget reports.	<u>Input Assumptions</u>: a. U.S. entomologist will be available for work in Cameroon throughout the project. b. Cameroonian P.I. and student trainees will be available. c. Adequate information exchange from small/subsistence farmers to project (and vice versa) through extension and other demonstration media takes place. d. Vehicle, equipment and suppli[es] are available and arrive on time.

The University of Georgia College of Agriculture

Experiment Stations • Georgia Station

EXPERIMENT, GEORGIA 30212

404-228-7263

OFFICE OF THE RESIDENT DIRECTOR

May 4, 1984

Bean/Cowpea CRSP Management Office
200 Center for International Programs
Michigan State University
East Lansing, Michigan 48824

Attention Management Office:

I sincerely apologize for the delay in responding to the questions which you sent to me. I hope that these responses will be of assistance to you in the preparation for the Bean/Cowpea CRSP extension review.

1. Benefits to host country agriculture. I can see several benefits. One is that it is an opportunity for host country scientists to work collaboratively with scientists in this country, gain exposure to current techniques and research technologies, and have access to sophisticated equipment and supplies which might be difficult for host country scientists to obtain without a CRSP. Host country scientists also have an opportunity to obtain germplasm from improved cultivars developed in this country. The collaborative effort also enhances the confidence of the host country in themselves to accomplish scientific efforts. Beans and cowpeas are often produced in mixed cropping systems. Bean and cowpea yields are quite low so that if these yields can be increased particularly cultivars that will still retain leaves to be used as fodder as well as increasing the yield of the plant would provide a tremendous advantage to the small farmer. Also, pest control in storage would be almost as beneficial as pest control under field conditions.

2. What do you see as the benefits to the U. S. agriculture particularly domestic interests of agriculture in our State? There are several benefits. One is that the cowpea is indigenous to Africa and Africian cultivars may be identified which can provide germplasm for incorporating pest resistance and/or tolerance into varieties presently grown in the United States. The CRSP broadens the prospective of U. S. scientists into what is happening in other parts of the world and may expose them to problems that do not yet exist in the United States. If and when they do become present in the United States, they will know how to deal with the situation.

3. To what extent do our regular domestic research programs reinforce, complement, or otherwise relate to the goals of the CRSP? I think that scientists with mutual interests, when they become better

Page 2
May 4, 1984

acquainted with each other, cannot help but be advantageous to our country as well as the developing world by broadening the base for sharing questions and information to strengthen research efforts.

4. Much of the information that is stated above discusses the impact or influence of a CRSP on the regular ongoing domestic research program.

5. The impact or influence of the CRSP on regular ongoing international programs. I think it's too early to tell what the full impact will be of the CRSP existence upon regular ongoing international research programs. I think it is still not fully understood by AID people what the real potentials and impacts can be upon research. I think that collaborative research activities are far better than having our researchers go to the country, do the research, and leave. CRSP is providing the opportunity for the development of a trained cadry of host country scientific researchers so that research activities will continue after the departure of the U. S. scientists. I think that the collaborative relationship developing between scientists provides opportunities for host country scientists to be in touch with our people for sharing knowledge, questions, and support.

I hope these responses will meet your needs.

Sincerely,

Charles W. Laughlin
Associate Director

CWL:bzr

UNITED STATES OF AMERICA
AGENCY FOR INTERNATIONAL DEVELOPMENT
Yaounde

UNITED STATES ADDRESS:
YAOUNDE (AID)
DEPARTMENT OF STATE
WASHINGTON, D. C. 20520

MAR 12 1984

INTERNATIONAL ADDRESS
USAID
B. P. 817
YAOUNDE, CAMEROUN
Tel: 23-05-81
22-02-69

Dr. Pat Barnes-McConnell
Bean/Cowpea CRSP
200 Center for International Programs
Michigan State University
East Lansing, Michigan 48824

Dear Dr. Barnes-McConnell:

Thank you for letter of February 9, 1984. The answers to your four questions are as follows:

1. The Bean/Cowpea CRSP in Cameroon is a good effort largely as result of the excellent research program conducted by Dr. Moffi Ta'Ama. I believe that the pest management strategies program for optimizing cowpea yields will lead to more applied control measures on Cameroon farms. Dr. Ta'Ama works well with his Cameroonian counterparts and USAID-supported researchers associated with SAFGRAD and the National Cereals Research and Extension Project. However, some of the weaknesses of the project are as follows:

a. USAID/Cameroon has not been kept sufficiently informed or involved in project management and evaluation. I believe that many problems could have been avoided or solved earlier if the USAID/Cameroon Project Officer (Abdel Moustafa) had been consulted about the management decisions and had had an opportunity to evaluate the project performance with the members of the External Review Panel. Unfortunately, the evaluation of the Bean/Cowpea CRSP was conducted at the same time Dr. Moustafa was in the evaluation of a major cereals research project, which prevented him from being involved. The dates of future evaluations of the Bean/Cowpea CRSP in Cameroon should be approved by the Mission well in advance to ensure that Mission staff is available to participate.

b. Communications have been a problem. The management entity (Michigan State University) and the contractor (University of Georgia), have not yet developed an effective system of communications between IRA Yaounde, IRA-Maroua or the USAID Mission. Many problems could have been avoided if all concerned parties had been well informed. The Mission has received telexes from the Bean/Cowpea CRSP which had not been copied to the AID/Washington Project Officer (Dr. B. Pollack). Communications with the AID/W Project Officer have likewise not always been copied to USAID/Cameroon. Other correspondence has been sent directly to IRA-Maroua without informing the USAID/Cameroon Mission. Arrangements concerning project finances, developed by the University of Georgia, have not been thoroughly explained or discussed with Cameroonian officials.

2. As stated above, the CRSP program of research in Cameroon is sound and comprehensive, and should help develop agricultural practices and control measures to overcome or minimize insect damage to the cowpea crop in Northern Cameroon.

3. We believe that the host country's feelings towards this project are not as positive as they should for the following reasons:

a. Project research plans are developed by the University of Georgia without proper consultation with the Institute of Agricultural Research. Our concern was conveyed to AID/Washington on December 2, 1983 (Yaounde 10127 attached). This message stated the Director of IRA's strongly held belief "...that the Bean/Cowpea CRSP in Cameroon has isolated itself from his institution. He and the Chief of Center, IRA-Maroua, have not been consulted or requested to participate in CRSP program planning. In addition, many important financial and management decisions related to CRSP activities have been made without his approval".

b. Moffi Ta'Ama has undertaken extensive travel and has been away from Cameroon for 30 per cent of the 1983 calendar year. These absences cannot help but be disruptive to his research and are thus a major factor contributing to the CRSP's growing isolation from IRA. Cameroonian officials and USAID/Cameroon feel that one trip each year to the United States by Dr. Ta'Ama is sufficient.

c. IRA believes that the budget needs a major revision and that too much money has been allocated to be spent outside of Cameroon and for travel. They note that $30,000 was programmed for travel in FY 83/84. The budget that has been submitted is very difficult to understand. This confusion could have been avoided by thorough explanation to Cameroonian counterparts and the Mission.

d. Neither IRA nor USAID/Cameroon understands how the research conducted at the Boyce-Thompson Institute (BTI) contributes to optimizing cowpea production in Cameroon. The 1982 Bean/Cowpea CRSP Annual Report makes no reference to the work conducted by the BTI. Results of the research conducted by BTI, as verbally explained by Moffi Ta'Ama appear to be purely academic and of only marginal value to the project. Therefore, we recommend that reports of BTI's research results be made available to the Mission in order to allow IRA and the Mission to assess the contriution of this effort to the project.

4. USAID/Cameroon's position is that Dr. Moffi Ta'Ama is completing useful and relevant research. Therefore the Mission would support an extension of this CRSP if the above coordination and communication problems can be solved and mutual agreement between all parties can be reached during your visit to Cameroon and your discussions with IRA.

In summary, USAID/Cameroon believes that the CRSP program can be a worthwhile effort and has potential for success in Cameroon. However, the management of the project in Cameroon shows insufficient regard for the concerns of IRA in exercising coordination of all research activities being conducted under its auspices.

Sincerely,

Ronald D. Levin

Ronald D. Levin
Director

SUMMARY OF BEAN/COWPEA CRSP COSTS

Sub-Grantee: Cameroon/UGA

	US CONTRIBUTION				TOTAL	TOTAL	Total
	AID Contri.	Spent in HC	Non-Federal Contri.	Total US Contri.	HC Contri.	US & HC Contri.	Spent in HC
Cumulative through Year 3 (9-30-83)	281,440	216,701	47,180	328,620	86,680	415,300	303,381
Estimated Year 4	165,728	118,080	74,483	240,211	47,230	287,441	165,310
Estimated Year 5	253,880	189,995	21,295	275,175	72,355	347,530	262,350
SUB-TOTAL INITIAL GRANT	701,048	524,776	142,958	844,006	206,265	1,050,271	731,041
Projected Year 6	200,130	149,770	16,787	216,917	59,900	276,817	209,670
Projected Year 7	216,140	161,750	18,130	234,270	64,700	298,970	226,450
Projected Year 8	233,430	174,690	19,580	253,010	69,900	322,910	244,590
SUB-TOTAL EXTENSION	649,700	486,210	54,497	704,197	194,500	898,697	680,710
TOTAL PROGRAM	1,350,748	1,010,986	197,455	1,548,203	400,765	1,948,968	1,411,751

6062B

Bean/Cowpea Collaborative Research Support Program
Sub-Grantee: Cameroon/UGA

	Act Exp Thru Year 3	Est Exp Current Year 4	Est Exp Year 5	Total Initial Grant	Projected Year 6	Projected Year 7	Projected Year 8	Total Ext Request	Total Grant & Extension
Salaries	22,550	37,564	44,880	104,994	45,625	49,275	53,215	148,115	253,109
Fringe Benefits	-0-	-0-	-0-	-0-	-0-	-0-	-0-	-0-	-0-
Equip & Fac	31,835	2,949	14,500	49,284	3,550	3,835	4,140	11,525	60,809
Dom Travel	26,008	737	1,100	27,845	865	935	1,010	2,810	30,655
Intnl Travel	2,405	26,171	30,300	58,876	31,765	34,305	37,050	103,120	161,996
Materials & Supplies	79,458	958	11,500	91,916	1,185	1,280	1,380	3,845	95,761
Other Direct Costs	62,404	58,915	92,400	213,719	70,470	76,110	82,200	228,780	442,499
Total Direct Costs	224,660	127,294	194,680	546,634	153,460	165,740	178,995	498,195	1,044,829
Indirect Costs	56,780	38,434	59,200	154,414	46,670	50,400	54,435	151,505	305,919
Total Costs	281,440	165,728	253,880	701,048	200,130	216,140	233,430	649,700	1,350,748

Equipment included in Extension Budget Request:
1. Compound Microscope - $1,500
2. Incubator - $2,000
3. Plant Growth Chamber - $5,000
4. Irrigation Pump - $2,000

6026B

PROJECT REVIEW AND EXTENSION PLAN

DOMINICAN REPUBLIC • UNIVERSITY OF NEBRASKA (Initiated June 1981) • BEANS
Coyne

BIOLOGY, EPIDEMIOLOGY, GENETICS AND BREEDING FOR RESISTANCE TO BACTERIAL AND RUST PATHOGENS OF BEANS (PHASEOLUS VULGARIS L.)

INTRODUCTION

Common blight and rust continue to be serious diseases limiting yield of dry beans in the Dominican Republic and in many other countries in Latin America and Africa, as well as in the Rocky Mountain, lake states and high plains areas of the United States. The cooperators in this project expect to develop a methodology to identify resistant germ plasm, determine genetic information and a strategy that will lead to the incorporation of high levels of more stable and durable resistance to bacterial and rust pathogens of the main bean types in the Dominican Republic and high plains of the US. This genetic material and information is expected to benefit all bean production areas of the world which have conditions favoring common blight and rust diseases. The research is complementary to the ongoing research project by the University of Puerto Rico, whose main objective is to develop bean varieties resistant to a wide number of bacterial, viral and fungal pathogens in the Dominican Republic and other areas of Latin America. The genetic and pest management approaches undertaken by this project are different from those of the UPR researchers. This project seeks to complement the UPR project with a more basic approach to deal effectively with the two main pathogens causing common blight and rust. The project will also continue to improve and enhance the regional and state bean improvement programs in the US. Without Title XII, such progress would be substantially reduced.

There is a need to address these disease problems and to train scientists in the Dominican Republic. The project activities included: screen germplasm for resistance, determine pathogenic variation and inheritance of resistance, improve research facilities, and train graduate students. One white seeded and three black seeded breeding lines performed well in trials on small farms in the Dominican Republic and are being increased for release. Use of resistant varieties should improve small farmer income. New sources of resistance to common blight and rust were identified and are being used in breeding. The genetics of resistance to common blight were determined. Interactions between bacterial isolates, concentrations and host genotypes were identified. A plant pathology laboratory, a seed storage room, a seed preparation room and a screen house were constructed in the Dominican Republic. Baseline data have been collected and twelve publications were prepared or published. Two Dominican Republic graduate students are in the second semester of their M.S. programs and two other students are completing pertinent theses at the University of Nebraska.

YEARS ONE THROUGH THREE REFERENCE GUIDE

The information referred to here has been compiled in separate documents included in Sections I and III of this report.

Three-Year Progress Report

1983 Annual Report: See Section III, Technical Summary, page 45.

Research Publications and Presentations: See Section III, Pulse Beat, Spring 1984, Insert, page 2.

Project Evaluations

1983 Annual Report: See Section III, External Review Panel Report, page 23, and Follow-Up Chart Insert.

1983 Board of Directors Extension Rating: See Section I, page 25.

YEARS FOUR AND FIVE

In the case of bacterial blight, seed transmission is a major mechanism for dissemination, yet we know little about the interaction of plant genotype with pathogen colonization of the seed or other epiphytic situations. Since resistance to blight is only partial, seed transmission and epiphytic colonization must be understood in order to increase the efficacy of resistance and achieve economic control. It will be necessary to select host genotypes with reduced levels of phytopathogenic bacterial seed transmission. A newly discovered hypersensitive reaction could benefit selection of resistance to common blight. Rust presents a situation where single gene (race specific) resistance has not been successful, ultimately succumbing to a new virulent race of the pathogen. The existence of partial resistance to rust is well known but neither the mechanism(s) or durability of reduced pustule size or 'slow-rusting' is known. To improve yield and virus resistance in red pintos, an indeterminate plant type is needed. However, there appears to be a strong association between indeterminancy and loss of rust resistance. The possible linkage between these characters must be broken.

An additional component of the project will be the initiation of an improved nitrogen fixation program. With the cost of fertilizer prohibitive for many small farm situations, the ability of the plant to be more productive without added nutrients is essential. Lines developed by Dr. F. Bliss of the University of Wisconsin/-Brazil project will be assessed in the Dominican Republic. Methodology acquired by the Dominican students at the UW workshop, sponsored by. F. Bliss last July, will be used. Improved, adapted lines will be crossed with disease resistant sources and the progeny selected for overall adaptation in sites throughout the Dominican Republic.

The principal questions to be answered by this research are as follows:

1. What is the nature and variation of bacterial strains causing common blight disease of dry beans in the Dominican Republic?

2. What are the sources of primary inoculum of these bacterial pathogens?

3. How can a bacterial disease-free seed program best be developed in the Dominican Republic?

4. What is the best testing procedure to select lines with low or no transmission of bacteria in seeds of tolerant lines?

5. What is the role of epiphytic bacteria in common blight epidemiology?

6. Will the newly discovered simply inherited hypersensitive reaction to the bacteria causing blight be a useful tool for selection of resistant lines?

7. Are there useful levels of non-specific resistance to the rust pathogen available in bean germ plasm?

8. What is the nature of this resistance and how is it inherited?

9. Is there linkage between indeterminant plant habit and lack of rust resistance in red pintos and, if so, how can it be broken?

10. Does the rust pathogen survive as urediniospores between bean crops, or do teliospores play a major role in pathogen survival?

EXTENSION YEARS SIX THROUGH EIGHT

New directions will hinge on research obtained in years four and five, particularly those objectives with postdoctoral input. A breeding improvement program is normally an eight-to-ten-year project, and one can expect to be pursuing some of the original broader objectives such as improving rust and blight resistance in adapted black and red pinto dry bean types for some time. Clean seed production is expected to be a major goal for years six, seven and eight, if this is not achieved by year five.

The continued involvement of D. P. Coyne and J. R. Steadman as Co-PIs for the project is expected. The Host Country PI, however, will probably change from C. Paniagua to one of the M.S. students being trained in Nebraska or Puerto Rico.

The present director of research appears to be knowledgeable, cooperative and stable in his position, as is the new director of the southern region's agricultural research. The main problem, assuming stability of the present administrators, is the lack of funding being provided for bean research by the government. More financial support, in addition to Title XII, needs to be provided so that when the Title XII project is completed, the country has its own commitment to bean research.

The US institution, the University of Nebraska, has been very supportive of international involvement of its staff members. This commitment to international programs is expected to continue. The heads of the two departments, R. D. Uhlinger in Horticulture and A. K. Vidaver in Plant Pathology, are involved in the Title XII project as member of the Board of Directors and Investigator, respectively.

Revised Log Frame Matrix - University of Nebraska/Dominican Republic (DR)
December 30, 1983

Narrative Summary	Objectively Verifiable Indicators	Means of Verification	Important Assumptions
Program or Sector Goal: To improve yield and seed quality of beans through utilization of genes for resistance to pathogens.	Measures of Goal Achievements The utilization of biological, epidemiological and genetic information and germplasm from our program in the development of adapted useful cultivars by UPR and DR programs.	(a) Dissemination of information in annual reports, peer reviewed publications and conferences. (b) Identification of our program contributions by the UPR and DR breeding programs for the production of superior cultivars.	Assumptions for achieving goal targets if the incentives and interest continue for small farmers to produce beans as a food for their own consumption and for a cash crop.
Project Purpose: (1) To develop biological, epidemiological, genetic and breeding information on rust and bacterial pathogens, primarily common blight of beans. (2) To educate/train HC and US graduate students in plant breeding and plant pathology so that they can contribute to future research efforts in the DR or other LDC countries.	Conditions that will indicate purpose has been achieved: (1) The derived information, methods, and germplasm will be used in the breeding programs and pest management strategies in the UPR, DR, and other CRSP projects. (2) Graduate students are enrolled at UNL.	(1) Information available in annual reports, professional and peer reviewed articles. (2) Information, methods, genetic strategy and germplasm being used in UPR, DR and other CRSP projects. (3) Genes identified by us utilized in improved cultivars developed by UPR, DR and others. (4) Graduate students with completed academic programs contribute to bean improvement program in DR or elsewhere.	Assumptions for achieving purpose: (1) This depends on a continuation of effective cooperation between administrative and professional elements in host country and Univ. Nebr./Univ. Puerto Rico. (2) Students meet requirements of training program. (3) Genes can be incorporated into adapted, improved bean types.
Outputs: (1) Identification of sources of stable/durable resistance to the strains of common blight and rust pathogens. (2) Identify variation in pathogenicity and monitor changes in pathogencity in rust and blight pathogens.	Magnitude of Outputs: (1) Information on methods of inoculation, pathogen strain variations, germplasm sources of resistance, and genetic information will be utilized in tropical breeding program to develop resistant varieties with reduced bacterial seed transmission by DR and UPR programs.	(1) Information on all of these research areas will be made available in annual reports, professional reports and meetings, and peer reviewed papers. (2) The germplasm, methods, and epidemiological and biological information will be used in the UPR, DR and CRSP [redacted]jects.	Output Assumptions: (1) Continued availability, enthusiastic and effective technical and administrative leadership in HC. (2) Continued availability of facilities.

Narrative Summary	Objectively Verifiable Indications	Means of Verification	Important Assumptions
<u>Outputs:</u> (3) Study inheritance of resistant reactions to pathogens and linkage relations with other traits. (4) Develop more effective breeding strategies to incorporate stable resistance. (5) Select for reduced seed transmission of common bacterial blight. (6) Develop new biological and epidemiological information on rust and bacterial blight pathogens that could be useful in pest management strategies.	<u>Magnitude of Outputs:</u> (2) Rust resistance stability, particularly in the black seed types, needs new strategies. The incorporation of red pinto seed type, virus resistance (UPR), high yield, and Pompadour rust resistance will be a major breakthrough.		
<u>Inputs:</u> (a) <u>Univ. of Nebr.</u> Principal Investigator (PI), Co-PI, Investigator, technicians, laboratory, greenhouse, field, equipment and supplies availability. (b) <u>Dominican Republic</u> Corresponding Principal Investigator, National Program Technical Personnel, CESDA Director Support, Student Trainees, Office, Laboratory Facilities, Field Research Facilities, Extension Service Cooperation, Availability of project vehicle.	To use current project poster to determine continued personnel involvement and to examine annual reports to evaluate if facilities and other listed resources have been available to the project.	Annual Project, Budget and trip reports.	<u>Input Assumptions:</u> (1) The present AID/US and HC institution financial contributions will be available at planned increased levels. (2) The positions listed under inputs in US and HC will be sustained. (3) Administrative support listed under inputs will be sustained. (4) Graduate student trainees will be available/involved in the project. (5) Facilities, resources, and services listed under inputs will continue to be available. (6) Vehicle is maintained in working condition.

University of
Nebraska
Lincoln
Institute of Agriculture and Natural Resources

Dept. of Horticulture
377 Plant Sciences, East Campus
Lincoln, NE 68583-0724

May 9, 1984

Pat Barnes-McConnell, Director
Bean/Cowpea Management Office
200 Center for International Programs
Michigan State University
East Lansing, Michigan 48824

Dear Dr. Barnes-McConnell:

Attached is the Nebraska response to your request for information pertinent to the Triennial Review and three year extension of the Bean/Cowpea CRSP.

Omitted from the body of the report was reference to issues and concerns which should be discussed during the Triennial Review. The following are submitted for your consideration:

1. The lead time required for travel authorization for PI's and others to visit the host country restricts flexibility which is desirable when dealing with biological organisms. Specific to the work in the Dominican Republic, crop development and stages of disease development are subject to weather conditions. Therefore, it is quite difficult to anticipate by several weeks the times which would be most favorable for people from Nebraska, Puerto Rico, CIAT and the DR to meet in the DR for the purpose of evaluating material and making on-site decisions about program activities. Therefore, a shorter lead time or more flexibility for travel authorization would improve the effectiveness of the DR project.

2. Host country institutionalization is very, very limited - in large part as a result of host country economic conditions. Presently land, facilities and some staff are made available by the host country but no operating support funding accrues to the CRSP project. A desirable and important signal from the host country would be to dedicate Arroyo Loro to bean research (as has been done with another station for the rice research program).

The PI is concerned that a minimum of another five years will be required to develop desired disease resistant Pompadour lines. In the event that project funding is terminated before that time, much of the work that has already been done will be lost unless the project is institutionalized by the host country.

3. A concern which is probably beyond the perview of the Triennial Review - but one which is very real nevertheless - is the dependence of leadership in agricultural research on the political process in the host country. Separation of university and/or national programs for agricultural research from the political arena would do much to insure the stability of long-range program activity.

Sincerely,

Roger D. Uhlinger
Head

RDU:cm

Enclosure

xc: D. P. Coyne

TITLE XII BEAN/COWPEA CRSP PROJECT
DOMINICAN REPUBLIC/UNIVERSITY OF NEBRASKA
MAY 7, 1984

Project Title: Biology, Epidemiology, Genetics and Breeding for Resistance to Bacterial and Rust Pathogens of Beans (*Phaseolus vulgaris* L.)

Participants:

United States: D. P. Coyne (Principal Investigator, Horticulture)
J. R. Steadman (Co-Principal Investigator, Plant Pathology)
Anne Vidaver (Investigator, Plant Pathology)

Dominican Republic: Cesar V. Paniagua (Principal Investigator)

1. Benefits to Host Country Agriculture

(a) Research (Documentation - see attached 1983 Annual Research Report)

i. Bacterial and rust diseases significantly reduce bean yields and seed quality of this important, nutritious staple crop in the Dominican Republic. The need for more abundant and reasonably priced basic foods was emphasized by the recent riots in the country when prices of basic foodstuffs were increased dramatically.

ii. Identified and released in 1983 in cooperation with the University of Puerto Rico, a MITA (UPI) white seeded breeding line (based on extensive testing in the Dominican Republic) named Arroyo Loro #I. This is a widely adapted variety with moderately high resistance to rust. It has performed better than the standard local white seeded variety.

Documentation - See attached data on the performance of this new variety.

iii. New strains and races of the pathogens causing the bacterial and rust diseases were detected by use of differential reaction on host varieties/lines. Laboratory tests were also used to distinguish between strains of the bacterial blight pathogens. Strain and race differentiation is essential for conducting genetic and breeding investigation for resistance to these pathogens.

iv. New sources of resistance to the pathogens causing rust and bacterial blight diseases were detected. These are being utilized in the genetic and breeding programs.

v. The first phase of a genetic analysis of resistance to different strains of the bacterial blight pathogen has been completed and data derived from a genetic study of resistance to both rust and bacterial blight is being analyzed at present.

vi. Based on extensive tests, a black seeded line resistant to rust looks promising for release. This should be a useful contribution since their main black seeded variety, Venezuela #44 is highly susceptible to rust.

vii. A breeding program to combine rust and bacterial blight resistance in Pompadour class beans (their main type) was initiated. Some F3 and F4 families derived from crosses made in the new screenhouses in the Dominican Republic combine desired seed type and high rust resistance in both determinate and indeterminate plant types. The level of bacterial blight resistance will be evaluated under controlled tests this semester.

(b) Training/Education of Host Country Students and Technicians

Currently, there are two Dominican Republic students enrolled (project funded) in a master of science degree program at the University of Nebraska, Lincoln. They participated in the English Language Training Program at the University of Nebraska, Omaha, before coming to Lincoln. One student, Eladio Arnaud Santana, is studying plant breeding (Horticulture Dept.) and a second student, Wenceslao Ramirez, is studying plant pathology (Plant Pathology Dept.). They participated in a course on nitrogen fixation of beans at the University of Wisconsin (funded by a CRSP project, F. Bliss, Univ. of Wisconsin). This experience will benefit host country agriculture when they return.

In-country training has been of great benefit to the host country technicians involved in this CRSP project. With improved facilities (CRSP funded) and better technical expertise, the bean improvement program has made great strides in the last two years. Little or no progress would have been possible without the CRSP. An extensive bean course in cooperation with CIAT was conducted in the country in October, 1983. Over 30 technicians attended this course. In addition, technical training at CIAT and UPR has been conducted with more expected in the near future.

(c) Organization

We are trying to have the project institutionalized and are making good progress in this area. The CRSP Project has been incorporated into the National Legume Program. The CRSP Project Leader in the Dominican Republic, Dr. Cesar Paniagua, is in charge of the entire program. Dr. Paniagua is trying to develop the Arroyo Loro Experiment Station into a center of research devoted to beans in a similar manner to their Rice Research Center. This would effectively institutionalize the project and secure funding for it after the Title XII project terminates. The Dominican Republic has contributed facilities and personnel to assist in the research, but has not contributed funds directly. We do not expect them to contribute funds in 1984, 85, or 86, because of the difficult economic times in the country.

(d) Facilities and Equipment

At the initiation of the project on July 1, 1981, facilities were lacking to conduct a breeding and pathology program. A plant pathology laboratory, a seed storage room, a seed preparation room and two screenhouses were constructed at the Arroyo Loro Experiment Station using project funds. The plant pathology laboratory has been partially equipped and additional equipment is on order. The screenhouses have permitted the initiation of the bean breeding program. A station wagon was purchased and shipped to the Dominican Republic. This has facilitated travel to plant and to manage the bean experiments on small farmer's fields in numerous and distant parts of the country.

(e) Communication (Conferences/Publications)

Dr. Cesar Paniagua (PI) continually explains the project and objectives and current progress to members of the government and community groups. A short course on bean production was organized by Dr. Paniagua for technicians involved with beans in the Dominican Republic in order to improve their technical skills. Dr. Paniagua has attended the international PCCMCA meeting (Caribbean and Central America) each year and reported the results of bean experiments to bean specialists in other countries. Abstracts of these talks have been published in the Proceedings of the PCCMCA. The project receives international visibility and the Dominican Republic participants also bring back new information on methods and materials for use in the project in the Dominican Republic. We keep in constant contact with the Dominican Republic via trips, phone calls and letters.

A number of publications (12) based on project research ranging from refereed articles, abstracts, reports and newspaper articles, have been published (see attached list).

(f) International Cooperation

Cooperation with CIAT has been of immense benefit to the project since it has led to the identification of useful disease resistant lines for crossing. This cooperation will be maintained and enhanced. However, the amount of material sent for testing should be decreased since much of it is of limited value to the program. CIAT needs to be more selective in sending material for testing since too much project funding and effort can be tied up in testing materials of limited value to the country. Dr. Paniagua has explained this to CIAT.

(g) WID

A number of female technicians (3) are currently involved with the project and the experience has been beneficial to them and to the project. They serve as good role models for other women in the Dominican Republic and indicate the opportunities available to women in agricultural research.

2. Benefits to United States Agriculture

(a) Research

i. Common blight and rust of beans are major diseases reducing yield and seed quality of beans in many areas of production in the United States. Common blight has always been a problem in the western Nebraska dry bean growing area. In recent years, rust has been serious in southwest Nebraska and in northeastern Colorado and has been observed late in the season in the North Platte Valley, Nebraska. There is no chemical control for common blight. Rust can be controlled by chemicals, but this adds to the cost of production and conditions may not be suitable for spraying at certain times. Disease resistant varieties adapted to the United States are desired. There is a need to develop more stable resistance to rust since most of the resistant bean varieties have become susceptible to rust in recent years due to the development of new races of the pathogen. In the course of the present investigations, we have detected sources of resistance to rust which have small pustule size (less than 300 mu). We need to determine the inheritance of this type of resistance and find out if this type of resistance is more stable than the hypersensitive type of reaction (necrotic lesion - no sporulation) which is simply inherited. We have also detected new sources of resistance (varying levels of resistance) in the Dominican Republic trials and in Puerto Rico to the bacterial common blight and determined that there can be a differential reaction of pod and leaves to different strains of this pathogen. Information derived from studies which have been conducted will lead to higher levels of resistance in commercial varieties.

ii. Rust Workshop - There was a serious need among pathologists and breeders involved with rust in the United States to standardize inoculation and testing procedures, disease evaluation (rating) procedures, and differential varieties, in order to provide for more effective communications regarding host (bean) resistance and the race situation both in the United States and overseas. This project stimulated workers to arrange an international meeting, funded by this project, in Puerto Rico in order to achieve this goal. This workshop was a great success and is contributing to accelerated progress in this area.

(b) Technical Support

We have been able to obtain the services of a full-time technician (male) on bacterial research (strain tests), half-time technician (male) on rust reserach in the Department of Plant Pathology, and half-time technican (female) on genetics and breeding for resistance in the Department of Horticulture. These technicians work on rust and bacterial problems common to Nebraska and the Dominican Republic. We would not have this personnel support without CRSP project funds.

(c) Training

We are seeking a graduate student to work on a Ph.D. program on rust resistance useful to Nebraska and the Dominican Republic. The plant pathologists are looking for two postdoctorals to work on the small rust pustule size (its value) and on strain variation and bacteria seed transmission in common blight. This research is valuable for Nebraska and the United States. We would not be able to obtain these types of contributions without project funding.

Ms. Luann Finke (Horticulture) is expected to complete her MS degree on the genetics of rust resistance in beans using United States and Dominican Republic varieties and lines. She has not been funded by the project, but has worked on a project problem. She will be valuable to the U.S. plant breeding/horticulture community when she completes her degree.

Debbie Fujimoto (Plant Pathology) is studying strain variation in the common blight pathogen. Part of her support is in CRSP and part is departmental.

(d) Facility and Equipment Improvement and Use

We were able to use project funds to purchase halide lamps for all the greenhouses in Horticulture and Plant Pathology that are used to grow beans for both the Dominican Republic and U.S. projects. We had difficulty previously growing beans during the winter months because of low light intensity. Laboratory supplies have been purchased for the laboratories of Drs. Vidaver and Steadman. This has been of immense value to their programs.

(e) Teaching

The three participants in the project are all involved in teaching graduate courses in their respective fields to graduate students (involved in research). Many of them come from third world tropical countries. The experience of working in a tropical area has brought a new dimension to certain aspects of their courses. Experience with continuous cropping, and observations on associated cropping have given the participants a new view of food production and its problems in breeding, genetics, and plant pathology.

(f) Language Training

Nebraska's three participants have acquired moderate competency in the Spanish language which has improved their ability to work in the host country and in Latin America.

3. Dominican Research Programs

The cooperators, D. Coyne (genetics/breeding), J. R. Steadman (pathology/epidemiology), Anne Vidaver (bacteriology), currently have approved state/Hatch

Experiment Station Projects that deal specifically with the areas of expertise and objectives outlined in the CRSP Project. Our state projects provide for a mutual benefit for the Dominican Republic and Nebraska, and can be considered complementary in nature (parts dealing with rust and common blight).

4. Impact of CRSP Project on Nebraska Bean Program

Since the research on rust and bacterial blight in Nebraska complements that for the Dominican Republic, the Nebraska program derives benefit from the CRSP funding for technical assistance (see 2-b above for details), for graduate student training, and post doctoral assistance (see 2-c above for details), for travel expenses from Lincoln to Scottsbluff (400 miles) to conduct experiments, and for improvement of facilities to conduct bean research at Lincoln (see 2-d above for details). We have only limited financial support from the dry bean industry (Rocky Mountain Bean Dealers Association and none so far from the new Dry Bean Growers Association). Dr. Steadman receives numerous small grants from chemical companies and Dr. Vidaver has secured competitive federal grants.

5. Importance of CRSP on On-Going International Research Program

(a) Institutional Level

The Bean/Cowpea CRSP Project is small in comparison with the new Nebraska/Morocco Project and the INTSORMIL Sorghum Project. Nebraska is the lead institution in both of these projects. However, it does make a useful contribution to our overall international research program since it is making use of long time specific expertise on bacterial and rust pathogens of beans and breeding/genetics for resistance to those pathogens.

(b) Bean Program Level

The existence of the international CRSP has facilitated greater exchange and communication with the Bean International Center (CIAT), which is of great value (mutual) to the Dominican Republic and Nebraska bean programs. In addition, it has fostered greater communication and exchange of information and materials among the other involved Bean/Cowpea CRSP participants, both in the United States and host countries. Dr. Fred Bliss, University of Wisconsin, CRSP Project PI, is providing expert advice on nitrogen fixation evaluation of lines for people in the Dominican Republic. Dr. Don Hagedorn, CRSP Project PI, has interacted on rust and blight.

(c) Rust Workshop

Under the leadership of Dr. J. R. Steadman (Nebraska), Dr. J. Stavely (USDA, Washington D.C.), Dr. Freytag (UPR - MARS), and Dr. H. Schwartz (Colorado), an international rust workshop was organized (funded by CRSP) to coordinate all international research on rust of beans. This has had a far reaching effect on our own CRSP project as well as that of all others in the international arena involved with rust (see 2-a (ii) for details).

6. Documentation

Please see attached supporting materials:

1. Annual Report (1983)
2. List of publications
3. Release of Arroyo Loro #I dry bean variety (data)
4. Most recent reprints - Common bacterial blight

CARACTERISTICAS AGRONOMICAS GENERALES

ARROYO LORO #1 (2 W - 33 - 2)

Arquitectura de la planta:

Hábito de crecimiento	:	Tipo II
Color de las hojas	:	Verde normal
Tamaño de las hojas	:	Mediano
Color del tallo	:	Verde claro
Sentido de la floración	:	Ascendente
Color de la legumbre	:	Verde claro
Tamaño de la legumbre	:	Mediano
Color del Grano	:	Blanco
Forma del grano	:	Oblongo
Peso del grano (en 100 semilla)	:	16.9
Número de veinas por planta (promedio 10 plantas)		13
Número de granos por vainas (promedio 10 vainas)		5.8

Arroyo Loro # 1

PROMEDIO DE 2 W - 33 - 2 Y BCO. R. D. EN DOS VIVEROS DE ADAPTACION EN LOCALIDADES DIFERENTES - ENERO - ABRIL/82.-

	Flor	D. Cos.	Roya	Bact.	Rend. Kg/Ha.
2 W-33-2	41	81	2-3	1.1	1336
Blanco R.D.	42	83	3-6	2.0	1197

PROMEDIO DE 2W-33-2 Y BCO.R.D. EN 4 VIVEROS DE ADAPTACION DE 1983. EN DIFERENTES LOCALIDADES.-

	Flor	D. Cos.	Nódulos	Roya	Bact.	Rend. Kg/Ha
2 W-33-2	43	83	26	2-0	2-1	1243
Blanco R.D.	45	84	30	3-18	2-0	1225

/M. Cabral.-

PROMEDIO DE 2 W -33 - 2 Y BCO. R.D. EN 4 ENSAYOS DE RENDIMIENTO DE 1983 EN DIFERENTES LOCALIDADES :

	Flor	D. Cos.	Nódulos	Roya	Bact.	Rend. Kg/ Ha.
2W-33-2	42	80	37	2- 2	2.3	1468
Blanco R.D.	43	82	23	3- 6	2.6	1398

/mcda .-

HortScience 18(6):901–903. 1983.

Sources of *Phaseolus* Species Resistance and Leaf and Pod Differential Reactions to Common Blight

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Additional index words. *Phaseolus vulgaris, Phaseolus acutifolius, Xanthomonas phaseoli, Xanthomonas campestris* pv. *phaseoli*, vegetable breeding, disease resistance

Abstract. **Eight known resistant lines of *Phaseolus vulgaris* L., one resistant line of *P. acutifolius* A. Gray, and the susceptible 'Dark Red Kidney' were evaluated in the greenhouse for their leaf and pod reactions to 7 isolates of *Xanthomonas phaseoli* (E.F. Sm.) Dows. [=*Xanthomonas campestris* pv. *phaseoli* (E.F. Sm. Dye)] from the Dominican Republic (DR) and Nebraska isolate EK-11. *P. acutifolius* had the highest leaf and pod resistance, followed by Great Northern (GN) Nebr. #1 sel. 27 and Pinto Nebr. EP-1, while the leaves of PI 207262 were highly susceptible to isolates, DR-7 and DR-12. A significant host entry × isolate interaction occurred both for leaf and pod reactions but in some lines the reaction of these plant parts to the isolates was different. Plants of BAT 93 (CIAT) has resistant leaves but susceptible pods to all isolates except Nebr. EK-11, while leaves of BBSR-130 were susceptible to the DR-12 isolate, but its pods were moderately resistant to all isolates.**

Common blight, a serious bacterial disease of beans in the warmer areas of production throughout the world (10, 13, 14), is incited by *Xanthomonas phaseoli* (*X.p.*). There is no satisfactory chemical control of this pathogen (10, 13, 14). Recommended control measures are the production of disease-free seed, deep plowing, crop rotation, and the use of resistant cultivars (4, 10, 13, 14). Recent research on the germplasm's sources of resistance, genetics of host plant reaction, and breeding for resistance has been reviewed (4, 7, 10, 13). We have been involved in the past in many different phases of breeding and genetic programs for resistance to *X.p.* in Nebraska (3, 4, 5, 8, 9, 10, 12) and are now developing bacterial-disease-resistant cultivars for the Dominican Republic.

No information was available on the reaction of the known sources of resistance to the *X.p.* isolates from the Dominican Republic. Variation in virulence of *X.p.* has been reported previously (4, 6, 8, 9, 10, 12). Yoshii (13) did not find such host × *X.p.* isolate interaction at CIAT, Colombia, S.A. while Valladares et al. (12) in Nebraska found a differential interaction. A prerequisite to our breeding program was to determine the reaction of known sources of resistance to *X.p.* isolates from the Dominican Republic. This paper reports the results of these investigations.

Eight known resistant sources of *P. vulgaris* and one of *P. acutifolius* A. Gray to *X.p.* (4, 7, 10, 12, 13) and one susceptible check, 'Dark Red Kidney', were evaluated in the greenhouse, Lincoln, Neb., for their reaction to 7 isolates of *X.p.* from several locations in the San Juan de la Maguana region of the Dominican Republic and to one isolate, EK-11, from Nebraska (Table 1). Several common-blight-resistant selections from population 79-1953-N (received from R. Wilkinson, Cornell Univ., Ithaca, N.Y.) were made by Coyne in 1980, and one of those selections, sel. #2, was used for this experiment. A randomized, complete-block design with 4 replications was used and analyzed as a factorial experiment, omitting the water check (11). Four seeds were planted per 15-cm earthen pot on December 22, 1981 and thinned to 2 plants per pot to represent the experimental unit in each replicate. The potting medium consisted of equal parts by volume of sand, peat, vermiculite, and soil (Sharpsburg silty clay loam). The pots were fertilized with 'Ra-Pid-Gro' (Ra-Pid-Gro Corp. Danville, N.Y.) liquid fertilizer every 10 days for a total of 5 applications. Air temperatures were maintained at 24° to 27°C/21° to 24°, (day night) and no supplemental lighting was used.

A separate, sterilized multiple-needle inoculator, described by Andrus (1) and used by Valladares et al. (12), was utilized to inoculate leaves of 3-week-old plants, when the first trifoliolate was fully expanded with each isolate. Bacterial inoculum of 10^7 CFU/ml was used and check plants were inoculated with distilled H_2O. Later, the youngest, fully expanded trifoliolates on 6-week-old plants were inoculated in a similar manner. Six leaflets per line per replicate were inoculated separately with each isolate. Two pods per plant were inoculated by inserting a dissecting needle at 3 sites along the sides of each immature pod between the developing seeds. The sterilized dissecting needles were dipped into 2-day-old cultures prior to pod inoculation.

Leaf and pod reactions (described in legends for Tables 1 and 2) were determined 12 days after inoculations; a 2nd reading of the first trifoliolate leaf was made at 22 days after inoculation. Replicate leaf ratings and pod lesion measurement means were derived from 6 leaflets in the case of leaves and 6 sites in the case of pods. Simple correlations were calculated between the readings recorded at different times and in different plant parts.

Significant differences were observed between means of leaf and pod reactions for cultivars/lines and isolates (Tables 1 and 2). Only the data for the first reading (12 days after inoculation) of the first trifoliolate of 3-week-old plants are presented (Table 1), since high correlations were noted between those ratings and ratings on the same leaves 22 days after inoculation (−0.81) and also with ratings on upper leaves (12 days after inoculation) of 6-week-old plants (+0.91). It is easier and more efficient to evaluate reactions on seedlings than on taller and older plants in the greenhouse. In addition, young seedlings are nearly similar in stage of physiological development, so differences in stages of development (vegetative vs. flowering/pod stage) do not influence the readings of different genotypes (5). All plants, in this case, were nearly similar in stage of development when the ratings were recorded on the upper leaves because of nearly similar flowering under the short photoperiods (9.4 hr/planting date to 10.2 hr/6 weeks later). The leaves and pods of the *P. acutifolius* (Tepary) line showed the highest resistance, with no visual symptoms on the leaves. However, this Tepary accession may not be resistant to all pathotypes of *X.p.* in the San Juan de la Maguana area of the D.R., since a susceptible reaction was observed on the same Tepary accession at other locations than where the isolates used here were collected (Cesar Paniagua, Dominican Republic, unpublished data). Great Northern (GN) Nebraska #1 sel. 27 and Pinto Nebr. EP-1 exhibited the next highest combination of leaf and pod resistance; 'GN Emerson' had a similar pod reaction but slightly less leaf resistance. These cultivars/lines also express high resistance to isolates of this bacterium in Nebraska and the resistance of the GN Nebraska #1 sel.

Received for publication February 14, 1983. Published as Paper No. 7089, Journal Series, Nebraska Agricultural Experiment Station. Research was conducted under Title XII Bean/Cowpea CRSP project–University of Nebraska and Dominican Republic–Project No. 20-036 and 20-042. The authors appreciate receipt of seed samples from the Plant Introduction Station, Prosser, Wash., F.A. Bliss and D. Hagedorn, Univ. of Wisconsin, Madison, Wis., S. Temple, CIAT, Cali, Colombia, and R. Wilkinson, Cornell Univ., Ithaca, N.Y. The authors also appreciate the laboratory and greenhouse assistance of Christine Smith and Cheryl Campbell and thank Cesar Paniagua for assistance in the Dominican Republic. The cost of publishing this paper was defrayed in part by the payment of page charges. Under postal regulations, this paper therefore must be hereby marked *advertisement* solely to indicate this fact.

[1]Professor.

[2]Formerly Research Assistant.

[3]Former Graduate Student.

Reprinted from HortScience, Vol. 18(6), December 1983
A publication of the American Society for Horticultural Science, Alexandria, Virginia

Table 1. Leaf reaction ratings of 11 *Phaseolus* lines germplasm to one Nebraska (EK-11) and 7 Dominican Republic (DR) isolates of *Xanthomonas phaseoli*.

Line of *Phaseolus*	Leaf reaction ratings[z] Isolate DR-7	DR-11	DR-12	EK-11	DR-8	DR-19	DR-9	DR-10	Control (H_2O)	Line mean
Dark Red Kidney	4.4 ab[y](a)[y]	4.9 a(a)	4.8 a(a)	3.9 bc(a)	2.6 d(a)	3.7 bc(a)	3.2 cd(a)	2.9 d(a)	1.0	3.8 a
PI 207262	3.9 a(a)	2.5 c(b)	3.7 ab(abc)	3.0 bc(ab)	2.9 bc(a)	3.1 abc(ab)	3.3 abc(a)	3.2 abc(a)	1.0	3.2 b
Wis BBSR-130	2.4 bcd(ab)	2.4 bcd(b)	4.6 a(ab)	3.0 bc(ab)	2.1 d(a)	3.1 b(ab)	2.8 bcd(a)	2.3 cd(a)	1.0	2.8 c
Cornell 79-1953-N (Nebr. sel. #2)	2.9 a(ab)	3.4 a(ab)	2.6 ab(abcd)	3.2 a(ab)	2.8 a(a)	2.9 a(ab)	2.6 ab(a)	1.9 b(a)	1.0	2.8 c
Wis. 71-3938	3.3 a(ab)	3.1 a(ab)	2.1 bc(cd)	2.6 ab(ab)	3.2 a(a)	1.9 bc(ab)	1.9 bc(a)	1.5 c(a)	1.0	2.4 d
GN Emerson	3.6 a(a)	2.7 bc(ab)	3.1 ab(abcd)	3.0 ab(ab)	2.2 dc(a)	1.7 de(ab)	1.2 e(a)	1.3 e(a)	1.0	2.3 d
CIAT BAT 93	1.9 bc(ab)	3.3 a(ab)	2.3 b(bcd)	2.3 b(ab)	2.6 b(a)	2.0 bc(ab)	2.1 bc(a)	1.5 c(a)	1.0	2.3 de
GN Nebr. #1 sel. 27	3.2 a(ab)	2.2 bcd(b)	1.9 bcde(cd)	2.7 ab(ab)	2.4 bc(a)	1.3 e(b)	1.4 de(a)	1.4 de(a)	1.0	2.0 e
Pinto Nebr. EP-1	2.2 ab(ab)	2.5 a(b)	1.5 bc(cd)	1.8 abc(ab)	2.1 ab(a)	1.2 c(b)	1.1 c(a)	1.1 c(a)	1.0	1.7 f
Tepary Nebr. Acc. #10	1.0 a(b)	1.0 a(b)	1.1 a(d)	1.0 a(b)	1.0 a(a)	1.0 a(b)	1.0 a(a)	1.0 a(a)	1.0	1.0 g
Isolate mean	2.9 a	2.8 a	2.8 a	2.6 a	2.4 b	2.2 bc	2.0 c	1.8 d	1.0	

[z]Disease rating scale: 1 = no symptoms on the multiple-needle-inoculated area, 2, 3, 4, 5 = 1–25%, 26–50%, 51–75%, 76–100% necrosis, respectively, of the inoculated area.

[y]Mean separation among cultivar/lines within each isolate (vertical—letters in parenthesis), among isolates within each cultivar/line (horizontal—letters outside parenthesis), and between cultivar/line means and isolate means using Duncan's multiple range test, 5% level.

Table 2. Size of pod lesion in 11 *Phaseolus* lines to one Nebraska (EK-11) and 7 Dominican Republic (RB) isolates of *Xanthomonas phaseoli*.

Line of *Phaseolus*	Pod lesion size (mm) Isolate DR-7	DR-11	DR-8	DR-10	DR-19	DR-9	DR-12	EK-11	Control (H_2O)	Line Mean
Dark Red Kidney	14.2 b[z](a)[z]	13.8 b(a)	15.6 a(a)	15.4 a(a)	15.5 a(a)	14.1 b(a)	14.6 b(a)	15.6 a(a)	1.0	14.9 a
CIAT BAT 93	7.2 a(bc)	6.0 bc(b)	6.3 b(b)	6.2 b(b)	5.3 cd(b)	5.2 cd(b)	4.7 d(b)	2.5 e(b)	1.0	5.4 b
Wis. 71-3938	9.4 a(b)	6.3 b(b)	5.8 b(b)	2.2 d(cd)	3.3 c(bc)	2.9 dc(bc)	2.5 dc(bc)	3.2 c(b)	1.0	4.4 c
PI 207262	5.0 a(cd)	3.7 bcd(bc)	3.6 cd(bc)	4.6 ab(bc)	4.3 abc(bc)	3.4 d(bc)	3.2 d(bc)	2.2 e(b)	1.0	3.7 d
Cornell 79-1953-N (Nebr. sel. #2)	5.2 a(cd)	4.5 ab(bc)	4.0 b(bc)	3.1 c(cd)	2.8 c(bc)	2.5 c(bc)	2.8 c(bc)	2.7 c(b)	1.0	3.4 de
Wis. BBSR-130	4.5 a(cd)	2.8 cd(c)	2.5 d(c)	3.5 b(cd)	3.8 ab(bc)	3.7 ab(bc)	3.3 bc(bc)	2.1 d(b)	1.0	3.2 e
Pinto Nebr. EP-1	3.6 a(de)	4.5 a(bc)	3.8 a(bc)	1.6 b(d)	1.7 b(c)	1.8 b(c)	2.0 b(bc)	2.3 b(b)	1.0	2.6 f
GN Emerson	4.0 a(de)	4.0 a(bc)	3.7 a(bc)	1.5 b(d)	1.6 b(c)	2.0 b(c)	2.3 b(bc)	1.7 b(b)	1.0	2.6 f
GN Nebr. #1 sel. 27	3.5 a(de)	3.8 a(bc)	3.7 a(bc)	1.8 b(cd)	1.8 b(c)	1.7 b(c)	1.9 b(bc)	2.2 b(b)	1.0	2.6 f
Tepary Nebr. Acc. #10	1.6 a(e)	1.9 a(c)	2.0 a(c)	1.8 a(cd)	1.8 a(c)	2.0 a(c)	1.5 a(c)	1.7 a(b)	1.0	1.8 g
Isolate mean	5.8 a	5.1 b	5.1 b	4.2 c	4.2 c	3.9 d	3.9 d	3.6 e	1.0	

[z]Mean separation, among lines within each isolate (vertical—letters in parenthesis), among strains within each cultivar/line (horizontal—letters outside parenthesis), and between cultivar/line means and isolate means using Duncan's multiple range test, 5% level.

27 has been reported in many areas of the world (4, 10). 'Dark Red Kidney' was the most susceptible entry in the test based on pod and leaf reactions. The leaves of PI 207262, a known resistant source (3, 4, 10, 12, 13), were highly susceptible to the DR-7 isolate.

Table 3. Analysis of variance for leaf reaction of *Phaseolus* germplasm to isolates of *Xanthomonas phaseoli*.

Source of variation	df	Sum of squares	Mean square	F-value
Total	319	370.3		
Replicates	3	12.3	4.08	
Lines	9	175.3	19.48	60.3**
Rep × lines	27	8.7	0.32	
Isolates	7	44.3	6.33	23.1**
Lines × isolates	63	72.0	1.14	4.2**
Error	210	57.7	0.28	

R^2 = 0.84   cv = 21.5%

**Significant at 1% level.

The DR-7, DR-11, DR-12, and EK-11 isolates were most virulent on the leaves for all cultivars/lines tested (Table 1). The first 2 isolates listed above were also the most virulent on the pods (along with DR-8) while the latter 2 were the least virulent (Table 2). DR-10 was the least virulent isolate on the leaves while it was moderately virulent on the pods.

Significant host entry × isolate interactions were detected both for leaf reactions (for 3 recording times) and pod reactions in separate ANOVAs and between leaves and pods (Tables 3 and 4). The pods of WIS 71-3938 were highly susceptible to DR-7 isolate and were moderately resistant to EK-11, DR-12, DR-9, DR-19, and DR-10 isolates, while the leaves were moderately to slightly resistant to all isolates except DR-7, DR-8, and DR-11. The pods of WIS BBSR-130 were moderately susceptible to DR-7 but were much more resistant to DR-8 and EK-11 (Table 2), while its leaves were highly susceptible to DR-12 and slightly to moderately resistant to the other isolates (Table 1). The leaves of BAT 93 (CIAT) had a uniformly resistant reaction to all isolates (Table 1), but the pods were susceptible to all isolates except Nebr. EK-11. Reactions of some lines, such as Pinto Nebr. EP-1 and GN Nebr. #1 sel. 27, were nearly similar to all isolates.

Table 4. Analysis of variance for pod reaction of *Phaseolus* germplasm to isolates of *Xanthomonas phaseoli*.

Source of variation	df	Sum of squares	Mean square	F-value
Total	319	4647.8		
Replicates	3	1.8	0.583	
Lines	9	4145.0	460.550	993.9**
Rep × lines	27	12.5	0.463	
Isolates	7	168.0	23.998	65.5**
Lines × isolates	63	243.6	3.867	10.6**
Error	210	76.9	0.366	

R^2 = 0.98   cv = 13.5%

**Significant at 1% level.

The different interaction of isolate × host entry for leaves and pods is a new finding, but the observed differential reaction of leaves and pods themselves to the pathogen in general confirms previous findings (8, 9, 10, 12). The interaction of isolates × leaves of host entries differs from results at CIAT, possibly due to the different combination of host genotypes and isolates used in their studies (2). These results emphasize the importance of testing leaves and pods of progeny and lines with different isolates in order to develop uniform and wide resistance to the pathogen.

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U. S. AID MISSION TO DOMINICAN REPUBLIC
AMERICAN EMBASSY, P. O. Box 367
SANTO DOMINGO, DOMINICAN REPUBLIC

FOR U. S. CORRESPONDENTS:
U. S. AID MISSION
APO MIAMI 34041

February 23, 1984

Dr. Pat Barnes-McConnell, Ph.D.
Director
Michigan State University
Bean/Cowpea CRSP Management Office
200 Center for International Programs
East Lansing, Michigan 48824

Dear Pat:

Although I have not yet received the report of your internal review, I am answering your letter of February 9 since you probably need this information for consideration in extending the CRSP.

I think the CRSP is being managed well and is probably on schedule in achieving its goals. My only problem is conceptual. The CRSP attempts to give the DR the scientific capability to carry out rather sophisticated breeding programs for beans; hence food legumes. My conceptual problem is whether that is really necessary in order to give the DR a continuous source of resistant varieties of beans, etc. to meet its production needs. It may be a cliché or oversimplification, but I think the proper use of superior CIAT germ plasm is sufficient for short term varietal improvement. The long term needs are more difficult to access but I am forever fearful of duplicating the work done by the international centers.

With regards to your question about the CRSP's contribution to development, I think it has done quite a lot. The CRSP has created a bean center; thus a bean program. While I am not sure the CRSP so intended it, the center is developing into a excellent facility for testing material from CIAT. The San Juan center could eventually become for food legumes what Juma (Bonao) has been for rice. In short, I think the right thing may be happening but not entirely for the intended reason. If I could have my way I would like to see the CRSP continue but with emphasis shifted from the scientific toward the applied.

As for the host country's feeling about the project, I have certinally heard no criticism. Beans are a high priority and they want all the assistance they can get. Cesar Paniagua and Ing. Richiez have told me they support the project and they believe that it is providing "good" assistance. Incidentally, Paniagua is leaving the project and getting the right counterpart replacement could be a problem.

I hope these comments are useful to you in preparing the CRSP extension.

Sincerely,

Marion H. Ford

Marion H. Ford
Agriculture/Rural Development
Officer.

SUMMARY OF BEAN/COWPEA CRSP COSTS

Sub-Grantee: Dominican Republic/UNE

	US CONTRIBUTION				TOTAL	TOTAL	Total
	AID Contri.	Spent in HC	Non-Federal Contri.	Total US Contri.	HC Contri.	US & HC Contri.	Spent in HC
Cumulative through Year 3 (9-30-83)	247,390	170,326	114,712	362,102	26,678	388,780	197,004
Estimated Year 4	175,936	87,648	57,000	232,936	15,000	247,936	102,648
Estimated Year 5	329,610	158,525	57,029	386,639	17,235	403,874	175,760
SUB-TOTAL INITIAL GRANT	752,936	416,499	228,741	981,677	58,913	1,040,590	475,412
Projected Year 6	194,780	96,445	32,778	227,558	12,450	240,008	108,895
Projected Year 7	211,165	104,570	35,532	246,697	13,500	260,197	118,070
Projected Year 8	228,860	113,345	38,505	267,365	14,650	282,015	127,995
SUB-TOTAL EXTENSION	634,805	314,360	106,815	741,620	40,600	782,220	354,960
TOTAL PROGRAM	1,387,741	730,859	335,556	1,723,297	99,513	1,822,810	830,372

6062B

Bean/Cowpea Collaborative Research Support Program
Sub-Grantee: Dominican Republic/UNE

	Act Exp Thru Year 3	Est Exp Current Year 4	Est Exp Year 5	Total Initial Grant	Projected Year 6	Projected Year 7	Projected Year 8	Total Ext Request	Total Grant & Extension
Salaries	99,928	72,034	78,010	249,972	74,315	81,060	88,345	243,720	493,692
Fringe Benefits	1,476	4,376	6,700	12,552	5,090	5,500	5,940	16,530	29,082
Equip & Fac	37,658	13,208	90,400	141,266	15,495	16,735	18,075	50,305	191,571
Dom Travel	8,932	5,625	8,600	23,157	6,535	7,060	7,625	21,220	44,377
Intnl Travel	22,188	10,500	16,200	48,888	12,305	13,290	14,355	39,950	88,838
Materials & Supplies	19,681	18,000	27,750	65,431	21,080	22,765	24,585	68,430	133,861
Other Direct Costs	34,790	30,816	59,000	124,606	34,940	37,735	40,755	113,430	238,036
Total Direct Costs	224,653	154,559	286,660	665,872	169,760	184,145	199,680	553,585	1,219,457
Indirect Costs	22,737	21,377	42,950	87,064	25,020	27,020	29,180	81,220	168,284
Total Costs	247,390	175,936	329,610	752,936	194,780	211,165	228,860	634,805	1,387,741

Equipment included in Extension Budget Request:
1. Replacement Vehicle - $14,000
2. Growth Chamber - $36,000

6026B

PROJECT REVIEW AND EXTENSION PLAN

DOMINICAN REPUBLIC • UNIVERSITY OF PUERTO RICO (Initiated June 1981) • BEANS
Lopez-Rosa

IMPROVEMENT OF BEAN PRODUCTION IN THE DOMINICAN REPUBLIC THROUGH BREEDING FOR MULTIPLE DISEASE RESISTANCE (MDR) IN THE PREFERRED STANDARD CULTIVARS

INTRODUCTION

This project, in collaboration with USDA-ARS Tropical Agriculture Research Station (TARS), addresses the problem of bean yield losses associated with susceptibility to diseases. Significant progress toward the objectives was achieved. As a result of intensive evaluation of genotypes a white seeded line from the project was identified for release in the Dominican Republic, and improvement of the rust susceptible commercial black seeded cultivar is anticipated. Five improved multiple disease resistant genotypes were released and made available to other breeding programs. Advances in evaluation of genotypes, training of personnel and development of infrastructure made possible the initiation of a crossing program at the Dominican Republic Arroyo Loro station for improvement of the preferred Pompadour bean type. It is anticipated that project outputs, particularly improved Pompadour type beans, will be beneficial to farmers engaged in bean production and ultimately to poor rural and urban consumers.

Training of Dominican Republic personnel proceeded as planned. One student will complete requirements for the M.S. degree in early 1984 and a second student initiated his M.S. program in August, 1983 at the University of Puerto Rico (UPR), Mayaguez. Two project technicians from the Dominican Republic received practical training in bean technology at UPR.

YEARS ONE THROUGH THREE REFERENCE GUIDE

The information referred to here has been compiled in separate documents included in Sections I and III of this report.

Three-Year Progress Report

1983 Annual Report: See Section III, Technical Summary, page 52.

Research Publications and Presentations: See
Section III, Pulse Beat, Spring 1984, Insert, page 2.
Section III, Research Highlights Vol. 1, No. 2, 1984.

Project Evaluations

1983 Annual Report: See Section III, External Review Panel Report, page 25, and Follow-Up Chart Insert.

1983 Board of Directors Extension Rating: See Section I, page 25.

YEARS FOUR AND FIVE

Since the Dominican Republic and Honduras Bean/Cowpea CRSP Projects UPR-Mayaguez are aimed at common goals, i.e., stabilization and improvement of bean yield and production through incorporation of disease resistance into the preferred standard types, the information that follows is common for both projects.

Plans for future years will depend in large part on progress made during preceding years. As progress is made in breeding for disease resistance of one type new disease problems may become more apparent and thus require a shift in project emphasis.

The project itself is not the total effort being made in bean improvement either at the University of Puerto Rico or in the two Host Countries. Encouraging close cooperation among these groups, the major research question for this project in the near future should stay the same, "Improvement of bean production through disease resistance." Other factors will be incorporated into the project when possible but will not be major thrusts to expend scarce project funding and personnel time. These long-term factors may be: improved erect plant types, higher yield, earliness and adaptability. Basically the project will be working within generally accepted bean types, that is, tropical blacks, small seeded whites, reds and pinks and Cranberry types (bush beans).

EXTENSION YEARS SIX THROUGH EIGHT

Host Countries will be encouraged to form a balanced bean program including: socio-economic research, soils and soil fertility, farming systems, irrigation, weed control, seed production, management and storage and marketing. The project will concentrate specifically on major diseases and control through use of genetic resistance.

Puerto Rico

1. Continue to obtain new germ plasm and to test it to confirm disease resistance.

2. Continue to develop *P. coccineus* populations.
   a. This work will make about one cycle per year, thus new seed should be available each year for use in interspecific crosses and for release to other programs. We will be concentrating on resistance to: BGMV and a non-necrotic type of resistance to BCMV.
   b. Interspecific crosses to *vulgaris* lines to transfer resistance. Apparently this will require several backcross generations so work will proceed slowly and may require three to five years to transfer simply inherited genes to breeding germ plasm.

3. Continue to develop *P. vulgaris* populations.
   a. The main *vulgaris* population has been divided into sub-populations in accordance with bean types:
      (1) blacks and whites
      (2) reds and pintos
      (3) cranberry and red kidneys
      (4) others

or with disease problems:
(1) BCMV
(2) rust
(3) angular leaf spot
(4) root rots
(5) others

b. Since one cycle may take two to three years, new germ plasm suitable for the Host Countries' use should be available from time to time.
c. It is inconceivable that all resistances can be transferred to all bean types within the forseeable future due to the number and complexity of bean types and gene action. Though it is theoretically possible, it may take twenty-five to thirty years.

4. As new lines are produced from the program item 3 above they will be run through a complete selection and field trial procedure, at least through the F_4 generation which may take from 1 1/2-2 years per cycle. The best lines will be additionally tested in the Host Countries.

5. Main thrusts underway at present and to continue, probably through years six, seven and eight are:
   a. BCMV--protection of the I gene with bc 22 and/or bc 3.
   b. Pyramiding rust race resistance using the thirteen linked gene set of L-227 and adding on resistance to races in Central America.
   c. Bacterial blight resistance--pyramid XR-235 and Cornell resistances in both bush and semi-vine types.
   d. Increase ALS resistance--using 3M.99 as germ plasm base.
   e. Anthracnose resistance--transfer ARE gene into reds and pinks.

Host Countries

1. Continue to train personnel, increase staffing and hold training courses in the field and in Puerto Rico.

2. Maintain and improve the capacity to plant small farmer field trials--establish disease profiles for standard varieties during various seasons and over a period of three years or more.

3. Determine project's most useful breeding lines for each disease at each location.

4. Develop facilities and expertise to make crosses of standard cultivars and donor lines for disease resistance. Make one or two backcrosses to standard cultivars, select and field test converted lines.

5. Establish disease priority--on completion of obtaining resistance to major diseases, begin work on next disease, or concurrently if possible.

The recent change in the US PI should make no change in the projected research as the designee has been an integral part of the project from the CRSP initiation. No change in the US institution is anticipated.

Dominican Republic/UPR Bean/Cowpea CRSP Project

LOGICAL FRAMEWORK MATRIX
(December 1983)

Narrative Summary	Objectively Verifiable Indicators	Means of Verification	Important Assumptions
ogram or Sector Goal: The oader objective to which this oject contributes: (A-1)	Measures of Goal Achievement (A-2)	(A-3)	Assumptions for achieving goal targets (A-4)
make available to the tional legume program ltiple disease resistant dry an breeding lines/cultivars able of achieving yield bility over time.	- A measure of the improvement of yield stability, and yield level of MDR varieties over traditional varieties (Pompadour seed type) by 1988-1990. - A measure of acceptance of MDR varieties by small farmers.	- Comparison of the performance of MDR varieties produced by the program with original base-line data. - Determine the quantity of MDR seed planted by small farmers and the production levels they obtain.	- Small farmers continue to grow dry beans in the Dominican Republic. - The national seed program will increase seed of the new varieties. - The extension service will promote their use.
oject Purpose (B-1)	Conditions that will indicate purpose has been achieved. End-of-Project status (B-2)	(B-3)	Assumptions for achieving purpose (B-4)
educe losses due to diseases y incorporating multiple lisease resistance (MDR) into roductive genotypes with a eed type suitable to the ominican consumer. nhance the capability of the ominican bean research team hrough training, collabora-ive research, and improve-ent of facilities.	- Incorporation of MDR into the Pompadour and black bean types leading to improved yield stability level. - Training of graduate students and technicians. - Improvement of research infra-structure such as screen houses, laboratory equipment and vehicles.	- Yield loss studies will be conducted to determine the importance of the different diseases. - MDR will be demonstrated by the establishment of demonstra-tion plots on small farms, baseline data, and by test plots containing traditional and MDR cultivars. - Physical evidence of improve-ment of research infra-structure.	- Sources of resistance incorporated into local varieties remain stable. - A bean disease currently identified as a minor problem does not emerge as a major problem. - Bean research team in DR remains active and trained personnel continue to work with the project. - No natural disasters that might destroy research infrastructur

Project Outputs (C-1)	Magnitude of Outputs (C-2)	(C-3)	Assumptions for achieving output (C-4)
- Identification of stable sources of resistance to the major diseases affecting bean production in the Dominican Republic. - Incorporation of these sources of resistance into productive genotypes with a seed type suitable to the Dominican consumer.	- Development of varieties with improved levels of resistance to one or more diseases resulting in significantly increased yield stability and yield level. - Sufficient quantity of disease-free seed of the improved varieties to be made available to the national seed program.	- Sources of MDR will be tested at several locations in the DR. - MDR lines will be tested at several locations in the DR. - Breeder seed of the most promising lines will be made available to the national seed program.	- Reasonably heritable sources of resistance can be identified for the important bean diseases. - Breeding methods are appropriate to incorporate these resistances into local seed types. - The national seed program is capable of increasing seed of promising MDR varieties and making it available to small farmers, and the extension service effectively promotes their use.

INPUTS (D-1)	INDICATORS (D-2)	MEANS OF VERIFICATION (D-3) (What data needed and how to get it)	ASSUMPTIONS (D-4)
University of Puerto Rico/ USDA-ARS - Principal Investigator - Two Co-investigators - Two Research Associates. - One Technician. - Laborers. - Adequate facilities for personnel to conduct research programs in breeding and pathology. Administrative infrastructure.	- Use of project roster to determine continued involvement of personnel. - Examination of annual reports to determine performance of personnel and to evaluate if facilities and resources are made available to the project.	- Use of baseline data to measure acceptance of the improved MDR varieties by the small farmers and to to verify the yield stability and yield levels. - Research results obtained from the Dominican Republic and Puerto Rico. - Annual Reports.	- The present USAID, UPR and HC financial support remains at the planned level. - Involvement of personnel at all levels listed in D-1 will be continued. - Facilities mentioned in D-1 will remain to be available.

nputs (D-1)	Indicators (D-2)	Means of verification (D-3)	Assumptions (D-4)
Bean germplasm of potential value to the Dominican Republic.		- Trip reports. - Fiscal reports.	
<u>ominican Republic</u>		- Quarterly activities and fiscal reports from the HC.	
Principal investigator.			
Adequate personnel from CESDA and CENDA to conduct bean research.			
Adequate facilities at the Arroyo Loro experiment station to conduct a bean breeding program.			
Cooperation from Extension Service.			
Cooperation from local small farmers.			

DEPARTMENT OF AGRONOMY AND SOILS
COLLEGE OF AGRICULTURAL SCIENCE
UNIVERSITY OF PUERTO RICO - RUM
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May 9, 1984

Dr. Pat Barnes-McConnell, Director
Bean/Cowpea CRSP Management Office
200 Center for International Programs
Michigan State University
East Lansing, Michigan 48824

Dear Pat,

This letter is in response to your request for information for the Bean/Cowpea CRSP Extension Review. I did my best to answer those questions which I felt qualified to answer. Dr, Ayala or Ing. Gonzalez Roman would be in a better position than I to assess the impact of the CRSP on the College of Agricultural Science.

1. Benefits of the CRSP to host country agriculture

   a. One of the major goals of the projects is to develop bean varieties for Honduras and the Dominican Republic with improved levels of multiple disease resistance. One variety, Arroyo Loro 1, has already been released in the Dominican Republic.

   b. Another major objective is to enhance the research capacity of the bean research groups in Honduras and the Dominican Republic. Much progress has been made during the first three years of the project. Four members of the bean research team from the Dominican Republic have come to the University of Puerto Rico for graduate training. One person from Honduras has come to the University of Puerto Rico to complete a B.S. degree in the Crop Protection Department. Several research assistants have come to the University of Puerto Rico for short term training. Short term training has improved the quality of research being conducted in the Host Countries. Another important contribution of the CRSP project to the Host Country research capabilities has been the construction of facilities and the purpose of equipment. The project in the Dominican Republic is a good example. With the assistance of the CRSP, the research team at the Arroyo Loro Experiment Station now has the infastructure necessary for an effective bean breeding program.

   c. The project has made a special effort to conduct a major portion of the research on small farms. The on-farm trials have enabled project personnel to gain a better understanding of the importance of different disease problems. It is hoped that the on-farm trials also will enable germplasm developed by project to be more rapidly adopted by small farmers.

2. Benefits of the CRSP to U.S. agriculture.

a. Many of the bean diseases that cause economic damage in the Tropics also are important diseases in the temperate bean growing regions of the U.S. In fact, results from winter nursery work in Puerto Rico indicate that the Tropics can provide more selection pressure for resistance to certain pathogens such as rust. Sources of genetic resistance identified by the CRSP can be used as breeding material for U.S. bean research programs.

b. The CRSP is directly beneficial to the bean research program in Puerto Rico. The presence of the CRSP permits a greater level of activity. The result is that local research goals can be met in a shorter period of time. Since the Dominican Republic is located near to Puerto Rico, results from performance trials in the Dominican Repoublic provide us with an idea of how the germplasm will perform under local conditions.

3) Extent to which your regular domestic research program reinforce, complement, or otherwise relate to goals of the CRSP.

a. The Department of Agromony has three projects that are directly relavent to the CRSP projects in Honduras and the Dominican Republic. I am the Principal Investigator for a Hatch project which has the goal of developing dry bean varieties for Puerto Rico. Germplasm from this project has been used as parental material for the CRSP projects. I also am the Principal Investicator for a CSRS supported research project which is investigating the effectiveness of different selection methods in the genetic improvement of large seeded dry bean. We feel that information from this research will help the CRSP project to be efficient in the improvement of the large-seeded Pompadour beans for the Dominican Republic. At times, both facilities and personnel from these projects are shared with the CRSP projects. Dr. Eduardo Schroder is the Principal investigator for a Biological Nitrogen Fixation Project. He has tested some of the most promising bean lines from the CRSP projects for nitrogen fixation and has participated in the informal training of personnel from the Host Countries. At present, Dr. Schroder's project is supporting a graduate student from the Dominican Republic. The winter nursery activities in Puerto Rico also are beneficial to the CRSP projects since U.S. germplasm can be evaluated under Tropical conditions.

b. The Department of Crop Protection is actively involved in bean research. Mildred Zapata is the Principal Investigator for a CSRS supported project with the goal of developing bean germplasm with improved levels of resistance to bacterial blight. Since this disease is one of the most important diseases in Honduras and the Dominican Republic, the CRSP projects stands to gain much from her project. Dr. Julio Bird is the leader of a virology laboratory which is conducting research with the Bean Golden Mosaic Virus. He is presently serving as the major advisor for one of the CRSP supported graduate students from the Dominican Republic.

c. The projects also benefits from the USDA bean research program at the Tropical Agriculture Research Station. Dr. George Freytag is involved in a wide range of basic research with beans. Many of the important sources of disease resistance used in the Dominican Republic and Honduras CRSP projects were developed by a previous cooperative research project of the USDA and the University of Puerto Rico.

4. Impact or influence of CRSP existence on your regular on-going domestic research program.

a. The overall impact of the CRSP on the bean research program at the University has been an expansion of activities. In order to develop beans for Puerto Rico, we must breed beans for Tropical conditions. The CRSP project permits the project to screen a greater amount of germplasm for resistance to a wider range of diseases. The support also allows a greater lever of cooperative work with international centers such as CIAT.

b. The presence of the CRSP projects permit a a great opportunity for the professional improvement of those scientists involved with projects. In addition to gaining a degree of expertise in dealing with bean research problems in the Host Countries, scientists involved with CRSP projects gain new insights into research and teaching. I find that I frequently use examples in my lectures that come from my experiences working with the CRSP projects.

c. The presence of CRSP supported graduate students from the Host Countries permit more research to be conducted on problems related to the goals of the project. I have found that the graduate students are a valuable resource when a "local expert" is needed. For example, one of the graduate students from the Dominican Republic proved to be very useful in evaluating a group of bean lines for seed type.

I have attempted to support the responses to the questions with examples. I do not feel qualified to answer the last question related to the impact of CRSP existance on the regular on-going international research program.

There are three issues which I would like to recommend to be considered for discussion.

1. How can the length of time to obtain permission from AID to purchace equipment be reduced?

2. How can researchers with a technical backround become more effective in realizing objectives related to baseline data and the involvement of women in development.

3. The experience of collaboration between the University of Nebraska and the University of Puerto Rico in the Domiican Republic has been very positive. Could this sort of arrangement be useful in other countries?

I hope that this letter will provide most of the information that you requested. Please give me a call if I can provide any additional information.

Sincerely,

Julio

James Beaver
Assistant Professor

cc. Ing. Miguel Gonzalez Roman
Dr. Julio Lopez Rosa
Dr. Luiz Cruz Perez

U. S. AID MISSION TO DOMINICAN REPUBLIC
AMERICAN EMBASSY, P. O. Box 867
SANTO DOMINGO, DOMINICAN REPUBLIC

FOR U. S. CORRESPONDENTS:
U. S. AID MISSION
APO MIAMI 34041

February 23, 1984

Dr. Pat Barnes-McConnell, Ph.D.
Director
Michigan State University
Bean/Cowpea CRSP Management Office
200 Center for International
Programs
East Lansing, Michigan 48824

Dear Pat:

Although I have not yet received the report of your internal review, I am answering your letter of February 9 since you probably need this information for consideration in extending the CRSP.

I think the CRSP is being managed well and is probably on schedule in achieving its goals. My only problem is conceptual. The CRSP attempts to give the DR the scientific capability to carry out rather sophisticated breeding programs for beans; hence food legumes. My conceptual problem is whether that is really necessary in order to give the DR a continuous source of resistant varieties of beans, etc. to meet its production needs. It may be a cliché or oversimplification, but I think the proper use of superior CIAT germ plasm is sufficient for short term varietal improvement. The long term needs are more difficult to access but I am forever fearful of duplicating the work done by the international centers.

With regards to your question about the CRSP's contribution to development, I think it has done quite a lot. The CRSP has created a bean center; thus a bean program. While I am not sure the CRSP so intended it, the center is developing into a excellent facility for testing material from CIAT. The San Juan center could eventually become for food legumes what Juma (Bonao) has been for rice. In short, I think the right thing may be happening but not entirely for the intended reason. If I could have my way I would like to see the CRSP continue but with emphasis shifted from the scientific toward the applied.

As for the host country's feeling about the project, I have certinally heard no criticism. Beans are a high priority and they want all the assistance they can get. Cesar Paniagua and Ing. Richiez have told me they support the project and they believe that it is providing "good" assistance. Incidentally, Paniagua is leaving the project and getting the right counterpart replacement could be a problem.

I hope these comments are useful to you in preparing the CRSP extension.

Sincerely,

Marion H. Ford

Marion H. Ford
Agriculture/Rural Development
Officer.

SUMMARY OF BEAN/COWPEA CRSP COSTS

Sub-Grantee: Dominican Republic/UPR

	US CONTRIBUTION				TOTAL	TOTAL	Total
	AID Contri.	Spent in HC	Non-Federal Contri.	Total US Contri.	HC Contri.	US & HC Contri.	Spent in HC
Cumulative through Year 3 (9-30-83)	312,411	139,680	96,915	409,326	33,523	442,849	173,203
Estimated Year 4	152,687	73,793	35,329	188,016	24,830	212,846	98,623
Estimated Year 5	273,780	140,263	44,506	318,286	25,140	343,426	165,403
SUB-TOTAL INITIAL GRANT	738,878	353,736	176,750	915,628	83,493	999,121	437,229
Projected Year 6	198,600	95,125	34,492	233,092	24,400	257,492	119,525
Projected Year 7	215,290	103,120	37,390	252,680	26,460	279,140	129,580
Projected Year 8	233,315	111,750	40,522	273,837	28,700	302,537	140,450
SUB-TOTAL EXTENSION	647,205	309,995	112,404	759,609	79,560	839,169	389,555
TOTAL PROGRAM	1,386,083	663,731	289,154	1,675,237	163,053	1,838,290	826,784

6062B

Bean/Cowpea Collaborative Research Support Program
Sub-Grantee: Dominican Republic/UPR

	Act Exp Thru Year 3	Est Exp Current Year 4	Est Exp Year 5	Total Initial Grant	Projected Year 6	Projected Year 7	Projected Year 8	Total Ext Request	Total Grant & Extension
Salaries	235,346	77,185	87,960	400,491	96,150	104,640	113,810	314,600	715,091
Fringe Benefits	18,300	7,955	10,260	36,515	10,940	11,815	12,760	35,515	72,030
Equip & Fac	22,156	7,728	81,900	111,784	10,620	11,470	12,390	34,480	146,264
Dom Travel	7,137	4,697	7,200	19,034	6,425	6,940	7,495	20,860	39,894
Intnl Travel	12,965	7,455	11,500	31,920	10,260	11,080	11,965	33,305	65,225
Materials & Supplies	4,801	5,899	9,100	19,800	8,120	8,770	9,470	26,360	46,160
Other Direct Costs	5,905	31,062	39,360	76,327	41,365	44,675	48,250	134,290	210,617
Total Direct Costs	306,610	141,981	247,280	695,871	183,880	199,390	216,140	599,410	1,295,281
Indirect Costs	5,801	10,706	26,500	43,007	14,720	15,900	17,175	47,795	90,802
Total Costs	312,411	152,687	273,780	738,878	198,600	215,290	233,315	647,205	1,386,083

Equipment included in Extension Budget Request:
1. Replacement Vehicle - $13,000
2. Screenhouse - $5,000
3. Lab Office Complex - $15,000

6026B

PROJECT REVIEW AND EXTENSION PLAN

ECUADOR • CORNELL UNIVERSITY (Initiated September 1981) • BEANS
Wallace

AGRONOMIC, SOCIOLOGICAL AND GENETIC ASPECTS OF BEAN YIELD AND ADAPTATION

INTRODUCTION

Collaborative farming systems research is being conducted in Ecuador. The CRSP research complements the National Institute for Agronomic Investigation (INIAP) programs concerned with smallholders. This collaboration contributes to the identification of researchable problems for the National Legume Program and for the CRSP.

Farming Systems Research philosophy is a potential antidote toward lessening the increasing distance between the advantaged and the disadvantaged. The operational feature of Farming Systems Research is to place the applied research worker in the field with the farmer. Together, the farmer and scientist carry through on-site research, procedures and processes that are relevant, appropriate and feasible as means of improving the technology of the small farmer. This proceeds with a ground-up philosophy. It yields greater insight and understanding of the political, social and cultural realities of appropriate technology transfer problems.

Short-term objectives focus on the development of an appropriate and economical methodology for farming systems research. Interview schedules have been drawn up and microcomputer techniques developed. Two methodologies have been designed--one for informants and another for a statistically representative sample. Informant interviews were used in Imbabura and questionnaires in Pimampiro. Both methodologies have been evaluated. Work suggests that structured interviews with informants can provide valid information, provided analysis of secondary data precedes fieldwork.

Microcomputers are being used to facilitate farming systems research. A manual for analysis of agricultural census data was written. Environmental data are being processed to identify "recommendation domains." Pre-intervention farming systems research in new zones (Manabi and Canar/Azuay) will be supplemented by on-farm experimentation in zones where the CRSP has worked (Pimampiro). One US female sociologist and one Ecuadorian female agronomist were enrolled in courses in Ecuador during 1983.

YEARS ONE THROUGH THREE REFERENCE GUIDE

The information referred to here has been compiled in separate documents included in Sections I and III of this report.

Three-Year Progress Report

1983 Annual Report: See Section III, Technical Summary, page 57.

Research Publications and Presentations: See
Section III, Pulse Beat, Spring 1984, Insert, page 2.

Project Evaluations

1983 Annual Report: See Section III, External Review Panel Report, page 27, and Follow-Up Chart Insert.

1983 Board of Directors Extension Rating: See Section I, page 25.

YEARS FOUR AND FIVE

Secondary data were gathered and analysed in 1982-83 for the Pimampiro region to help identify "recommendation domains" where on-farm social-economic-agronomic and plant biological research should give reasonably uniform recommendations for farmer practices, decisions and interpretations for future research. Similar work will begin in 1984 for the Manabi region and in 1985 for the Canar region.

Crosses for selection of improved cultivars and new agronomic research have started with identification of new germ plasm. On-farm research and agronomic investigations are beginning in 1984 with tests of the cultivars being evaluated for adaptation and yield.

EXTENSION YEARS SIX THROUGH EIGHT

Organizational problems now solved have delayed this project's progress. Now that the resident agronomist and social scientist are identified, the extension years can be expected to focus on further development of the work begun in years four and five.

INIAP is now beginning to make its own crosses. They will be concentrating on making the crosses, conducting yield trials and conducting adaptation trials. This adaptation research is of special concern to the CRSP project. On-farm research using cultivars evolving from this work will concentrate on farmer requirements.

ECUADOR

LOGICAL FRAMEWORK [redacted] CORNELL/INIAP

NARRATIVE SUMMARY	OBJECTIVELY VERIFIABLE INDICATORS	MEANS OF VERIFICATION	IMPORTANT ASSUMPTIONS
OUTPUTS	MAGNITUDE OF OUTPUTS		OUTPUT ASSUMPTIONS
1) redefine and operationalize concept "dominios de recomendaciones"	document elaborating demarcation rules; application of rules to one province	maps and precise documentation on demarcation rules	staff stability in the province(s)
2) train INIAP staff in methodology	10 trained in FY 82; another 5-10 to be trained in FY 83	budget allocation and technical reports	motivation of INIAP staff and identification of appropriate province for diagnostic research
INPUTS			INPUT ASSUMPTIONS
1) Cornell, on campus: time of Co-I's, secretaries and G.S.'s	3-4 person/months in country	professional calendars (We dare you!) and trip reports	informed staff do not quit in desperation with paperwork and bureaucratic hassles
2) Cornell off campus: sociologist, agronomist and equipment	most equipment delivered; sociologist arrived July, 1982; agronomist due January, 1983	budget	appropiate students available, interested and acceptable to INIAP
3) INIAP 2 counterparts, office space and support staff, vehicle maintenance and per-diems for INIAP staff.	staff, office and budgetary allocations		continued goodwill and genuine interest by INIAP staff; recuperation of INIAP budget to permit expenditure of counterpart funds

.LOGICAL FRAMEWORK - CORNELL/INIAP

NARRATIVE SUMMARY	OBJECTIVELY VERIFIABLE INDICATORS	MEANS OF VERIFICATION	IMPORTANT ASSUMPTIONS
PROGRAM/SECTOR GOAL	MEASURES OF GOAL ACHIEVEMENT		ASSUMPTIONS FOR ACHIEVING GOAL TARGETS
To understand agronomic and socioeconomic aspects of bean production by smallholders	Professional publications on interface between agronomic and socioeconomic determinants	Articles in referred journals	Continued interest at Cornell and INIAP in the organization of smallholder production
PROJECT PURPOSE	CONDITIONS THAT INDICATE PURPOSE WAS ACHIEVED		ASSUMPTIONS FOR ACHIEVING PURPOSE
1) To conduct FSR in at least one province	diagnostic research conducted by Cornell/INIAP teams; follow up by smaller team	technical reports on province published by INIAP	re-establishment of stable and high exchange rate
2) to develop an economic methodology for FSR	adoption of Cornell methodology by others	costs to apply methodology after two more years of development	maintenance of self-critical attitude by researchers, currently flushed by initial success
3) to identify researchable problems via field research for experiment station programs	establishment of new research programs in legumes at experiment stations	staff and budget allocations within legume program	strong leadership within legume program plus resources to expand research activities

ACHIEVEMENTS OF BEAN COWPEA RESEARCH ACTIVITIES FROM COLLABORATION AMONG ECUADOR, GUATEMALA AND CORNELL UNIVERSITY

April, 1984

INTRODUCTION.

With all of the outstanding success and achievement in the science and technology of Agricultural Development, one of the most elusive and intractable problems has been how to transmit the new beneficial knowledge to people positioned toward the bottom of the socio-economic ladder. In the 3rd world small land holders constitute the majority of the farmers.

In the U.S. the record is not distinguished in terms of bringing the results of research and new technology to the small scale and low income farm population who have the greatest needs.

The farming systems research philosophy undergirding the Bean/Cowpea CRSP in Ecuador and Guatemala proceeds under quite a different set of assumptions from those giving thrust to the green revolution. In the latter the assumption was one of designing preparing and packaging the technology, assuming that it would naturally find its way and be transmitted across political social and cultural barriers to reach the small and poor farmers. It is true the green revolution spread with remarkable success. Unfortunately, the small scale subsistence farmers constituting the vast majority of farmers in the 3rd world countries did not and could not avail of the green revolution benefits.

A central problem is that scientific research and technology normally flows through top down organizational systems. This top down orientation acts like a series of sieves to strain out the benefits of the science and technology before it reaches people at the bottom.

Farming Systems Research philosophy is a potential antidote toward lessening the increasing distance between the advantaged and the disadvantaged. The operational feature of Farming Systems Research is to place the applied research worker in the field with the farmer. Together, the farmer and scientist carry through on-site research, procedures and processes that are relevant, appropriate, and feasible as means of improving technology of the small farmer. This proceeds with a ground up philosophy. It yields greater insight and understanding of the political, social and cultural realities of appropriate technology transfer problems.

Farming Systems Research is essential to meaningful agricultural progress in the 3rd world countries where the preponderance of small scale farmers gives legitimacy. The insights of this approach transmit obvious benefits to counterpart work in the U.S. and New York State.

BENEFITS TO CORNELL AND THE UNITED STATES

1. The Bean/Cowpea CRSP has facilitated multidisciplinary research by focusing attention on the needs of small scale producers of beans and other legumes. The CRSP is the first of several projects at Cornell to adopt a farming systems orientation. In all cases, concerns which arose in an international context caused researchers to redefine and reexamine the situation in New York. Several mechanims have allowed CRSP researchers to apply in the U.S. lessons that were learned in international settings.

2. The CRSP has fostered a reciprocal relationship between domestic and international research, especially in the development of procedures for collecting sociological and political data. Our first pre-test to evaluate structured interviews as a data collection technique was conducted during one summer with organic farmers in up-state New York. Another pre-test was conducted in Mexico. Both sites identified major but different problems in collecting certain information. This facilitated development of the interview guide now being used in CRSP interviews in Ecuador. These experiences, in turn, influenced the design of a questionaire administered to small holders in another country state. The latter research was funded by a Title XII strengthening grant concerned with a domestic/international comparison of appropriate technologies. A graduate student is analyzing these data for her dissertation. Although this research was not funded by the CRSP or by Cornell, it illustrates how international experience influences domestic research via both formal and informal channels.

3. The Cornell Farming Systems Research Seminar, in which CRSP staff have taught, provides an approach for learning by staff and students from international activities. The field trips of this course, and the complementary seminar on Household Food Production Systems, both study limited resource farmers in New York. The assumption behind work in New York is precisely the same as that behind research in Ecuador and Guatemala: It is necessary to analyze existing farming systems, to evaluate research and/or extension activities which would improve them, and to develop technologies which are appropriate to meet farmer's felt needs.

4. Public presentations of project research and activities have elicited very positive reactions from domestically oriented colleagues. Senior staff have had especially strong and positive reactions. The farming systems approach reminds them of the collaboration which was more common in the past between and among social and production scientists.

5. As international research influences domestic research, land grant institutions may be able to achieve improved research balance between: 1) problem which require a narrow and specialized focus and 2) problems which benefit from multidisciplinary collaboration. A positive regard for holistic perspectives can again characterize land grant institutions.

6. Our collaboration with CIAT, Ecuador and Guatemala has made valuable germplasm available to New York State. Crosses are being made between New York bean cultivars and cultivars identified as being later to flower because of a mechanism other than sensitivity to long daylength and high temperature. These cultivars are late in spite of insensitivity to these environmental factors. The later maturity by a different physiological mechanism may facilitate higher yields of beans under the long summer days of New York.

7. Tropical locations have proven more effective for assaying the control over days to flower and maturity of bean by daylength and/or high temperature than is the climate of New York State. Thus, international collaboration has provided Cornell with an improved geographical location for verifying that daylength and temperature control the days to flowering and maturity of bean in the field, just as they do in the growth chamber. This shows us how to efficiently select for early, intermediate, late or very late maturity. It sharpens our knowledge about how to select for the different maturities that are needed to maximize cultivar adaptation and bean yields for all different world areas, including the temperate climate of New York State and such areas as lowland tropics, moderate elevation tropics, and highland tropics.

8. Without the CRSP on going international research on beans at Cornell would be almost non existent.

BENEFITS TO ECUADOR AND INIAP

1. The Bean/Cowpea CRSP provides specific support to the national legume program and generalized support to farming systems activities with INIAP. Consequently, the CRSP helps Ecuador meet the needs of small scale producers of beans and other legumes by sponsoring activities which are incorporated into INIAP's research and development planning, and by complementing other externally funded activities.

2. The CRSP has supported the expressed interest of INIAP to move off station and to serve small scale producers. Since the CRSP began, INIAP leadership has changed. Current administrators are very supportive, and this position is unlikely to be affected by future changes in personnel. Therefore, in Ecuador the CRSP exists in an institutional context. Staff of both the national legume program and regional technicians for smallholders have uniformly and consistently supported Farming Systems Research. AID/E and the projects they have funded, notably the Rural Technology Transfer Systems Research approach. Finally, the CRSP has a distinctive if modest contribution to such research in Ecuador.

3. The CRSP has contributed to Farming Systems Research methodology. We have developed a procedure which combines the analysis of secondary data with structured interviews. We have evaluated the relative merits of informant and sample survey techniques. The CRSP has provided Ecuador's National Institute of Agricultural Investigations (INIAP) with principled discussion of

intellectually defensible but economical field research methodologies.

4. The CRSP has provided for INIAP the microcomputer hardware and software which makes Farming Systems Research possible. INIAP appreciates that the CRSP has made a distinctive and important contribution to its field research activities, and is supportive of efforts which are funded by other grants and loans.

5. CRSP funds have focused attention on regions which might not have received preference in INIAP's allocation of resources. The three identified zones for CRSP activities all represent specific types of legume production which are important in both an international and national context.

6. CRSP funds have allowed Ecuador's National Legume Program to initiate regional activities and to begin a breeding program. A well trained plant breeder has been placed in charge of the grain legume program. Active bean breeding using crosses made at INIAP is beginning, replacing selection only of the best land race cultivars or of lines provided by CIAT. The National Legume Program has been weak in comparison to other commodity program within INIAP. CRSP resources allow INIAP to focus resources on specific programs and zones in order to achieve a multiplifier effect.

7. To date, CRSP efforts have been concentrated in the Province of Imbabura and in the zone of Pimampiro. Constraints to bean production have been identified by farmers and researchers working together, including limitations of varieties, plant spacing, cultural practices, seed selection, and seed storage. CRSP sponsored Farming Systems Research has, therefore, met a major objective; it has identified researchable problems for reorienting experiment station activities toward meeting the needs of small scale farmers. This CRSP research has provided INIAP with the first link between baseline research and appropriate technology-- a link not assuming that an appropriate technology had already been developed on station, just awaiting demonstration by researchers before adoption by smallholders.

8. CRSP experience has reinforced the open mindedness of leadership and staff. They are allowing on farm research to influence INIAP's research agendas.

9. Currently, Farming Systems Research receives considerable support from Cornell, INIAP, and AID/E. An incontrovertible argument can be made that Farming Systems Research is the only viable alternative for meeting the needs of small scale producers by agricultural research and development.

10. The CRSP in Ecuador and INIAP are beginning to work with cowpeas and with small and large seeded lima beans in the lowland area of Ecuador. The director general and other INIAP administrators are accepting and pushing socio-agronomic research as an integral component of INIAP's commodity research programs.

11. FAO funded workshops on bean production are planned that will involve governmental agencies with responsibility for social concerns.

Thus, the Farming System Researchs view of the CRSP is leading to multidisciplinary interactions among diverse Ecuador agencies and personnel.

BENEFITS TO GUATEMALA

1. CRSP research in Guatemala has found that ability of climbing bean cultivars to compete with or out compete the associated corn crop is conditioned primarily by the bean plant's days to maturity and attendant high vs. low positioning on the stem of flowers and pods. That is, early vs. late maturity plus vertical distribution of the pods along the stem constitute the primary genetical variability that plant breeders of climbing beans must select for. Because of the CRSP research, this knowledge is on hand as Guatemala's Insitute of Science and Technology of Agriculture (ICTA) begins intensive effort to breed climbing bean cultivars for native Indian Farmers of the highlands.

2. The CRSP research has shown that the days to maturity and the height of pods on the stem are controlled by daylength and temperature acting jointly with the genetics of the plant.

3. Guatemala is in 1984 beginning to breed and select bush bean cultivars for extending bean production into the lowland tropics where beans do not now grow well. Beginning this effort follows CRSP demonstration in Guatemala that cultivars are adapted to the lowland tropics by having insensitivity to daylength and temperature and also by having a higher optimal temperature for flowering. This optimum temperature for flowering gives the cultivars fewest days to flowering. It can be measured for each cultivar by growing it across a range of elevations (mean temperatures). Unexpectadly, beans best adapted to lowland tropics are insensitive to daylength like those that are best adapted to the temperate zone of New York.

4. Beans for the tropical highlands must be selected primarily for adaptation to below optimum temperatures for flowering.

5. Beans for moderate elevation tropics should be selected for adaptation as controlled by that minimal days to flowering that occurs at the optimal temperature for flowering.

6. The CRSP provided ICTA with its first microcomputer. This accellerated, analysis of agronomic research data by the bean program. ICTA's other commodity programs are now seeking to acquire microcomputers.

7. The CRSP will shortly fund the employment of an anthropologist by ICTA. This will strengthen ICTA's socioeconomic activities and thereby enhance the multidisciplinary approach of ICTA's Farming Systems Research.

8. ICTA has assigned a full time agronomist to the CRSP activities and a part time agricultural economist. These moves strengthen the ongoing Farming Systems Research.

9. Guatemala has intensified its agronomic and sociological work with native Indian farmers as a consequence of the CRSP. ICTA and the CRSP aim to learn about family and on farm concerns and goals of these farmers, as these factors relate to bean production and to other farming and non farming activities of the farmers and their families.

10. ICTA states that a major benefit to them from the CRSP is the communication with U.S. scientists and the linkage to new ideas, research objectives, and research methodologies acquired from this communication with the broader scientific community.

UNITED STATES AID MISSION TO ECUADOR
INTERNATIONAL DEVELOPMENT COOPERATION AGENCY
AGENCY FOR INTERNATIONAL DEVELOPMENT
QUITO, ECUADOR

RDO-84-368

April 17, 1984

Dr. Pat Barnes - McConnell
Director
Bean/Cowpea CRSP Management Office
200 Center for International Programs
Michigan State University
East Lansing, Michingan 48824

Dear Dr. Barnes - McConnell:

Thank you for the informal copy of the Technical Summary of the Annual Report for the Bean/Cowpea CRSP project in Ecuador. We in USAID/Ecuador are very interested in the results of the project.

We would like to receive copies of the reports as well as copies of the research and technical papers forthcoming from the research.

In response to your letter of February 9, I would like to apologize for the extensive delay in responding, but it was necessary to wait until the most recent visit by the Cornell University team was concluded.

First, to address your question of strengths and weaknesses of the CRSP in Ecuador. Overall, the project's implementation and consequently its impact have been less than what was envisioned at the outset. This was due to two very serious constraints, which I feel are now being resolved.

First, was the delay in securing the full-time agronomist and social scientist team to work in Ecuador on the project. The

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lack of the agronomist was especially critical given INIAP's reluctance to accept a social scientist in agricultural research. The agronomist, I feel, would have been able to facilitate the connection. This situation appears resolved with Cornell identifying two excellent individuals, Drs. Kris Merschrod and Wiley Klein, to fill the long-term social scientist and agronomist positions, respectively. The second reason for the lack of better progress was a series of changes which have occurred in key INIAP personnel, and which resulted in, at best, indifference to the CRSP, and which translated into lack of active support. Once again, this appears basically resolved due to recent appointments of INIAP officials who are demonstrably more sympathethic to the objectives of the CRSP.

Aside from the personnel issue, the main weakness of the CRSP in Ecuador has been in not coordinating sufficiently with other in-country activities having similar objectives or mutually supportive activities. This is particularly evident at the U.S. University level. A specific example with which I am familiar relates to the Small Farming Systems Subproject which is being implemented by INIAP through USAID/Ecuador financing.

I saw no evidence of coordination or communication between Cornell and the University of Florida, which has the FSSP Cooperative Agreement with A.I.D. and is providing technical assistance to the subproject. I have raised this issue with both universities, and have been promised closer coordination efforts. Opportunities for coordination with on-going and planned projects must be a prime concern of the CRSPs worldwide, as all A.I.D. Missions are facing personnel reductions, and therefore, are less able to support isolated activities which are not integral to their overall program and development strategy.

The strength of the Bean Cowpea CRSP is clearly its ability, in the case of Ecuador, to make a significant contribution to improving the overall well-being of the small farmer, and by extension, the rural sector. The objectives of the CRSP, as presented in the initial A.I.D./Michigan State University Agreement are as valid today as ever, only now they are more urgent.

I touched on the question of host country feelings earlier, and therefore will only add that perceptions will most certainly become even more positive as the effect of the two full-time advisors is felt by INIAP research personnel.

Extending the Bean/Cowpea CRSP is certainly warranted given: 1) it addresses an important development sector i.e. the small farmer; and 2) the situation of the small farmer has not reached the point where emphasis can be necessarily placed elsewhere. The real critical issue is not extension or no extension, but how to incorporate the knowledge acquired into improving the effectiveness of the CRSP during the FY 86 - FY 88 period.

Sincerely yours,

Joseph Goodwin, Chief
Agriculture and Rural
Development Office

SUMMARY OF BEAN/COWPEA CRSP COSTS

Sub-Grantee: Ecuador/Cornell

	US CONTRIBUTION				TOTAL	TOTAL	Total
	AID Contri.	Spent in HC	Non-Federal Contri.	Total US Contri.	HC Contri.	US & HC Contri.	Spent in HC
Cumulative through Year 3 (9-30-83)	181,049	89,477	57,344	238,393	14,647	253,040	104,124
Estimated Year 4	159,035	76,139	35,496	194,531	16,795	211,326	92,934
Estimated Year 5	253,560	120,780	44,260	297,820	18,950	316,770	139,730
SUB-TOTAL INITIAL GRANT	593,644	286,396	137,100	730,744	50,392	781,136	336,788
Projected Year 6	114,190	54,265	19,975	134,165	8,885	143,050	63,150
Projected Year 7	123,325	58,595	21,577	144,902	9,600	154,502	68,195
Projected Year 8	133,190	63,300	23,297	156,487	10,370	166,857	73,670
SUB-TOTAL EXTENSION	370,705	176,160	64,849	435,554	28,855	464,409	205,015
TOTAL PROGRAM	964,349	462,556	201,949	1,166,298	79,247	1,245,545	541,803

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Bean/Cowpea Collaborative Research Support Program
Sub-Grantee: Ecuador/Cornell University

	Act Exp Thru Year 3	Est Exp Current Year 4	Est Exp Year 5	Total Initial Grant	Projected Year 6	Projected Year 7	Projected Year 8	Total Ext Request	Total Grant & Extension
Salaries	40,560	44,262	47,210	132,032	36,980	39,540	42,305	118,825	250,857
Fringe Benefits	3,427	7,916	10,200	21,543	7,720	8,175	8,670	24,565	46,108
Equip & Fac	16,778	17,964	47,700	82,442	5,985	7,025	8,150	21,160	103,602
Dom Travel	5,089	5,063	7,800	17,952	3,655	3,945	4,260	11,860	29,812
Intnl Travel	21,301	18,435	28,400	68,136	13,315	14,380	15,530	43,225	111,361
Materials & Supplies	24,565	12,720	19,600	56,885	9,190	9,925	10,720	29,835	86,720
Other Direct Costs	35,490	30,423	58,350	124,263	21,260	22,960	24,795	69,015	193,278
Total Direct Costs	147,210	136,783	219,260	503,253	98,105	105,950	114,430	318,485	821,738
Indirect Costs	33,839	22,252	34,300	90,391	16,085	17,375	18,760	52,220	142,611
Total Costs	181,049	159,035	253,560	593,644	114,190	123,325	133,190	370,705	964,349

Equipment included in Extension Budget Request:
1. Jeep - $15,000
2. 2 programmable Nikon Cameras - $1,000
3. 2 Panasonic video recording systems - $3,000

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PROJECT REVIEW AND EXTENSION PLAN

GUATEMALA • CORNELL UNIVERSITY (Initiated September 1981) • BEANS
Wallace

AGRONOMIC, SOCIOLOGICAL AND GENETIC ASPECTS OF BEAN YIELD AND ADAPTATION

INTRODUCTION

The socio-agronomic bases for the bean farming systems of highland Indians are being sought. Change from monocropped bush, to bush with corn, to climbing bean with corn occurs as elevation increases. Human and ecological factors underlying the various systems are being investigated. Trials at varied elevations showed two plant processes regulate days to flower. One is node number developed per day, which at elevations above the optimal, accelerates as temperature rises, causing earlier flowering and maturity. The second is daylength-temperature controlled delay in node to flower. Delay increases as daylength (latitude) extends and/or temperature rises, (elevation lowers), causing later flowering. Each cultivar's fewest days to flower occurs at its "optimum" temperature (elevation) where change toward earlier and later flowering are balanced. Lower, upper, and relative limits of both changes are each set by a few genes. Other genes control the expressed minimal days to flowering. Separate genes for both changes (early flowering and late flowering) plus for minimal days and optimal temperature interact with the daylength and/or temperature effects to divide the world into zones where each component of maturity alternatively and predominantly controls cultivar adaptation. Genotypes, crosses, segregates, responses, adaptations and yields are evaluated in low, moderate and high elevation tropical zones as well as temperate zones.

Project-supported research for one US Ph.D. student's thesis was completed at CIAT. Additional graduate work included one US student, one Guatemalan student and one from another developing country.

YEARS ONE THROUGH THREE REFERENCE GUIDE

The information referred to here has been compiled in separate documents included in Sections I and III of this report.

Three-Year Progress Report

1983 Annual Report: See Section III, Technical Summary, page 65.

Research Publications and Presentations: See
Section III, Pulse Beat, Spring 1984, Insert, page 3.
Section III, Vanguard Vol. 1, No. 1.

Project Evaluations

1983 Annual Report: See Section III, External Review Panel Report, page 29, and Follow-Up Chart Insert.

1983 Board of Directors Extension Rating: See Section I, page 25.

YEARS FOUR AND FIVE

Effort has been put into the further integration of this project at Cornell. Additional social science input will support expanded farming systems research as will collaboration with the INCAP team of another CRSP project in Guatemala.

Emphasis will be on Chimaltenango for collection of secondary data and administration of interviews. The expanded socio-economic fieldwork will provide a comprehensive description of the system and farmer-perceived needs and verify the objectives of the agronomic research plan. The agronomic work will continue to emphasize farmer needs and on-farm trials in the research on yield and adaptation.

EXTENSION YEARS SIX THROUGH EIGHT

Farming Systems Research will continue as developed from the product of years four and five. Breeding of improved cultivars is always a long-term project of six or eight or usually ten to fifteen years. The proposed stepwise evaluation of germ plasm and more detailed assays of maturity, adaptation and yield merit CRSP support over at least five or more years. This duration is necessary to minimally evaluate the proposed improvement in efficiency of breeding for cultivar maturity, adaptation and yield. To evaluate potential improvement of breeding efficiency for all three tropical elevations plus the temperate area will require even more years. However, it should save years over current breeding approaches. Genetics and environment each constitute a theoretical fifty percent of all crop production systems. This is particularly so if viewed from the biology of maturity, wherein every environmental response is dependent for its expression on a facilitating genotype.

As genetic variabilities for the four physiological-genetic components of maturity, adaptation and yield of the currently most useful germ plasm are identified, the different genotypes will be intercrossed in ways that will most predictably improve maturity, adaptation, yield and other horticultural and disease resistance characters for one or more of three tropical zones and also for the temperate zone (New York). These procedures should lead to more efficiently planned and achieved breeding of improved cultivars. Crosses have in 1983 been made in Guatemala. Crosses are being made in 1984 in Ecuador.

The F_2 to F_7 or F_8 generations will be selected by individual plant selection using the described assays, or advanced by single pod descent procedures and assayed in the F_4 through F_6 generation. The best yielding, horticulturally most acceptable and most disease resistant lines will be selected and evaluated for merit of cultivar release using the same assays described above for identifying the genetic variation in the best current germ plasm.

Making of new and/or additional crosses will continue as knowledge of germ plasm variabilities for maturity and adaptation expands. Selection through the F_2 to F_7 or F_8 to cultivar release will follow for each series of new crosses.

LOGICAL FRAMEWORK -- CORNELL/ICTA

PHYSIOLOGICAL GENETICS OF MATURITY, ADAPTATION AND YIELD

NARRATIVE SUMMARY	OBJECTIVELY VERIFIABLE INDICATORS	MEANS OF VERIFICATION	IMPORTANT ASSUMPTIONS
CRSP Goal	Measures of Goal Achievement		
Improve the production of beans by small/subsistence farmers.	Yields per unit land area will increase by 1994.	Productivity census. Yield trial data.	Farmers are and will continue to be intereste[d] in increasing bean yield[s]
Purpose			
To identify the daylength, temperature and genetic bases for variations in days to maturity and of adaptation of bean cultivars, and of the consequent effects on yield.	Interpretable knowledge about the genetic directions over maturity and yield, and about the controls over this direction that are modulated by the variations in daylength and temperature.	Peer reviewed and accepted publications on the biology of variations in days to maturity and attendant variations in yield of beans.	Daylength, temperature genotype and time are assumed to be the input resources used by the plant to biointegrate a days to maturity plus the attendant biological and economic yields.
Outputs			
Capability to more efficiently breed new cultivars with consistently high adaptation and yields across years or planting seasons, or for specific climatic zones and locations and planting seasons	Identification of breeding lines of different and physiologically-genetically defined characteristics of adaptation and yield.	Consistent capability to efficiently breed and select lines, to evaluate them, and to release higher yielding cultivars in fewer years than required before the biology of maturity, adaptation and yield was understood.	Continuous application of CRSP effort across at least one to one and a half durations of the 10-12 years normally required to breed, evaluate and release a new variety. The time must be sufficient to elucidate the biology and then use it in applied bean breeding.
Inputs			
Physiological, genetic and breeding research efforts by ICTA and Cornell.	Allotment toward the objectives of research efforts by the ICTA and Cornell principal investigators, graduate students, and technicians.	Budget and time commitments and their appropriate application.	CRSP and other funding will be adequate, even after inflation.

ACHIEVEMENTS OF BEAN COWPEA RESEARCH ACTIVITIES FROM COLLABORATION AMONG ECUADOR, GUATEMALA AND CORNELL UNIVERSITY

April, 1984

INTRODUCTION.

With all of the outstanding success and achievement in the science and technology of Agricultural Development, one of the most elusive and intractable problems has been how to transmit the new beneficial knowledge to people positioned toward the bottom of the socio-economic ladder. In the 3rd world small land holders constitute the majority of the farmers.

In the U.S. the record is not distinguished in terms of bringing the results of research and new technology to the small scale and low income farm population who have the greatest needs.

The farming systems research philosophy undergirding the Bean/Cowpea CRSP in Ecuador and Guatemala proceeds under quite a different set of assumptions from those giving thrust to the green revolution. In the latter the assumption was one of designing preparing and packaging the technology, assuming that it would naturally find its way and be transmitted across political social and cultural barriers to reach the small and poor farmers. It is true the green revolution spread with remarkable success. Unfortunately, the small scale subsistence farmers constituting the vast majority of farmers in the 3rd world countries did not and could not avail of the green revolution benefits.

A central problem is that scientific research and technology normally flows through top down organizational systems. This top down orientation acts like a series of sieves to strain out the benefits of the science and technology before it reaches people at the bottom.

Farming Systems Research philosophy is a potential antidote toward lessening the increasing distance between the advantaged and the disadvantaged. The operational feature of Farming Systems Research is to place the applied research worker in the field with the farmer. Together, the farmer and scientist carry through on-site research, procedures and processes that are relevant, appropriate, and feasible as means of improving technology of the small farmer. This proceeds with a ground up philosophy. It yields greater insight and understanding of the political, social and cultural realities of appropriate technology transfer problems.

Farming Systems Research is essential to meaningful agricultural progress in the 3rd world countries where the preponderance of small scale farmers gives legitimacy. The insights of this approach transmit obvious benefits to counterpart work in the U.S. and New York State.

BENEFITS TO CORNELL AND THE UNITED STATES

1. The Bean/Cowpea CRSP has facilitated multidisciplinary research by focusing attention on the needs of small scale producers of beans and other legumes. The CRSP is the first of several projects at Cornell to adopt a farming systems orientation. In all cases, concerns which arose in an international context caused researchers to redefine and reexamine the situation in New York. Several mechanims have allowed CRSP researchers to apply in the U.S. lessons that were learned in international settings.

2. The CRSP has fostered a reciprocal relationship between domestic and international research, especially in the development of procedures for collecting sociological and political data. Our first pre-test to evaluate structured interviews as a data collection technique was conducted during one summer with organic farmers in up-state New York. Another pre-test was conducted in Mexico. Both sites identified major but different problems in collecting certain information. This facilitated development of the interview guide now being used in CRSP interviews in Ecuador. These experiences, in turn, influenced the design of a questionaire administered to small holders in another country state. The latter research was funded by a Title XII strengthening grant concerned with a domestic/international comparison of appropriate technologies. A graduate student is analyzing these data for her dissertation. Although this research was not funded by the CRSP or by Cornell, it illustrates how international experience influences domestic research via both formal and informal channels.

3. The Cornell Farming Systems Research Seminar, in which CRSP staff have taught, provides an approach for learning by staff and students from international activities. The field trips of this course, and the complementary seminar on Household Food Production Systems, both study limited resource farmers in New York. The assumption behind work in New York is precisely the same as that behind research in Ecuador and Guatemala: It is necessary to analyze existing farming systems, to evaluate research and/or extension activities which would improve them, and to develop technologies which are appropriate to meet farmer's felt needs.

4. Public presentations of project research and activities have elicited very positive reactions from domestically oriented colleagues. Senior staff have had especially strong and positive reactions. The farming systems approach reminds them of the collaboration which was more common in the past between and among social and production scientists.

5. As international research influences domestic research, land grant institutions may be able to achieve improved research balance between: 1) problem which require a narrow and specialized focus and 2) problems which benefit from multidisciplinary collaboration. A positive regard for holistic perspectives can again characterize land grant institutions.

6. Our collaboration with CIAT, Ecuador and Guatemala has made valuable germplasm available to New York State. Crosses are being made between New York bean cultivars and cultivars identified as being later to flower because of a mechanism other than sensitivity to long daylength and high temperature. These cultivars are late in spite of insensitivity to these environmental factors. The later maturity by a different physiological mechanism may facilitate higher yields of beans under the long summer days of New York.

7. Tropical locations have proven more effective for assaying the control over days to flower and maturity of bean by daylength and/or high temperature than is the climate of New York State. Thus, international collaboration has provided Cornell with an improved geographical location for verifying that daylength and temperature control the days to flowering and maturity of bean in the field, just as they do in the growth chamber. This shows us how to efficiently select for early, intermediate, late or very late maturity. It sharpens our knowledge about how to select for the different maturities that are needed to maximize cultivar adaptation and bean yields for all different world areas, including the temperate climate of New York State and such areas as lowland tropics, moderate elevation tropics, and highland tropics.

8. Without the CRSP on going international research on beans at Cornell would be almost non existent.

BENEFITS TO ECUADOR AND INIAP

1. The Bean/Cowpea CRSP provides specific support to the national legume program and generalized support to farming systems activities with INIAP. Consequently, the CRSP helps Ecuador meet the needs of small scale producers of beans and other legumes by sponsoring activities which are incorporated into INIAP's research and development planning, and by complementing other externally funded activities.

2. The CRSP has supported the expressed interest of INIAP to move off station and to serve small scale producers. Since the CRSP began, INIAP leadership has changed. Current administrators are very supportive, and this position is unlikely to be affected by future changes in personnel. Therefore, in Ecuador the CRSP exists in an institutional context. Staff of both the national legume program and regional technicians for smallholders have uniformly and consistently supported Farming Systems Research. AID/E and the projects they have funded, notably the Rural Technology Transfer Systems Research approach. Finally, the CRSP has a distinctive if modest contribution to such research in Ecuador.

3. The CRSP has contributed to Farming Systems Research methodology. We have developed a procedure which combines the analysis of secondary data with structured interviews. We have evaluated the relative merits of informant and sample survey techniques. The CRSP has provided Ecuador's National Institute of Agricultural Investigations (INIAP) with principled discussion of

intellectually defensible but economical field research methodologies.

4. The CRSP has provided for INIAP the microcomputer hardware and software which makes Farming Systems Research possible. INIAP appreciates that the CRSP has made a distinctive and important contribution to its field research activities, and is supportive of efforts which are funded by other grants and loans.

5. CRSP funds have focused attention on regions which might not have received preference in INIAP's allocation of resources. The three identified zones for CRSP activities all represent specific types of legume production which are important in both in international and national context.

6. CRSP funds have allowed Ecuador's National Legume Program to initiate regional activities and to begin a breeding program. A well trained plant breeder has been placed in charge of the grain legume program. Active bean breeding using crosses made at INIAP is beginning, replacing selection only of the best land race cultivars or of lines provided by CIAT. The National Legume Program has been weak in comparison to other commodity program within INIAP. CRSP resources allow INIAP to focus resources on specific programs and zones in order to achieve a multiplier effect.

7. To date, CRSP efforts have been concentrated in the Province of Imbabura and in the zone of Pimampiro. Constraints to bean production have been identified by farmers and researchers working together, including limitations of varieties, plant spacing, cultural practices, seed selection, and seed storage. CRSP sponsored Farming Systems Research has, therefore, met a major objective; it has identified researchable problems for reorienting experiment station activities toward meeting the needs of small scale farmers. This CRSP research has provided INIAP with the first link between baseline research and appropriate technology-- a link not assuming that an appropriate technology had already been developed on station, just awaiting demonstration by researchers before adoption by smallholders.

8. CRSP experience has reinforced the open mindedness of leadership and staff. They are allowing on farm research to influence INIAP's research agendas.

9. Currently, Farming Systems Research receives considerable support from Cornell, INIAP, and AID/E. An incontrovertible argument can be made that Farming Systems Research is the only viable alternative for meeting the needs of small scale producers by agricultural research and development.

10. The CRSP in Ecuador and INIAP are beginning to work with cowpeas and with small and large seeded lima beans in the lowland area of Ecuador. The director general and other INIAP administrators are accepting and pushing socio-agronomic research as an integral component of INIAP's commodity research programs.

11. FAO funded workshops on bean production are planned that will involve governmental agencies with responsibility for social concerns.

Thus, the Farming System Researchs view of the CRSP is leading to multidisciplinary interactions among diverse Ecuador agencies and personnel.

BENEFITS TO GUATEMALA

1. CRSP research in Guatemala has found that ability of climbing bean cultivars to compete with or out compete the associated corn crop is conditioned primarily by the bean plant's days to maturity and attendant high vs. low positioning on the stem of flowers and pods. That is, early vs. late maturity plus vertical distribution of the pods along the stem constitute the primary genetical variability that plant breeders of climbing beans must select for. Because of the CRSP research, this knowledge is on hand as Guatemala's Insitute of Science and Technology of Agriculture (ICTA) begins intensive effort to breed climbing bean cultivars for native Indian Farmers of the highlands.

2. The CRSP research has shown that the days to maturity and the height of pods on the stem are controlled by daylength and temperature acting jointly with the genetics of the plant.

3. Guatemala is in 1984 beginning to breed and select bush bean cultivars for extending bean production into the lowland tropics where beans do not now grow well. Beginning this effort follows CRSP demonstration in Guatemala that cultivars are adapted to the lowland tropics by having insensitivity to daylength and temperature and also by having a higher optimal temperature for flowering. This optimum temperature for flowering gives the cultivars fewest days to flowering. It can be measured for each cultivar by growing it across a range of elevations (mean temperatures). Unexpectadly, beans best adapted to lowland tropics are insensitive to daylength like those that are best adapted to the temperate zone of New York.

4. Beans for the tropical highlands must be selected primarily for adaptation to below optimum temperatures for flowering.

5. Beans for moderate elevation tropics should be selected for adaptation as controlled by that minimal days to flowering that occurs at the optimal temperature for flowering.

6. The CRSP provided ICTA with its first microcomputer. This accellerated, analysis of agronomic research data by the bean program. ICTA's other commodity programs are now seeking to acquire microcomputers.

7. The CRSP will shortly fund the employment of an anthropologist by ICTA. This will strengthen ICTA's socioeconomic activities and thereby enhance the multidisciplinary approach of ICTA's Farming Systems Research.

8. ICTA has assigned a full time agronomist to the CRSP activities and a part time agricultural economist. These moves strengthen the ongoing Farming Systems Research.

9. Guatemala has intensified its agronomic and sociological work with native Indian farmers as a consequence of the CRSP. ICTA and the CRSP aim to learn about family and on farm concerns and goals of these farmers, as these factors relate to bean production and to other farming and non farming activities of the farmers and their families.

10. ICTA states that a major benefit to them from the CRSP is the communication with U.S. scientists and the linkage to new ideas, research objectives, and research methodologies acquired from this communication with the broader scientific community.

USAID GUATEMALA

UNITED STATES OF AMERICA

AGENCY FOR INTERNATIONAL DEVELOPMENT
UNITED STATES A. I. D. MISSION TO GUATEMALA

USAID/GUATEMALA or c/o American Embassy
APO MIAMI 34024 Guatemala City, Guatemala, C. A.

Guatemala, March 27, 1984

Dr. Pat Barnes-McConnell, Director
Bean/Cowpea CRSP Management Office
200 Center for International Programs
East Lansing, Michigan 48824

Dear Dr. Barnes-McConnell:

This is in response to your letter of February 9, 1984 which requests our opinion of the Bean/Cowpea CRSP activities in Guatemala. As you are well aware, the common black bean plays an important role in the traditional Guatemalan diet. Little work other than that conducted through the Bean/Cowpea CRSP has been conducted to improve the prevalent bean cultivars, their method of home preparation and digestability. The micro-climatic zones found here provide the researcher with a variety of genetic material and growing conditions under which experiments can be conducted. The principal local investigative institutions involved with this CRSP (ICTA and INCAP) are both staffed with well qualified personnel who, based on past experience, require a minimum of supervision to achieve their research objectives. We believe the administrations of ICTA AND INCAP support the activities conducted in Guatemala under the Bean/Cowpea CRSP and would provide continued support in the advent of a project extension. The central offices of these two institutions are located in Guatemala City which provides a unique situation to facilitate agronomic and nutritional research. While ICTA and INCAP are well staffed, they lack the funds to properly operate field plots and to provide for expenses required for research. The Bean/Cowpea CRSP, in addition to providing important links with U.S. universities, has provided needed funds and has helped address a serious constraint.

/ . . .

The political situation in Central America is receiving a great deal of publicity in the United States. It is our belief that the activities of the Bean/Cowpea CRSP in Guatemala have not been impeded by this situation and, in fact, the CRSP has the potential to improve the diets and lives of those most effected by this violence.

The USAID/Guatemala believes the Bean/Cowpea CRSP has provided and is able to continue to provide a positive contribution to the people of this country. We support and encourage a three-year expansion of this project in Guatemala.

Sincerely,

Harry E. Wing

Harry Wing, Chief
Office of Rural Development

SUMMARY OF BEAN/COWPEA CRSP COSTS

Sub-Grantee: Guatemala/Cornell

	US CONTRIBUTION				TOTAL	TOTAL	Total
	AID Contri.	Spent in HC	Non-Federal Contri.	Total US Contri.	HC Contri.	US & HC Contri.	Spent in HC
Cumulative through Year 3 (9-30-83)	180,020	82,090	63,812	243,832	33,655	277,487	115,745
Estimated Year 4	142,481	78,967	30,852	173,333	31,585	204,918	110,552
Estimated Year 5	218,050	120,220	32,610	250,660	48,080	298,740	168,300
SUB-TOTAL INITIAL GRANT	540,551	281,277	127,274	667,825	113,320	781,145	394,597
Projected Year 6	114,190	62,950	17,080	131,270	25,180	156,450	88,130
Projected Year 7	123,325	67,975	18,450	141,775	27,190	168,965	95,165
Projected Year 8	133,190	73,420	19,924	153,114	29,370	182,484	102,790
SUB-TOTAL EXTENSION	370,705	204,345	55,454	426,159	81,740	507,899	286,085
TOTAL PROGRAM	911,256	485,622	182,728	1,093,984	195,060	1,289,044	680,682

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Bean/Cowpea Collaborative Research Support Program
Sub-Grantee: Guatemala/Cornell University

	Act Exp Thru Year 3	Est Exp Current Year 4	Est Exp Year 5	Total Initial Grant	Projected Year 6	Projected Year 7	Projected Year 8	Total Ext Request	Total Grant & Extension
Salaries	70,612	29,958	31,170	131,740	32,180	34,115	36,205	102,500	234,240
Fringe Benefits	2,191	2,600	4,000	8,791	3,095	3,260	3,440	9,795	18,586
Equip & Fac	8,022	31,170	33,000	72,192	4,425	6,180	6,995	17,600	89,792
Dom Travel	1,654	7,620	11,700	20,974	6,125	6,615	7,145	19,855	40,859
Intnl Travel	16,506	16,278	25,100	57,884	13,145	14,195	15,330	42,670	100,554
Materials & Supplies	2,941	11,083	27,080	41,104	10,180	10,315	11,540	32,035	73,139
Other Direct Costs	37,720	21,504	51,700	110,924	27,075	29,240	31,580	87,895	198,819
Total Direct Costs	139,646	120,213	183,750	443,609	96,225	103,920	112,235	312,380	755,989
Indirect Costs	40,374	22,268	34,300	96,942	17,965	19,405	20,955	58,325	155,267
Total Costs	180,020	142,481	218,050	540,551	114,190	123,325	133,190	370,705	911,256

Equipment included in Extension Budget Request:
1. Jeep - $15,000
2. 2 programmable Nikon Cameras - $1,000

6026B

PROJECT REVIEW AND EXTENSION PLAN

HONDURAS • UNIVERSITY OF PUERTO RICO (Initiated March 1982) • BEANS
Lopez-Rosa

IMPROVEMENT OF BEAN PRODUCTION IN HONDURAS THROUGH BREEDING FOR MULTIPLE DISEASE RESISTANCE

INTRODUCTION

This project, developed in collaboration with TARS (USDA-ARS), addresses the problem of bean yield losses associated with susceptibility to diseases. Satisfactory progress was achieved toward this year's objectives. As a result of multiple location introduction trials in the Departments of El Paraiso and Olancho the project initiated the formation of a multiple disease resistant bean germplasm base in Honduras. Five improved multiple disease resistant genotypes which included white, red and black seeded lines were released in collaboration with the Bean/Cowpea CRSP sister project in the Dominican Republic. These were made available to other breeding programs in the tropics and the United States. It is anticipated that additional project outputs, particularly improved cultivars of the preferred small seeded red type, will be beneficial to farmers engaged in bean production and ultimately to poor rural and urban consumers.

Training of Honduran personnel was initiated. The first Honduran student started his undergraduate training at the University of Puerto Rico, Mayaguez in Agriculture with the ultimate goal of completing graduate work in Crop Protection. In addition, two Honduran technicians received practical training in bean technology there.

YEARS ONE THROUGH THREE REFERENCE GUIDE

The information referred to here has been compiled in separate documents included in Sections I and III of this report.

Three-Year Progress Report

1983 Annual Report: See Section III, Technical Summary, page 72.

Research Publications and Presentations: See Section III, Pulse Beat, Spring 1984, Insert, page 2.

Project Evaluations

1983 Annual Report: See Section III, External Review Panel Report, page 31, and Follow-Up Chart Insert.

1983 Board of Directors Extension Rating: See Section I, page 25.

YEARS FOUR AND FIVE

Since the Dominican Republic and Honduras Bean/Cowpea CRSP Projects UPR-Mayaguez are aimed at common goals, i.e., stabilization and improvement of bean yield and production through incorporation of disease resistance to the preferred standard types, the information that follows is common for both projects.

Plans for future years will depend in large part on progress made during preceding years. As progress is made in breeding for disease resistance of one type new disease problems may become more apparent and thus require a shift in project emphasis.

The project itself is not the total effort being made in bean improvement either at the University of Puerto Rico nor in either of the two Host Countries. Encouraging close cooperation among these groups, the major research question for this project in the near future should stay the same, "Improvement of bean production through disease resistance." Other factors will be incorporated into the project when possible but will not be major thrusts to expend scarce project funding and personnel time. These long term factors may be: improved erect plant types, higher yield, earliness, and adaptability. Basically the project will be working within generally accepted bean types, that is, tropical blacks, small seeded whites, reds and pinks, and Cranberry types (bush beans).

EXTENSION YEARS SIX THROUGH EIGHT

Host Countries will be encouraged to form a balanced bean program including: socio-economic research, soils and soil fertility, farming systems, irrigation, weed control, seed production, management, and storage and marketing. The project will concentrate specifically on major diseases and control through use of genetic resistance.

Puerto Rico

1. Continue to obtain new germ plasm and to test it to confirm disease resistance.

2. Continue to develop *P. coccineus* populations.
   a. This work will make about one cycle per year, thus new seed should be available each year for use in interspecific crosses and for release to other programs. We will be concentrating on resistance to: BCMV and a non-necrotic type of resistance to BCMV.
   b. Interspecific crosses to *vulgaris* lines to transfer resistance. Apparently this will require several backcross generations so work will proceed slowly and may require three to five years to transfer simply inherited genes to breeding germ plasm.

3. Continue to develop *P. vulgaris* populations.
   a. The main *vulgaris* population has been divided into sub-populations in accordance with bean types:
      (1) blacks and whites
      (2) reds and pintos
      (3) cranberry and red kidneys
      (4) others

or with disease problems:
(1) BCMV
(2) rust
(3) angular leaf spot
(4) root rots
(5) others

b. Since one cycle may take two to three years new germ plasm suitable for Host Country use should be available from time to time.
c. It is inconceivable that all resistances can be transferred to all bean types within the forseeable future due to the number and complexity of bean types and gene action. Though it is theoretically possible, it may take twenty-five to thirty years.

4. As new lines are produced from the program item 3 above they will be run through a complete selection and field trial procedure, at least through the F_4 generation which may take from 1 1/2-2 years per cycle. The best lines will be additionally tested in the Host Countries.

5. Main thrusts underway at present and to continue, probably through years six, seven and eight are:
   a. BCMV--protection of the I gene with bc 22 and/or bc 3.
   b. Pyramiding rust race resistance using the thirteen linked gene set of L-227 and adding on resistance to races in Central America.
   c. Bacterial blight resistance--pyramide XR-235 and Cornell resistances in both bush and semi-vine types.
   d. Increase ALS resistance--using 3M.99 as germ plasm base.
   e. Anthracnose resistance--transfer ARE gene into reds and pinks.

Host Countries

1. Continue to train personnel, increase staffing and hold training courses in field and in Puerto Rico.

2. Maintain and improve capacity to plant small farmer field trials-- establish disease profiles for standard varieties during various seasons and over a period of three years or more.

3. Determine project's most useful breeding lines for each disease at each location.

4. Develop facilities and expertise to make crosses of standard cultivars and donor lines for disease resistance. Make one or two backcrosses to standard cv., select and field test converted lines.

5. Establish disease priority--on completion of obtaining resistance to major diseases, begin work on next disease, or concurrently if possible.

The recent change in the US PI should make no change in the projected research as the designee has been an integral part of the project from the CRSP initiation. No change in the US institution is anticipated. Designation of the new HC PI is a welcomed addition which should support increased project activity in the HC.

Honduras/UPR Bean/Cowpea CRSP Project

LOGICAL FRAMEWORK MATRIX
(December 1983)

Narrative Summary	Objectively Verifiable Indicators	Means of Verification	Important Assumptions
Program or Sector Goal: The broader objective to which this project contributes: (A-1)	Measures of Goal Achievement (A-2)	(A-3)	Assumptions for achieving goal targets (A-4)
To make available to the national legume program multiple disease resistant (MDR) dry bean breeding lines/ cultivars capable of achieving yield stability over time.	- A measure of improvement of yield stability, and yield level of MDR varieties over traditional varieties (small red seed type) by 1988-1990. - A measure of acceptance of MDR varieties by small farmers.	- Comparison of the performance of MDR varieties produced by the program with original base-line data. - Determine the quantity of MDR seed planted by small farmers and the production levels they obtain.	- Small farmers continue to grow dry beans in Honduras. - The national seed program will increase seed of the new varieties. - The extension service will promote their use.
Project Purpose (B-1)	Conditions that will indicate purpose has been achieved. End-of-Project status (B-2)	(B-3)	Assumptions for achieving purpose (B-4)
Reduce losses due to diseases by incorporating multiple disease resistance (MDR) into productive genotypes with a seed type suitable to the consumer. Enhance the capability of the Honduran (Escuela Agrícola Panamericana and Secretaría de Recursos Naturales) bean research team through training and collaborative research.	- Incorporation of MDR into the small red bean type leading to improved yield stability level. - Training of graduate students and technicians.	- Yield loss studies will be conducted to determine the importance of the different diseases. - MDR will be demonstrated by the establishment of demonstration plots on small farms, baseline data, and by test plots containing traditional and MDR cultivars.	- Sources of resistance incorporated into local varieties remain stable. - A bean disease currently identified as a minor problem does not emerge as a major problem. - Bean research team in Honduras remains active and trained personnel continue to work with the project.

roject Outputs (C-1)	Magnitude of Outputs (C-2)	(C-3)	Assumptions for achieving output (C-4)
Identification of stable sources of resistance to the major diseases affecting bean production in Honduras. Incorporation of these sources of resistance into productive genotypes with a seed type suitable to the Honduran consumer.	- Development of varieties with improved levels of resistance to one or more diseases resulting in significantly increased yield stability and yield level. - Sufficient quantity of disease-free seed of the improved varieties to be made available to the national seed program.	- Sources of MDR will be tested at several locations in Honduras. - MDR lines will be tested at several locations in Honduras. - Breeder seed of the most promising lines will be made available to the national seed program.	- Reasonably heritable sources of resistance can be identified for the important bean diseases. - Breeding methods are appropriate to incorporate these resistances into local seed types. - The national seed program is capable of increasing seed of promising MDR varieties and making it available to small farmers, and the extension service effectively promotes their use.

NPUTS (D-1)	INDICATORS (D-2)	MEANS OF VERIFICATION (D-3) (What data needed and how to get it)	ASSUMPTIONS (D-4)
<u>niversity of Puerto Rico/ SDA-ARS</u> Principal Investigator Two Co-investigators Two Research Associates One Technician Laborers Adequate facilities for personnel to conduct research program in breeding and pathology. Administrative Infrastructure.	- Use of project roster to determine continued involvement of personnel. - Examination of annual reports to determine performance of personnel and to evaluate if facilities and resources are made available to the project.	- Use of baseline data to measure acceptance of the improved MDR varieties by the small farmers and to to verify the yield stability and yield levels. - Research results obtained from Honduras and Puerto Rico. - Annual Reports.	- The present USAID, UPR and HC financial support remains at the planned level. - Involvement of personnel at all levels listed in D-1 will be continued. - Facilities mentioned in D-1 will remain to be available.

Inputs (D-1)	Indicators (D-2)	Means of verification (D-3)	Assumptions (D-4)
- Bean germplasm of potential value to Honduras.		- Trip reports.	
<u>Honduras</u>		- Fiscal reports.	
- Co-Principal Investigator		- Quarterly activities and fiscal reports from the HC.	
- Adequate personnel and facilities from the Escuela Agrícola Panamericana to conduct bean research.			
- Adequate support (facilities, experimental plots, transportation) made available by the Secretaría de Recursos Naturales (GH).			
- Cooperation from Extension Service.			
Cooperation from local small farmers.			

UNIVERSITY OF PUERTO RICO
COLLEGE OF AGRICULTURE AND MECHANIC ARTS
COLLEGE OF AGRICULTURAL SCIENCES
MAYAGUEZ, PUERTO RICO-00708

OFFICE OF THE DEAN

April 11, 1984

Dr. Pat Barnes-McConnel, Director
Bean/Cowpea CRSP Management Office
200 Center for International Programs
Michigan State Univeristy
East Lansing, MI 48824

Dear Dr. Barnes:

As the Institutional Representative for the University of Puerto Rico, I would like to take this opportunity to make a few comments concerning the status of the Bean/Cowpea CRSP project in Honduras. First, I want to commend the External Review Panel for their efforts in identifying the strengths and weaknesses of the project. Since the Technical Committee last met, I believe that the project has come a long way in addressing the problems pointed out by the External Review Panel.

The project has been fortunate to appoint an outstanding individual as the Host Country Principal Investigator. Eng. Rafael Díaz has worked with the project during the last year and has gained a good understanding of Title XII Bean/Cowpea CRSP objectives. His professional credentials include several years of experience working with the Ministry of Natural Resources (MNR) and a M.S. degree from CATIE where he studied bean farming systems in Honduras.

Dr. Julio H. López Rosa has served well as the Principal Investigator for the Project. However, he was recently appointed to be the Head of the Department of Crop Protection at the University of Puerto Rico. His responsibilities as Department Head will prevent him from dedicating the amount of time necessary to make the project realize its full potential. With the concurance of the Escuela Agrícola Panamericana, we have selected Dr. James Beaver to serve as the new Principal Investigator of the project. Dr. Beaver has served as a Co-Investigator since the onset of the project and we believe that he will do a good job performing his new task.

The reviewers' comments that the project operates like a bilateral assistance program is somewhat unjustified. Research in the past has been collaborative in nature. At the beginning of each fiscal year, the Host Country Principal Investigator at that time has traveled to Puerto Rico to plan research activities. Although turnover of personnel has been a problem, it is important to note that research has continued to be conducted as planned. Dr. Jorge Chang has been especially helpful in coordinating project activities during the most recent transition period.

The project evaluation profile failed to mention the important work that has been done during the last two years in determining the relative importance of diseases when beans are planted during different times of the year. This information will enable project researchers to concentrate on those bean diseases which are causing the greatest loss.

The UPR project personnel acknowledge that too few trips have been made in the past. In order to improve coordination of project activities, two trips were made since December and an additional trip is planned for this summer.

It has been difficult to identify potential graduate students from Honduras. One problem is the lack of incentive to continue graduate studies since the Ministry of Natural Resources does not provide monetary compensation to employees with a M.S. degree. In addition, students from the Escuela Panamericana need one or two additional years of undergraduate study before they are accepted into most graduate schools. Nevertheless, the project has one graduate from the Escuela Agrícola Panamericana currently enrolled at the UPR and another is scheduled to begin studies in August. Upon completion of their B.S. they will be considered as candidates for graduate study.

The administration of the project seems to be functioning well. A change in the status of the project to a subcontract or some other arrangement might prove to be more disruptive than helpful.

I appreciate having the opportunity to make a few comments concerning the project. We feel that the project is in the position of making an important contribution and would urge the Technical Committee to consider the approval of an extension for the project.

Cordially yours,

Alejandro Ayala

Alejandro ayala
Dean and Director

Escuela Agricola Panamericana
Tegucigalpa, Honduras

Views on the Role of CRSP's Bean/Cowpea vs. Other development efforts in the Caribbean Region, specifically in Honduras.

Simon E. Malo
Director, EAP.

1. CRSP vs. Other forms of development

a) CRSP represents a significant support to efforts already being made in Honduras and regions with bean improvement. CRSP lends continuity to these efforts, which in most countries are haphazard and lack the proper technical base and guidance.

b) Comparing to what the International Centers (IC's) are doing, particularly CIAT in the case of bean development in Central America, CRSP can conduct research and development work at levels where the IC's cannot reach. The IC's must work, with the national programs, according to the mandate of the funding agencies, and thus, are very much limited by them. The national programs are riddled with bureaucratic constraints, inefficiency, and especially a lack of continuity. Programs stop and restart every time the Minister of Agriculture is changed, an occurrence which can happen every year in some countries. CRSP in Honduras is already reaching the small farmer and assuming a leadership role in the national program ("Programa Nacional de Frijol") which have had several starts in the last few years.

c) CRSP gives needed support to some of the programs of the IC's; however, by working with private, independent organizations with continuity, like EAP, it is bound to succeed in areas where both the government and IC's have so far failed, areas dealing mainly with the medium and small farmer.

2. <u>CRSP potential and ideas for its evolution and progress</u>

a) Undoubtedly the potential of CRSP is enormous. With a few well selected bean varieties, we could revolutionize the diet of millions of people. Let me illustrate this point: In 1952 and 1953 Zamorano released 2 varieties of beans which became for 30 years the most popular in the markets of Honduras and other neighboring Central American countries. Today with perhaps 3 times more people in the area the impact obviously could be much larger.

b) The research conducted by the government has been very unfruitful because: 1. Meager resources available. 2. Lack of continuity in the work. 3. Lack of logistical and institutional support. 4. Lack of competent researchers, because of the reasons mentioned before.

c) Point No. 4 in the last paragraph illustrates the great need for training. CRSP must emphasize training at all levels. If the national institutions have trained people adequately, they would continue the programs after CRSP is terminated. It is the responsibility of CRSP to become obsolete, perhaps in a generation, and let local programs take over. Development is EDUCATION and it takes time and sometime generations to obtain the needed human resources.

d) Concrete results from CRSP in Honduras cannot be expected in less than two years. Actually this initial period has been the most difficult for EAP. However, an infra-structure is being created: One man is being trained in UPR, at least 4 more need to be trained abroad, and another 3 or 4 at Zamorano on a regular basis. It has been difficult to find competent people for this program. However, we are gaining experience, and many bean lines already look very promising. A good Honduran program leader has been selected, and we believe that this is the time for more support from CRSP. Positive results will speak for themselves in a very short time.

3. Progress in Honduras

Initial progress has been slow. We have had budget limitations; new personnel was difficult to attract and retain; and, Honduras has been given an erroneous bad reputation in the international press. But now we have an entirely new team in the Agronomy Department. The director and the COPI are new and we have a good project manager. As Drs. Barnes-McConnell, Gonzalez-Roman and Beaver saw at EAP in their March, 1984 visit, our irrigated plots look good, initial harvesting results indicate that we are in the right track, the technicians are optimistic, and there is a certain dynamism in the whole project which augurs a good show in the future.

4. Administrative structure of the Project

a) The CRSP project functions at EAP within the Agronomy Department and receives technical and lab support from this department. It has a fulltime investigator with the needed autonomy and support. The School is a base of operations for plot work being conducted in 3 other localities in the country.

b) In Honduras, CRSP works cooperatively with the "National Program of Agriculture Investigators", specifically the bean project, with which it interacts in as many ways as possible, whenever they are operating.

5. Specific contributions of the CRSP bean project to Honduras

a) The most lasting and perhaps most important is the training of technicians and "agronomos" in the many areas and facets of bean improvement.

b) Teaching and "in-service" training of both male and female students, or the future agronomists, in conducting bean research and production in the field. This is the great advantage of the association of CRSP with a practical, private, international institution such as EAP. The multiplying factor of this knowledge in the whole tropical American region is very significant.

c) The evaluation of Honduran genetic material and other bean collection contained in the School's germplasm bank.

d) The broadening of the genetic base in the search for genes resistant to diseases and insects.

e) An understanding of the magnitude of the losses caused by insects and diseases in the different regions and planting seasons of the country.

f) Evaluation of promising lines which could be released eventually as tolerant cultivars or their identification as promising parent material.

6. <u>Level of communication and interaction. Is it really collaborative?</u>

a) The collaboration with UPR has permitted the training of one agronomist so far. We have used F4 and F6 genetic bean material which show much promise. The visits of UPR personnel, although few, have contributed to the improvement of our field methodology and in gathering useful information.

b) EAP has contributed more than $7,000.00 to the project (May 1982 thru May, 1984), or about 10% of direct costs: food and lodging of scientists and technicians, use of equipment, irrigation, land, supplies, student labor, transportation, communications, phone and other overhead.

c) We are contributing materials, supplies, irrigation pumps, land, and labor to officials of the Ministry of Agriculture. The results of EAP's research and data are made available to them immediately and we help them in field demonstrations and in hosting their national meetings.

7. Possible changes which could be considered over time to improve the program

a) We are in the process of integrating CRSP/Bean-Cowpea with our programs of IPM and Bean Nitrogen Fixation (BNF) at the School, in cooperation with the Universities of Florida (Dr. J. B. Sartain and Dr. D. H. Hubbell) and Wisconsin (Dr. F. Bliss).

b) We believe CRSP should be integrated to include experiments in multiple croping and other agronomic research in dry areas, and perhaps marketing tests could be conducted at the School and throughout the country.

c) Considering the multiplicity of microclimates and regions in Honduras, we believe the geographic scope of CRSP should be broadened in the country, with the objective of releasing bean varieties for specific areas rather than for the whole country.

d) Increase the capacity for design, analysis, interpretation and use of the research data, perhaps decreasing the dependence on UPR on several aspects.

e) Considering that the most important bean diseases are seed-borne and seed transmitted, we believe it is a must to increase virus-free seed production at the School in the future.

8. What can CRSP do to increase the overall effectiveness of the program in Honduras

a) Visit the School more often in order that the real problems of carrying out the research can be recognized and appreciated. We must add that a bit more credit for what we have done would not be wasted on us. Working in underdeveloped countries is an entirely different ballgame and something that has to be appreciated first hand.

b) Support is needed when programs are being launched. We need patience and understanding from our CRSP colleagues who work in areas where all the means and tools for research are available.

c) We believe our budget could benefit from an increase to improve the scope of activities, particularly TRAINING AGRONOMOS in SERVICE, and FORMAL TRAINING of our students.

d) It is very desirable to speed up administrative procedures such as purchases, hiring personnel, etc. We have to go through UPR for most contacts with CRSP headquarters; thus, we are limited to the flexibility and administrative agility of UPR.

e) Finally we believe at least 6 scholarships should be made available to EAP to train its own students in-house (learning-by-doing) and abroad after they graduate from EAP.

DEPARTMENT OF AGRONOMY AND SOILS
COLLEGE OF AGRICULTURAL SCIENCE
UNIVERSITY OF PUERTO RICO - RUM
MAYAGUEZ, PUERTO RICO 00708

May 9, 1984

Dr. Pat Barnes-McConnell, Director
Bean/Cowpea CRSP Management Office
200 Center for International Programs
Michigan State University
East Lansing, Michigan 48824

Dear Pat,

This letter is in response to your request for information for the Bean/Cowpea CRSP Extension Review. I did my best to answer those questions which I felt qualified to answer. Dr, Ayala or Ing. Gonzalez Roman would be in a better position than I to assess the impact of the CRSP on the College of Agricultural Science.

1. Benefits of the CRSP to host country agriculture

   a. One of the major goals of the projects is to develop bean varieties for Honduras and the Dominican Republic with improved levels of multiple disease resistance. One variety, Arroyo Loro 1, has already been released in the Dominican Republic.

   b. Another major objective is to enhance the research capacity of the bean research groups in Honduras and the Dominican Republic. Much progress has been made during the first three years of the project. Four members of the bean research team from the Dominican Republic have come to the University of Puerto Rico for graduate training. One person from Honduras has come to the University of Puerto Rico to complete a B.S. degree in the Crop Protection Department. Several research assistants have come to the University of Puerto Rico for short term training. Short term training has improved the quality of research being conducted in the Host Countries. Another important contribution of the CRSP project to the Host Country research capabilities has been the construction of facilities and the purpose of equipment. The project in the Dominican Republic is a good example. With the assistance of the CRSP, the research team at the Arroyo Loro Experiment Station now has the infastructure necessary for an effective bean breeding program.

   c. The project has made a special effort to conduct a major portion of the research on small farms. The on-farm trials have enabled project personnel to gain a better understanding of the importance of different disease problems. It is hoped that the on-farm trials also will enable germplasm developed by project to be more rapidly adopted by small farmers.

2. Benefits of the CRSP to U.S. agriculture.

   a. Many of the bean diseases that cause economic damage in the Tropics also are important diseases in the temperate bean growing regions of the U.S. In fact, results from winter nursery work in Puerto Rico indicate that the Tropics can provide more selection pressure for resistance to certain pathogens such as rust. Sources of genetic resistance identified by the CRSP can be used as breeding material for U.S. bean research programs.

   b. The CRSP is directly beneficial to the bean research program in Puerto Rico. The presence of the CRSP permits a greater level of activity. The result is that local research goals can be met in a shorter period of time. Since the Dominican Republic is located near to Puerto Rico, results from performance trials in the Dominican Repoublic provide us with an idea of how the germplasm will perform under local conditions.

3) Extent to which your regular domestic research program reinforce, complement, or otherwise relate to goals of the CRSP.

   a. The Department of Agromony has three projects that are directly relavent to the CRSP projects in Honduras and the Dominican Republic. I am the Principal Investigator for a Hatch project which has the goal of developing dry bean varieties for Puerto Rico. Germplasm from this project has been used as parental material for the CRSP projects. I also am the Principal Investicator for a CSRS supported research project which is investigating the effectiveness of different selection methods in the genetic improvement of large seeded dry bean. We feel that information from this research will help the CRSP project to be efficient in the improvement of the large-seeded Pompadour beans for the Dominican Republic. At times, both facilities and personnel from these projects are shared with the CRSP projects. Dr. Eduardo Schroder is the Principal investigator for a Biological Nitrogen Fixation Project. He has tested some of the most promising bean lines from the CRSP projects for nitrogen fixation and has participated in the informal training of personnel from the Host Countries. At present, Dr. Schroder's project is supporting a graduate student from the Dominican Republic. The winter nursery activities in Puerto Rico also are beneficial to the CRSP projects since U.S. germplasm can be evaluated under Tropical conditions.

b. The Department of Crop Protection is actively involved in bean research. Mildred Zapata is the Principal Investigator for a CSRS supported project with the goal of developing bean germplasm with improved levels of resistance to bacterial blight. Since this disease is one of the most important diseases in Honduras and the Dominican Republic, the CRSP projects stands to gain much from her project. Dr. Julio Bird is the leader of a virology laboratory which is conducting research with the Bean Golden Mosaic Virus. He is presently serving as the major advisor for one of the CRSP supported graduate students from the Dominican Republic.

c. The projects also benefits from the USDA bean research program at the Tropical Agriculture Research Station. Dr. George Freytag is involved in a wide range of basic research with beans. Many of the important sources of disease resistance used in the Dominican Republic and Honduras CRSP projects were developed by a previous cooperative research project of the USDA and the University of Puerto Rico.

4. Impact or influence of CRSP existence on your regular on-going domestic research program.

a. The overall impact of the CRSP on the bean research program at the University has been an expansion o. activities. In order to develop beans for Puerto Rico, we must breed beans for T[illegible]ical conditions. The CRSP project permits the project to screen a greater amount of germplasm for resistance to a wider range of diseases. The support also allows a greater lever of cooperative work with international centers such as CIAT.

b. The presence of the CRSP projects permit a a great opportunity for the professional improvement of those scientists involved with projects. In addition to gaining a degree of expertise in dealing with bean research problems in the Host Countries, scientists involved with CRSP projects gain new insights into research and teaching. I find that I frequently use examples in my lectures that come from my experiences working with the CRSP projects.

c. The presence of CRSP supported graduate students from the Host Countries permit more research to be conducted on problems related to the goals of the project. I have found that the graduate students are a valuable resource when a "local expert" is needed. For example, one of the graduate students from the Dominican Republic proved to be very useful in evaluating a group of bean lines for seed type.

I have attempted to support the responses to the questions with examples. I do not feel qualified to answer the last question related to the impact of CRSP existance on the regular on-going international research program.

There are three issues which I would like to recommend to be considered for discussion.

1. How can the length of time to obtain permission from AID to purchace equipment be reduced?

2. How can researchers with a technical backround become more effective in realizing objectives related to baseline data and the involvement of women in development.

3. The experience of collaboration between the University of Nebraska and the University of Puerto Rico in the Domiican Republic has been very positive. Could this sort of arrangement be useful in other countries?

I hope that this letter will provide most of the information that you requested. Please give me a call if I can provide any additional information.

Sincerely,

Jim

James Beaver
Assistant Professor

cc. Ing. Miguel Gonzalez Roman
Dr. Julio Lopez Rosa
Dr. Luiz Cruz Perez

AGENCY FOR INTERNATIONAL DEVELOPMENT

UNITED STATES OF AMERICA AID MISSION TO HONDURAS

AMERICAN EMBASSY
TEGUCIGALPA HONDURAS

February 29, 1984

Dr. Pat Barnes-McConnell, Ph.D.
Director
Bean/Cowpea CRSP Management Office
200 Center for International Programs
East Lansing, Michigan 48824

Dear Dr. Barnes-McConnell:

In response to your letter of February 9, 1984, I offer the following observations:

The Bean/Cowpea CRSP Project has been working in Honduras in direct collaboration with the Panamerican Agricultural School, at El Zamorano. The Project pursues increased production through the lowering of yield loss due to bean diseases. To this effect, sources of disease resistance are identified by the University of Puerto Rico and then made available for incorporation into to local bean varieties. As we perceive it, adequate assessment of bean diseases on crop production, introduction of disease resistance into local cultivars, and extensive field testing of the "improved" materials are general guidelines for effective Project contribution to bean production in Honduras.

There has been one major constraint for effective project implementation in Honduras. This has been the lack of continuity of the Pan American School staff associated with the Project and failure to substitute them promptly. This needs to be adequately addressed; otherwise, stated goals will not be reached. The Bean/Cowpea CRSP Project could play a critical role in improving bean production in Honduras. We would suggest that stronger linkages should be secured with research and extension staff from the Ministry of Natural Resources and the proposed Agricultural Research Foundation, as well as individual bean producers and associations. This may give more exposure to the Project and the chance to benefit more from local input.

We strongly feel that the Project should be extended in Honduras for several reasons. The first is the importance of beans in the Honduran diet and its small farmer based production. These factors combined with the low bean productivity in Honduras and the importance the country has for U.S. foreign assistance efforts should mandate a Project extension. Secondly, the Mission is planning major interventions in agricultural research in Honduras through the creation of an Agricultural Research Foundation which would provide a future institutional setting for Bean/Cowpea CRSP efforts.

I hope that these comments will be of assistance to you in your final decision.

Sincerely,

Stephen C. Wingert
Office Director
Food and Agricultural Development

SUMMARY OF BEAN/COWPEA CRSP COSTS

Sub-Grantee: Honduras/UPR

	US CONTRIBUTION				TOTAL	TOTAL	Total
	AID Contri.	Spent in HC	Non-Federal Contri.	Total US Contri.	HC Contri.	US & HC Contri.	Spent in HC
Cumulative through Year 3 (9-30-83)	137,254	49,000	48,776	186,030	20,090	206,120	69,090
Estimated Year 4	168,779	91,822	33,965	202,744	36,730	239,474	128,552
Estimated Year 5	258,580	131,876	42,235	300,815	52,750	353,565	184,626
SUB-TOTAL INITIAL GRANT	564,613	1,409,521	124,976	689,589	109,570	799,159	1,519,091
Projected Year 6	176,260	95,305	26,985	203,245	38,120	241,365	133,425
Projected Year 7	190,360	102,950	29,137	219,497	41,200	260,697	144,150
Projected Year 8	205,590	111,140	31,484	237,074	44,400	281,474	155,540
SUB-TOTAL EXTENSION	572,210	309,395	87,606	659,816	123,720	783,536	433,115
TOTAL PROGRAM	1,136,823	1,718,916	212,582	1,349,405	233,290	1,582,695	1,952,206

6062B

Bean/Cowpea Collaborative Research Support Program
Sub-Grantee: Honduras/UPR

	Act Exp Thru Year 3	Est Exp Current Year 4	Est Exp Year 5	Total Initial Grant	Projected Year 6	Projected Year 7	Projected Year 8	Total Ext Request	Total Grant & Extension
Salaries	101,396	88,726	89,700	279,822	93,180	100,635	108,685	302,500	582,322
Fringe Benefits	8,560	12,145	12,700	33,405	12,745	13,765	14,865	41,375	74,780
Equip & Fac	2,500	4,512	47,000	54,012	4,770	5,150	5,560	15,480	69,492
Dom Travel	6,995	4,349	6,700	18,044	4,565	4,930	5,325	14,820	32,864
Intnl Travel	6,348	5,592	8,600	20,540	5,865	6,335	6,840	19,040	39,580
Materials & Supplies	2,948	4,972	7,700	15,620	5,250	5,670	6,125	17,045	32,665
Other Direct Costs	890	37,931	69,900	108,721	38,785	41,890	45,240	125,915	234,636
Total Direct Costs	129,637	158,227	242,300	530,164	165,160	178,375	192,640	536,175	1,066,339
Indirect Costs	7,616	10,552	16,280	34,448	11,100	11,985	12,950	36,035	70,483
Total Costs	137,253	168,779	258,580	564,612	176,260	190,360	205,590	572,210	1,136,822

6026B

PROJECT REVIEW AND EXTENSION PLAN

INCAP • WASHINGTON STATE UNIVERSITY (Initiated November 1981) • BEANS
Swanson

IMPROVED BIOLOGICAL UTILIZATION AND AVAILABILITY OF DRY BEANS

INTRODUCTION

The importance of beans in improving diets based on cereals or starchy foods is well established. However, a number of factors limit dry bean consumption. These include: (1) bean hardness that develops during storage, (2) bean cooking quality, (3) food acceptability and (4) bean protein digestibility and nutritional quality.

Research results suggest environmental and genetic factors influence the nutrient and cooking quality of dry beans. Sun-drying induced greater cooking times than drying beans in warm air. Storage of dry beans increased the cooking time. Preheating or soaking beans in salt brine before storage prevented hard-to-cook problems.

The accelerated development of storage technology, assays of tannin and lectin concentrations, methods for determining optimum cooking time and assessment of nutritional advantages of fermentation and bean broth preparation will help provide more and better beans for rural populations in Central America.

Bean protein digestibility is very low. Bean protein quality can be improved by methionine supplementation. Improving bean protein digestibility or quality through breeding or food technology will significantly enhance the nutritional status of populations consuming beans.

Participating in this project are eleven graduate students and one undergraduate student at US institutions. There are four tutorial students on CRSP stipends and seven not on CRSP stipends at INCAP working on this project.

YEARS ONE THROUGH THREE REFERENCE GUIDE

The information referred to here has been compiled in separate documents included in Sections I and III of this report.

Three-Year Progress Report

1983 Annual Report: See Section III, Technical Summary, page 77.

Research Publications and Presentations: See
Section III, Pulse Beat, Spring 1984, Insert, page 3.

Project Evaluations

1983 Annual Report: See Section III, External Review Panel Report, page 33, and Follow-Up Chart Insert.

1983 Board of Directors Extension Rating: See Section I, page 25.

YEARS FOUR AND FIVE

The following is the research plan for the final two years of the original grant. Because there are five US institutions participating in this project, the information is presented in separate sections.

1. US

Washington State University

a. Continue studies of chemistry of procyanidin-protein interaction.
b. Identify flavonoids in *Phaseolus vulgaris* plants and tissue cultures to demonstrate relationship between phenotypic traits of parent plants and cell cultures produced.
c. Assay the effects of procyanidins of beans on the intestional mucosa of rats.
d. Assess protein status and nitrogen balance of primates on high bean diets.
e. Assess nutritional advantages of fermenting dry beans prior to preparation or consumption.
f. Initiate collaborative studies on digestibility, procyanidin concentration and hard-to-cook phenonemon in dry beans with INCAP and other US institutions.

Michigan State University

a. Continue studies on lignin development, tannin content, seed coat pigment and hard-to-cook phenonemon in dry beans.
b. Expand studies on the development of tannin during the seed development and its changes in controlled storage condition under various humidity and temperature.
c. Expand studies on the determination of hemagglutinin concentrations of various dry beans using an electrical gating technique. Work will include assessing the hemagglutinin activity of fast and slow cooking beans at different cooking times.
d. Study the effects of environments on changes of tannin content in different classes of beans by growing a number of cultivars from each class in a number of environments and monitor the changes of tannin content.
e. Continue to breed dry beans which exhibit potential for more rapid cooking time or reduction in condensed tannins.

University of Puerto Rico

a. Isolation and HPLC analysis of procyanidins from a large number of colored bean cultivars.
b. Analysis of HCl-butanol reaction products of the isolated procyanidins.
c. Follow reactions between proteins of cotyledon and polyphenolic compounds during cooking with electrophoreses techniques.
d. Continue to develop the nylon chromatographic assay of procyanidins developed at TARS.

Kansas State University

a. Use more samples of beans to confirm the Instron method of determining cooking time. Reduce the variability in the test by choosing beans of more uniform sizes, or by compressing individual beans to the same percentage of thickness. Verify the method using a large number of samples of beans.
b. Plot the number of broken beans against cooking time for many samples of beans. Determine the point of inflection from each curve, and correlate those inflection points with a sensory end point for cooking.
c. Use differential scanning calorimetry to follow the changes in the denaturation characteristics of proteins during the aging of beans.
d. Use scanning electron microscopy to follow the advancing water front in the cotyledons of fresh and aged beans. This experiment will help determine if the rate of water penetration into the cotyledon controls the rate of cooking.

Colorado State University

a. Investigate the contribution of environmental and genetic factors to seed yield and protein quantity and quality of dry beans.

2. HC

INCAP

Production and Genetic Resources Related Projects.

a. Study the effect of genetics and location on the total sulfur, methionine and cystine content of common beans, and the relationship between total sulfur and sulfur containing amino acids in red and black common bean cultivars.
b. Study relationships between chemical and nutritional parameters in white bean cultivars of different protein content (Cooperative Research with Dr. Fred Bliss, University of Wisconsin).
c. Assess the chemical composition and nutritional value of selected cowpea varieties (Cooperative Research with Dr. S. Singh IITA).
d. Assess the genetic and environmental effects on physical, chemical and nutritional characteristics of bean cultivars.
e. Examine heat treatment as a process to inhibit bean hardness and reduce bean cooking time.
f. Assay specific chemical entities in common beans (carbohydrate, fiber, protein) and their association to the process of water absorption, before and after storage.

Processing Related Projects

g. Study the effect of dehulling on the nutritive value of common beans and the utilization of the dehulled cotyledons in food product development.
h. Process recently harvested and stored common beans by drum drying and extrusion cooking.
i. Investigate the use of single and mixed salts on the protein quality of cooked common beans.
j. Study the distribution and chemical identification of tannins in beans during common home preparation.

Biological Utilization and Nutritional Studies

k. Study the chemical compositions and nutritional contribution of bean broth to bean, cereal and animal protein diets.
l. Conduct further studies on the protein digestibility of common beans by chemical and biological fractionation of fecal nitrogen of human subjects fed white, red and black beans.

Development and Application of Chemical and Biological Methodology for Common Beans

m. Continue development and application of biological methodology to accurately assess protein digestibility.

n. Continue development and application of a multiple enzymatic method for the evaluation of <u>in vitro</u> bean protein digestibility.

EXTENSION YEARS SIX THROUGH EIGHT

The primary objective of continued research will be to improve the availability, utilization and nutritional quality of dry beans for human consumption in developing countries. The availability and utilization of dry beans will be enhanced by continued coordination of genetic, nutritional and food science research.

1. Specific objectives of research for these years include ideas, institutions and principal investigators as listed below.
   a. The biological evaluation of bean protein has always been limited by the necessary destruction of anti-physiological factors by cooking. Breeders are now able to develop beans without trypsin inhibitors, lectins, and tannins. A protein evaluation program will be developed around these genetic changes (WSU, MSU, UPR, INCAP).
   b. Breeding programs designed to increase sulfur amino acids and assess protein value and digestability in beans is also attractrive (CSU, WSU, INCAP).
   c. The hard-to-cook problem is still unsolved. It is necessary to study the physiology and biochemistry of bean seeds in connection with the hard-to-cook phenonemon and alterations in protein and other compositional factors (WSU, KSU, INCAP).
   d. The functionality and nutritional contribution of carbohydrates in beans has not been studied very much. An evaluation of carbohydrates and their significance in acceptability and utilization is proposed (WSU, KSU, INCAP).
   e. Post-harvest technology must be developed to pre-treat or pre-cook of beans to assure efficiency and convenience for consumers (KSU, WSU, INCAP).
   f. Along with these more practical treatments, it is necessary to develop rapid quality assurance techniques assay many lines of beans being developed in breeding programs across the country. Assays for available methionine, digestibility, and anti-physiological properties are necessary (WSU, MSU, UPR, INCAP).
   g. It may be advantageous to store beans under different temperatures and relative humidities, following the loss of dry matter, mold colonies, ergosteral and free fatty acids as indicators of storage deterioration. Correlation of storage conditions and bean quality with cooking time is proposed (KSU, WSU, INCAP).
   h. Development and evaluation of foods from extruded beans or beans processed by other advantageous technology (KSU, INCAP).

All of these research objectives would serve to collaborate in achieving the one great objective of improving the availability, nutritional quality and use of beans around the world. There is no change anticipated in the US investigators or institutions at this time.

LOG FRAME - Washington State Univ. - Swanson/INCAP

NARRA[illegible] SUMMARY	OBJECTIVELY VERIFIABLE INDICATORS	MEANS OF VERIFICATION	IMPORTANT ASSUMPTIONS
Program or Sector Goal: Integrate post-harvest physiology, food technology and nutrition research with genetic and breeding programs for dry beans; to enhance production, nutritional quality, acceptance and utilization of dry beans in Central American countries.	Measures of Goals Achievement: Farmer interest in production of dry beans and improved storage and cooking technology will increase; the availability and consumption of dry beans will increase; the nutrient contribution of dry beans to the diet of the rural populations in Central America will increase.	Comparison of dry bean production, interest and use survey taken before and after introduction of improved cultivars of dry beans and storage and cooking recommendations to rural populations of Guatemala and Central America. Evaluation of nutritional quality of available dry bean cultivars.	Assumptions for Achieving Goal Targets: a. Guatemalen and Central American farmers continue to produce dry bea store them in their homes for their own use, and rely upon dry beans to fulfill protein and other nutrient requirements of adults and children b. The farmers maintain an interest in growing dry beans that will provide more nutritional quality and more convenient preparation for his family; and provide for advantageous marketing to others. c. Additional nutritional quality and cooking convenience will be an advantage to consumers and producers of dry beans.
Project Purpose: Evaluate and develop methods for the study of nutritional quality, storage characteristics and cooking potential of dry beans.	Conditions that will indicate purpose has been achieved: Improved cultivars of dry beans will be introduced to farmers. Acceptance and use of dry beans will increase in rural Central America.	Evaluation of surveys integrated with visits and assessment of health of rural populations consuming dry beans. Assessment of nutritional quality of dry beans available to farmers in Guatemala and Central America.	Assumptions for Achieving Purpose: a. Dry beans remain a significant protein source in diets of rural families. b. Dry bean production remains advantageous for farmer storage, sale and consumption - in preference to producing a more marketable crop and purchasing other foods. c. Fuel economy and methods of preparation remain a factor in preparation of foods in rural areas - cooking convenience of dry beans important to person preparing meals. d. Improved cultivars of dry beans developed and distributed to farmers.

Outputs: a. Develop analytical methods for polyphenolic compounds in dry beans. b. Determine the protein quality and digestibility of dry beans. c. Investigate conditions of storage in Central America and determine how changes during storage may affect cooking and nutritional quality of dry beans. d. Initiate genetic studies on relationship of dry bean polyphenolics to production, storage and nutritional quality, digestibility and cooking quality.	**Magnitude of Outputs:** a. Dry beans will consistently contribute more than 10% of the diet of the rural population. b. Digestibility and protein quality of dry beans will be increased by 25%. c. Improved cultivars of nutritious dry beans will be introduced into rural Guatemala. d. Recommendations for storage and cooking of dry beans will be distributed to rural populations of Guatemala.	a. Survey use of dry beans in diets of Guatemalan farmers and families. b. Compare digestibility and protein quality of improved cultivars of beans with initial cultivars of dry beans. c. Assess acceptance of dry beans of different colors and flavors by rural populations. d. Assess storage of dry beans and incorporation into diet based on recommendations.	**Output Assumptions:** a. Continued cooperation and achievement of objectives among HC and US research scientists. b. Continued availability of facilities and resources. c. Maintenance of interest of rural farmers in developed cultivars and innovations of CRSP research teams d. Production of dry bean seed and recommendations that will be distributed to farmers in Central America.
Inputs: a. Washington State University Co-Principal Investigator - Food Scientist Graduate student training Laboratory research - chemistry and nutritional quality Animal feeding studies b. Institute of Nutrition of Central America and Panama Co-Principal Investigator - Nutritionist Professional Research Scientists - Food Chemists Laboratory Research - Chemistry Human & animal feeding studies Surveys of rural perspectives, production, utilization and consumption patterns for dry beans. c. Michigan State University Research Scientists - Agronomist and Food Scientist Breeding program and plots Standard lines of dry beans Laboratory research - storage and cooking quality.	Review of research progress and personnel involvement. Review annual progress reports and listed publications. Evaluate facilities and resource allocation and utilization.	Quarterly and annual research progress and financial support statements; travel reports.	**Input Assumptions:** a. USAID financial support and US and HC Institution contributions (cost-sharing) and interest remain strong and available. b. Training proposals be sustained and scientists returned to HC to maintain programs. c. Collaborative research progress continue and standard methods established and accepted by dry bean breeders, research scientists and consumers.

d. University of Puerto Rico
   Research Scientists - Chemist and Bean Breeder
   Laboratory research - chemistry of tannins and proteins

e. Colorado State University
   Research Scientist - Agronomist
   Breeding, field trials and plots
   Evaluate production environment relationship to nutrient quality.
   Laboratory research - nutrient composition

f. Kansas State University
   Research Scientist - Agronomist
   Laboratory research - cooking quality of dry beans

Washington
State University

Department of Food Science and Human Nutrition, Pullman, Washington 99164-6330

MEMORANDUM

TO: L. L. Boyd

FROM: Barry G. Swanson Barry

DATE: March 30, 1984

SUBJECT: Bean/Cowpea CRSP Triennial Review and Three Year Extension

I have read the interim proposed development, review and approval process document you sent along to me and will provide information in the categories defined as best I can.

1. Benefits to host country agriculture

-encourage rural land owners to plant cultivars of beans that provide greater nutritional value than the beans they are currently planning;

-encourage rural land owners to store increased quantities of beans for their own use, educating them to store the beans appropriately to provide beans with acceptable and reasonable cooking times upon preparation;

-develop new cultivars of beans with greater protein concentrations and digestibility than current cultivars and equivalent acceptability for production and consumption in the rural areas of Guatemala; and

-provide information so that the land owner can select beans, and avoid antinutritional factors that may adversely affect health if the beans are not prepared correctly.

All of the above objectives of our research proposal will effect rural host country agriculture directly, yet it may be the indirect effects of more nutritious and better quality beans that will lead the farmers to produce beans for their own consumption. Increase in the nutritional quality and utilization of beans produced may also positively effect the health of individuals in protein deficient areas of developing countries.

2. Benefits to U.S. agriculture

-provide a solution to the "hardseed" and "hard-to-cook" phenomena of dry beans that is currently limiting the quantity of dry beans and other legumes processed in this country;

-increase protein quantity and quality, and digestibility of dry bean cultivars;

-retard the psychologically and socially unacceptable qualities that Americans associate with dry beans; and

-provide information to the dry bean producers and handlers on appropriate growing, storing, and handling parameters that may result in better drybean utilization and acceptability than currently available.

3. Extent to which regular domestic research programs reinforce, compliment or otherwise relate to the goals of the CRSP.

   -the WSU nutritional quality evaluation laboratory (NQEL) assays nutritional quality and composition of legumes and cereal grains;

   -agricultural research center project with objectives to assay and study the protein, lipid and carbohydrate chemistry of dry beans;

   -cooperative Western Regional Research Project W-150, "Genetic improvement of beans (Phaseolus vulgaris L.) for yield, pest resistance and nutritional quality", incorporates research contracts, cooperation and constructive review; and

   -extension program interested in storage and processing of dry beans as they relate to dry bean production, while maintaining liaison with the dry bean handlers and processors in Washington and the Pacific Northwest.

4. Impact or Influence of CRSP existence on regular ongoing domestic research program.

   -the CRSP provides additional laboratory research support;

   -provides the principle investigator an opportunity to travel nationally and internationally, gaining experience and learning from contacts with researchers and administrators;

   -provides opportunities to conduct cooperative research with other land grant universities and international institutes which results in additional research publications, presentations and building of a national/international research reputation;

   -the CRSP supports undergraduate and graduate training of students from the US and developing countries; and

   -the CRSP contributes significant indirect costs which are utilized to maintain the research program and support of laboratory equipment and physical facilities.

5. Impact or Influence of CRSP existence on regular ongoing international research program.

   -the CRSP lends credence to the research program as a part of the campus-wide international research;

   -CRSP provides exposure for scientists, nationally and internationally, to make contact with other scientists with similar interests; and

   -the CRSP encourages and offers opportunities for international research and consulting experience that contributes directly to the development, conduct and success of international research programs on campus.

I have attached documentation that we have provided to the management office at Michigan State over the past year which include a partial list of publications and a table indicating statistics of beans that are lost from the food chain after harvest.

If I can provide additional information, give me call.

BGS:crm

Attachment

USAID GUATEMALA

UNITED STATES OF AMERICA

AGENCY FOR INTERNATIONAL DEVELOPMENT
UNITED STATES A. I. D. MISSION TO GUATEMALA

USAID/GUATEMALA or c/o American Embassy
APO MIAMI 34024 Guatemala City, Guatemala, C.A.

Guatemala, March 27, 1984

Dr. Pat Barnes-McConnell, Director
Bean/Cowpea CRSP Management Office
200 Center for International Programs
East Lansing, Michigan 48824

Dear Dr. Barnes-McConnell:

This is in response to your letter of February 9, 1984 which requests our opinion of the Bean/Cowpea CRSP activities in Guatemala. As you are well aware, the common black bean plays an important role in the traditional Guatemalan diet. Little work other than that conducted through the Bean/Cowpea CRSP has been conducted to improve the prevalent bean cultivars, their method of home preparation and digestability. The micro-climatic zones found here provide the researcher with a variety of genetic material and growing conditions under which experiments can be conducted. The principal local investigative institutions involved with this CRSP (ICTA and INCAP) are both staffed with well qualified personnel who, based on past experience, require a minimum of supervision to achieve their research objectives. We believe the administrations of ICTA AND INCAP support the activities conducted in Guatemala under the Bean/Cowpea CRSP and would provide continued support in the advent of a project extension. The central offices of these two institutions are located in Guatemala City which provides a unique situation to facilitate agronomic and nutritional research. While ICTA and INCAP are well staffed, they lack the funds to properly operate field plots and to provide for expenses required for research. The Bean/Cowpea CRSP, in addition to providing important links with U.S. universities, has provided needed funds and has helped address a serious constraint.

/ . . .

Dr. Pat Barnes-McConnell
March 30, 1984
Page No. 2

The political situation in Central America is receiving a great deal of publicity in the United States. It is our belief that the activities of the Bean/Cowpea CRSP in Guatemala have not been impeded by this situation and, in fact, the CRSP has the potential to improve the diets and lives of those most effected by this violence.

The USAID/Guatemala believes the Bean/Cowpea CRSP has provided and is able to continue to provide a positive contribution to the people of this country. We support and encourage a three-year expansion of this project in Guatemala.

Sincerely,

Harry E. Wing

Harry Wing, Chief
Office of Rural Development

SUMMARY OF BEAN/COWPEA CRSP COSTS

Sub-Grantee: INCAP/WSU

	US CONTRIBUTION				TOTAL	TOTAL	Total
	AID Contri.	Spent in HC	Non-Federal Contri.	Total US Contri.	HC Contri.	US & HC Contri.	Spent in HC
Cumulative through Year 3 (9-30-83)	325,726	129,581	141,026	466,752	43,405	510,157	172,986
Estimated Year 4	196,344	99,414	66,028	262,372	13,818	276,190	113,232
Estimated Year 5	301,060	210,727	30,111	331,171	22,080	353,251	232,807
SUB-TOTAL INITIAL GRANT	823,130	439,722	237,165	1,060,295	79,303	1,139,598	519,025
Projected Year 6	102,995	51,810	17,062	120,057	5,200	125,257	57,010
Projected Year 7	108,035	54,360	17,892	180,287	5,400	185,687	59,760
Projected Year 8	113,480	57,115	18,789	132,269	5,800	138,069	62,915
SUB-TOTAL EXTENSION	324,510	163,285	53,743	378,253	16,400	394,653	179,685
TOTAL PROGRAM	1,147,650	603,007	290,908	1,438,548	95,703	1,534,251	698,710

6062B

Bean/Cowpea Collaborative Research Support Program
Sub-Grantee: INCAP/WSU

	Act Exp Thru Year 3	Est Exp Current Year 4	Est Exp Year 5	Total Initial Grant	Projected Year 6	Projected Year 7	Projected Year 8	Total Ext Request	Total Grant & Extension
Salaries	158,020	92,467	103,510	353,997	67,820	70,205	72,780	210,805	564,802
Fringe Benefits	2,662	4,640	3,150	10,452	3,495	3,615	3,745	10,855	21,307
Equip & Fac	1,151	16,474	45,400	63,025	5,315	5,740	6,200	17,255	80,280
Dom Travel	8,903	5,062	7,800	21,765	1,630	1,760	1,900	5,290	27,055
Intnl Travel	4,278	4,125	6,400	14,803	1,340	1,445	1,560	4,346	19,148
Materials & Supplies	22,029	10,970	26,900	59,899	3,535	3,815	4,120	11,470	71,369
Other Direct Costs	31,197	23,792	48,100	103,089	7,345	7,930	8,565	23,840	126,929
Total Direct Costs	228,240	157,530	241,260	627,030	90,480	84,510	98,870	273,860	900,890
Indirect Costs	97,486	38,814	59,800	196,100	12,515	13,525	14,610	40,650	236,750
Total Costs	325,726	196,344	301,060	823,130	102,995	108,035	113,480	324,510	1,147,640

6026B

PROJECT REVIEW AND EXTENSION PLAN

KENYA • UNIVERSITY OF CALIFORNIA, DAVIS (Initiated August 1981) • BEANS
Webster

IMPROVEMENT OF DROUGHT AND HEAT TOLERANCE OF DISEASE RESISTANT BEANS IN SEMIARID REGIONS OF KENYA

INTRODUCTION

Significant progress toward the project objectives has been achieved. Kenyan screening trials conducted at four semiarid locations have identified eleven *P. vulgaris* cultivars that are tolerant of dry conditions. Some of these also show disease resistance. University of California, Davis (UCAL Davis) sprinkler trials have identified drought and heat tolerant *P. vulgaris* and *P. acutifolius* cultivars. Leaf characteristics of tolerant cultivars, including deposition of epicuticular waxes, occurrence of hairs and stomatal characteristics have been evaluated in relation to drought and heat tolerance at UCAL Davis. The bean-tepary breeding program at the University of California, Riverside (UCAL Riverside) has progressed to field trials which have identified drought resistance in *P. vulgaris* x *P. acutifolius* plants. Germplasm exchanges have occurred between the US, Kenya and CIAT. Project linkages have been established at UCAL Davis, UCAL Riverside and the University of Nairobi with the Kenya USAID mission, USAID-KARI, Kenya Ministry of Agriculture, CIAT, and the Bean/Cowpea CRSP Tanzania and Senegal projects. A Kenyan woman has been identified to undertake a socio-economic survey of small landholders in an identified area of Kenya. There are three Kenyans pursuing PhD degrees at UCAL Davis and Riverside and two more, including one female, are expected. The UCAL Davis PI spent a Fulbright in Kenya in 1983, and the Kenyan PI is expected to spend a sabbatical leave at UCAL Riverside and Davis in 1984.

YEARS ONE THROUGH THREE REFERENCE GUIDE

The information referred to here has been compiled in separate documents included in Sections I and III of this report.

Three-Year Progress Report

1983 Annual Report: See Section III, Technical Summary, page 86.

Research Publications and Presentations: See
Section III, Pulse Beat, Spring 1984, Insert, page 4.

Project Evaluations

1983 Annual Report: See Section III, External Review Panel Report, page 35, and Follow-Up Chart Insert.

1983 Board of Directors Extension Rating: See Section I, page 25.

YEARS FOUR AND FIVE

During the 1983 ERP review, this project was judged to be unacceptable, requiring some major changes. With the assistance of the TC and Board, the changes were further clarified. Those changes have now been made. A new plan of work, based on ERP and TC recommendations and agreed to by the US PI and the new HC PI, follows.

I. Log Frame Matrix - University of California/Kenya
February 15, 1983

Narrative Summary	Objectively Verifiable indicators	Mean of Verification	Important Assumptions
Program or Sector Goal: To increase drought and heat tolerance of disease-resistant beans brown by subsistence farmers in semi-arid regions.	Measures of Goal Achievements: Yields of beans grown by subsistence farmers in semi-arid areas will be stabilized and/or will improve as a result of increased tolerance to environmental stress, reduction in prevalence of disease, and improved knowledge of appropriate breeding and agronomic management techniques.	Comparisons of yields and stability of yields over time with initial data from pilot experiments in California and Kenya. Visits to appropriate sites (other CRSP projects and international centers). Comparisons of initial project results and methodology with information from other CRSP and other similar projects. Awarding of degrees for advanced training to Kenyans, attendance at workshops, professional scientific meetings, publications. Adapatability and acceptability of new cultivars and/or new techniques by farmers in the semi-arid areas of Kenya.	Continued need for semi-arid land for crop (bean) growth in Kenya. Continued dependence on rainfall, rather than developing irrigation systems. Continued population expansion in Kenya. Continued commitment by US-AID and UC Davis and Riverside to the project. Continued low and/or fluctuating yields of beans as grown by subsistence farmers.
Project Purposes: To establish collaborative relationships among scientists with interests in the project. To undertake pilot projects which will provide information relevant to the program goals.	Conditions that will Indicate Achievement of Purpose: Reduction in incidence of disease. Reduction in incidence of crop failure or very low yield in environmentally stressed regions.	Screening and sprinkler field trials in California and Kenya at approrpriate locations. Laboratory and greenhouse experiments on bean/tepary crosses. Acceptance of Kenyan students into programs at UC Davis and	Continued interest in the project by Kenyan scientists and Kenyan governmental personnel, cooperation with other CRSP scientists and those at international agricultural centers. Success in identifying

To instruct scientists in approaches, techniques and methodology of the project. To develop cultivars and agronomic management approaches consonant with the project goal.	Increased dissemination of information relevant to bean growth and development by trained personnel. Acceptance and planting of improved cultivars by subsistence farmers.	Riverside, attendance of students at workshops and professional meetings. Laboratory studies and publication on morphological features of promising cultivars.	promising cultivars from screening and sprinkler trials in the U.S. and Kenya. Identification of interested scientists and evidence of willingness to participate.
<u>Outputs:</u> Screening for identification of cultivars with drought and heat tolerance. Breeding for development of drought, heat and disease resistant cultivars. Training of Kenyan students in project methodologies. Identifying plant characteristics that enhance tolerance to stressful environments. Correlating information on environmental stress, flower and pod abscission and yield.	<u>Magnitude of Outputs:</u> Improved tolerance and yield of cultivars grown in semi-arid areas. Resistance to disease, heat and drought in tepary/bean crosses. Trained personnel available to interact with scientists at the University and with subsistence farmers. Compilation of information appropriate to all aspects of the project.	Accumulation of appropriate information on environmental stress, abscission, disease resistance and yield, and comparisons with similar investigations in other (CRSP) projects.	New cultivars and agronomic approaches will be consonant with needs of subsistence farmers and will be acceptable to them.
<u>Inputs:</u> University of California, Davis - Principal Investigator, Cooperators, technical laboratory and field personnel, computer operator, greenhouse, growth chamber, laboratory and field facilities and supplies, graduate students, office personnel and facilities, external consultants. University of California, Riverside - Co-Principal Investigator, cooperators,	<u>Magnitude of Inputs</u> Indicated by project reports, budgets, working papers, continued involvement of personnel and expansion of project contacts.	Various reports, publications, budgetary data, special information bulletins.	Screening program will indicate possible cultivars for adaptation to semi-arid regimes. Drought, heat and disease resistance cultivars can be developed over time. From field trials, cultivars with tolerance will have some common morphological characteristics which are related to ability to withstand

ınical laboratory and
d personnel, greenhouse,
ratory and field facili-
and supplies, graduate
ents, office personnel
facilities, external con-
ants.

ersity of Kenya - Co-
stigator, cooperators,
d personnel, field
lities, graduate stu-
s, consultants.

environmental stress.

Evidence in the form of results from field trials and laboratory studies will gradually accumulate and indicate appropriate directions for further study.

Funding to continue and maintain the investigation will continue as originally planned.

Young Kenyan scientists will continue to come to UC Davis and Riverside to study in graduate programs related to this project; the US commitment will also continue.

The Management Office will continue to facilitate project implementation and continuance, and will respond to PIs difficulties--particularly in budgetary matters and paperwork.

WORKPLAN - KENYA (REVISED MAY 9, 1984)

Barbara Webster, PI, University of California, Davis
David Ngugi, PI, University of Nairobi

This experimental work is based on the hypothesis that improvements in yields of beans for Kenya can be enhanced through a breeding program that takes advantage of morphological, physiological and agronomic parameters which have been identified as critical to the tolerance of beans and teparies to drought, heat, and disease stress in semi-arid conditions. To this end we need to determine the interactions of Kenyan cultivars and teparies in monoculture and intercrop under rainfed and irrigated conditions in semi-arid areas of Kenya.

Sites of Research

A: Kabete--this is the area adjacent to the agricultural campus of the University of Nairobi. There is irrigation available. There are also greenhouses, laboratories, seed storage facilities and (maybe) some operable growth chambers. Information is available on annual rainfall (ranging from 750-1000 mm per 60-day period), temperature, and soil characteristics. The site is convenient for all project investigators; to date, research there has been carried out by Coulson (physiology), Itulya (agronomy) and Mukunya (screening trials). These three propose to continue work there.

B: Katumani--the National Dryland Farming Research Station, located in the Machakos District ca. 80 km southeast of Nairobi. This is one of the ten National Research Institutions under the Scientific Research Division of the Ministry of Agriculture. Since its establishment in 1955 it has been the center for crop and land management research in the semiarid areas.

There is ample environmental and soil data available for the station and for areas near the station. The site is considered to be a medium altitude (1000-1700 m a.s.l.) dryland farming region, receiving 400-800 mm of rainfall during a 60-day rainy period. Rainfall reliability information and potential evaporation records have been recorded for the past 20 years. Soils in the region have have been characterized and range from friable clays through sandy loams to loamy sand, with common characteristics of capping rapidly (with massive runoff). They are easily workable but rather shallow and prone to impeded drainage due to murram horizons in the drier areas.

Data on impacts of weather analyses on agricultural production in the Katumani region have been published by Stewart and Hash (J. Applied Meterology 21:477-494, 1982).

Research to date at Katumani has been carried out mainly by Itulya and Mukunya. Both investigators propose to continue work there. In addition, if irrigation facilities are extended to the section of the station where beans are now being grown, Coulson will extend his physiological studies to this site.

C. Machanga--this is a Ministry of Agriculture vehicle maintenance and repair station. Land has been set aside for the CRSP bean research projects but there is no other research being carried out at the site. This is a very low rainfall area: less than 200 mm of rainfall was recorded during the most recent rainy season. The site is not irrigated and there are no immediate plans for irrigation (although the Kamburu Dam at Misinga is close by). Temperature and rainfall records are being maintained and a soil survey is currently underway. The region is experiencing a dramatic population increase.

Mukunya has had screening trials at this site and proposes to continue work there. Itulya has had some agronomic studies underway and will also continue work there. Coulson has indicated that if transportation and equipment are available to him, he will also have plots at Machanga.

Personnel

The present roster of Kenyan investigators is as follows:

1) PI David Ngugi (recent change of PI)

2) Daniel Mukunya (plant pathologist)

3) Chris Coulson (physiologist)

4) Francis Itulya (agronomist)

5) Eliott Gathuru (virologist)

The proposed roster is as follows:

1) PI David Ngugi

2) Chris Coulson (physiologist)

3) Julius Nyabundi (ecophysiologist; will receive Ph.D. from UC Davis in late 1984 or 1985 and is slated for a position at U. Nairobi; will overlap with Coulson and then replace him)

4) Francis Itulya (agronomist)

5) Patrick Ayiecho (geneticist, plant breeder; will receive Ph.D. from U.C. Davis in 1985 and is slated for a position at U. Nairobi; would work on the breeding program of the CRSP, hopefully with Van Rheenen)

6) Benjamin Oruko (soil scientist working on nitrogen fixation; will receive Ph.D. from U.C. Davis in 1984 and is slated for a position at U. Nairobi; is anxious to join the CRSP project and will be an excellent addition).

The proposed roster suggests that the agronomic and physiological research now has and will continue to have good supportive personnel. At the present time the breeding/screening component is inadequately staffed by Mukunya and Gathuru. To remedy this, the following alternatives are suggested:

1) Transfer of the major part of the screening/breeding component temporarily (for one year, until Patric, Ayiecho completes work at UC Davis and returns to Kenya) to the Tanzanian project but retain evaluations of disease resistance in connection with agronomic and physiological experiments at the three research sites; and/or

2) Collaborate with David Allen and the CIAT Thika project.

These suggestions eliminate Mukunya and Gathuru from further participation in the CRSP research.

Note that the two alternatives are not mutually exclusive.

Proposed Agronomic Research

Francis Itulya

I. Cultivars to be studied:

Mwezi moja	Teparies and Bean-Tepary hybrids
Small Rose Coco	Red Haricot
GLP 2	Katumani maize
Large Rose Coco	Bullrush millet or sorghum
Canadian Wonder	

II. Sites: Katumani; Machanga

III. Bean intercropping with maize and millet under rainfed conditions:

This aspect is designed to assess the performance of bean cvs. which have to date been evaluated only as monocrops. Justification is based on the fact that farmers in the experimental areas grow most of their beans in combination with maize. In the extreme arid areas they may intercrop with bullrush millet or sorghum. These agronomic studies to date have focused on monocrop regimes. This work now needs to be extended to determine whether the bean cultivars which have been found to do well under semiarid conditions and monocropping will perform similarly in intercropping regimes. The approach will focus on determination of the best spacing regimes in intercropping; identification of the bean cultivars which are best suited for intercropping with maize or millet under semiarid conditions determination of whether land output per unit area can be increased by intercropping beans with either maize or millet; determination of whether intercropping influences the growth pattern of beans; and determination of whether intercropping beans with either maize or millet influences the moisture status of the soil and/or bean plants.

IV. Experimental design:

Randomized complete block with 4 replications, plots 8 m x 4.5 m.

V. Parameters:

The first analyses will focus on yield and yield components, including, e.g., flowers per inflorescence plus axillary flowers; pods per plant, seeds per pod, pod wall and seed dry weight per plant and per unit area, and pod wall:seed ratio.

The second analyses will focus on patterns of growth and development, including, e.g., plant architecture total dry weight, leaf area (LA) and leaf area index (LAI), harvest index (HI) and, finally, computation of correlation coefficients between some of the parameters and economic yield.

Proposed Physiological Research

Chris Coulson

I. Cultivars to be studied:

Mwezi moja	Canadian Wonder
Small Rose Coco	Red Haricot
Large Rose Coco	Tepary (L172?)
GLP 2	Bean/tepary cross

II. Sites: Kabete

III. Physiological analyses to be carried out: to assess most useful physiological characteristics for future breeding work, the following data will be collected--leaf area and yield studies, soil water:yield relations, root development and soil water availability.

At set intervals during designated data collection days the following will be measured--rate of photosynthesis, respiration, leaf temperature, air temperature, transpiration rate, leaf water potential, light intensities.

(Some of these measurements are designed to be carried out in conjunction with the agronomic experimental work proposed by Itulya).

IV. Physiological analyses--nitrogen

This aspect is to be newly incorporated into the project and it is anticipated that it will be carried out by Benjamin Oruko. Since Oruko will not be returning to the University of Nairobi (from UC Davis, where he is now completing Ph.D. studies) until June 1984, the details of the research are not yet set. It is anticipated that the research will encompass measurements of nitrogen fixation rates (by acetylene reduction) and analyses of differences in nitrogen content of vegetative tissues under different levels of nitrogen fertilization (physiological nitrogen use efficiency studies) in beans and teparies, in conjunction with the experimental work of Itulya and Coulson at Kabete, Katumani and Machanga.

Workplan - UC Davis

Barbara Webster

1) Adapt field line source sprinkler system to reflect amount of rainfall at Kenyan sites (Kabete, Katumani and Machanga). Incorporate for drought tolerance evaluation Kenyan cultivars including Mwezi moja, Canadian Wonder, Red Haricot, Large and Small Rose Coco, GLP2, locally grown control, CIAT cultivars (if available), a drought-susceptible local variety and teparies and bean/tepary crosses.

2) Characterize morphologically major vegetative and reproductive growth phases and record changes at differing water stress levels through the growing season.

3) Incorporate measurements of nitrogen fixation in beans, teparies and bean/tepary crosses grown under different water regimes.

4) Analyze components of yield, including seeds per pod, pod weight, number of pods per plant, 100 seed weight, fresh and dry weights of plant parts, leaf area, shoot/root ratios.

5) Measure harvest index ratio and nitrogen distribution throughout the plants.

6) Continue measurements of water use efficiencies using neutron probe.

7) Continue analysis of morphological characteristics of leaves of Kenyas and U.S. beans and of teparies in relation to drought tolerance, including cuticle deposition, number and distribution of stomates, hairs and glands, leaf thickness and size (Arrizon).

8) Continue investigation of reproductive development, especially pollen and stigma characteristics in relation to drought and heat stress: analysis of sequence of pollen development, amount of pollen produced, pollen viability, stigma development, percent ovules fertilized, sequence of pod and seed development, percent and position of aborting seeds, spatial and temporal location of viable and abortive pods (Pechan).

9) Continue investigation of reproductive development, focusing on nutritive requirements for developing embryos and maturing seeds (Sage).

10) Visit Kenya in September 1984.

11) Long-term visit to Kenya (Cory) late 1984.

Workplan - UC Riverside

Giles Waines

1) Grow CIAT's drought test nursery at UCR and continue Zimmerman's drought test screening of selected lines and Kenyan lines under irrigated and stressed conditions.

2) Grow common bean/tepary backcross in drought regimes at Riverside and Irvine.

3) Select for Macrophominia resistance.

4) Increase seed of bean/tepary crosses made by Manshart involving Kenyan and California beans and CIAT teparies for drought stress and other tests in 1985.

5) Continue crosses of Kenyan cultivars and teparies to obtain new FI backcross population.

6) Investigate applicability of Pandy and Jink's pollen irradiation techniques to overcome hybrid lethality in bean/tepary crosses.

7) Continue attempts to produce red and yellow seed coated teparies.

8) Characterize tolerance to boron in tepary and bean/tepary selections.

9) Characterize tolerance for germination at cool soil temperatures in beans, teparies and hybrid selections (Scully).

10) Continue investigation of consumer preferences for common bean and teparies in rural and urban areas of Arizona and Sonora, Mexico, as a prelude to attempting similar studies in Kenya when hybrid selections and teparies are ready for release (Bouscaren).

11) Continue identification of hybrid selections immune to common bacterial blight (Thomas).

12) Visit Kenya in September 1984.

UNITED STATES OF AMERICA
AGENCY FOR INTERNATIONAL DEVELOPMENT
U.S.A.I.D. MISSION TO KENYA

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NAIROBI, KENYA

April 18, 1984

Dr. Pat Barnes-McConnell
Director
Bean/Cowpea CRSP Management Office
Michigan State University
200 Center for International Programs
East Lansing, Mich. 48824

Dear Dr. Barnes-McConnell:

This letter is the USAID/Kenya Agricultural Office formal reply to your questions concerning our understanding, opinions and view of the Bean/Cowpea CRSP projects operating here in Kenya. I follow your format responding to the four points outlined in your February 9th letter.

I note that the final report from the External Review of the Bean/Cowpea CRSP will soon be distributed and we request that a copy be sent to our Nairobi office. I assume that Dr. Barbara Webster has briefed you on our discussions with recent visitors from University of California at Davis and Riverside. USAID/Kenya will in the future be more closely following the work of CRSP. We are becoming increasingly aware of the need for USAID supported research projects to integrate and collaborate in their work in Kenya. At the same time we wish to extend our assurance that we will try to facilitate and be helpful in any way we can to further the work of bean research in Kenya.

Strength and weaknesses of CRSP Projects:

A major strength of the Bean CRSP is in giving needed support to University of Nairobi professionals, allowing them to carry out research in their field of interest. Money has been very scarce to carry out any sort of research. Also the ability to establish linkages with U.S. Universities and U.S. researchers is very beneficial.

We are well aware of the problems that the Kenya coordinator has had in meeting CRSP objectives in terms of getting financial support and needed equipment. One of the major weaknesses as we see it has been the lack of coordination and effective communication between the principal investigators in Davis and Riverside and the Kenyan researchers. The problem of reimbursement for expenses due to the lack of forwarded receipts was in our opinion unresolved for an excessive length of time. Possibly there has been a lack of understanding of the problems and difficulties that University researchers have in conducting their work. Another weakness is that CRSP research has been largely carried out in isolation of other bean research in Kenya. Some very good bean work has been sponsored by the Dutch Government at the Thika Horticultural Station. In the future we believe work should be done in collaboration with bean research conducted by the Ministry of Agriculture and Livestock Development.

Contribution to Development:

As you realize beans are a very important crop for Kenyan farmers especially in the drier areas. The fact that CRSP work in Kenya is concentrating on the development of drought resistant lines speaks to its contribution to agriculture development in Kenya. However, the impact of this contribution has been minimal to date due to problems of implementation.

CRSP Status in GOK Priorities:

It is difficult to get a reading as to official GOK response to the CRSP project. However, as was mentioned above the fact that the CRSP is supporting research conducted by University of Nairobi professionals is very positive. But greater collaboration between University of Nairobi researchers and Ministry of Agriculture researchers would of course be desirable and should raise the credibility of CRSP with GOK.

Appropriateness of CRSP Extension:

USAID/Kenya Agriculture Office would support the extension of Bean CRSP activities in Kenya. This of course would take for granted that changes recommended by Dr. Webster and others after their recent visit would be implemented. Collaboration and cooperation among the limited professional manpower in Kenya is essential. Another factor would be the coordination of bean CRSP activities with that of CIAT's proposed work in Kenya. There should be a top level Memo of Understanding between the CRSP and CIAT prior to continued work.

Page 3.

General Comments:

The management of another S&T Bureau CRSP namely the Small Ruminant CRSP in Kenya has undergone some evolution. Recently, i.e. March 1984, division of the responsibilities of the site coordinator resulted in the creation of 2 offices, (1) research coordinator; (2) program representative.

This example may be a workable solution to some Bean/CRSP management problems. The research coordinator would facilitate the conduct of the program. He would collaborate with the Program Representative to keep the U.S. PI's informed regarding the technical and administrative matters related to the overall Bean/CRSP activities in Kenya.

Responsibilities of the Program Representative (PR) be to facilitate and encourage communication and the flow of information among the following groups or individuals: USAID, MOA&LD, Host Country Representative, Resident Scientists, Management Entity and Principal Investigators. Technical functions would remain the responsibility of the appropriate resident scientist(s).

I trust these thoughts and observations will be helpful in the design of your request for extension.

Sincerely,

Curtis R. Nissly
Project Manager,
Research

SUMMARY OF BEAN/COWPEA CRSP COSTS

Sub-Grantee: Kenya/UCD

	US CONTRIBUTION				TOTAL	TOTAL	Total
	AID Contri.	Spent in HC	Non-Federal Contri.	Total US Contri.	HC Contri.	US & HC Contri.	Spent in HC
Cumulative through Year 3 (9-30-83)	350,999	117,615	66,438	417,437	89,387	506,824	207,002
Estimated Year 4	172,088	55,250	116,300	288,388	87,500	375,888	142,750
Estimated Year 5	313,680	195,010	39,560	353,240	90,000	443,240	285,010
SUB-TOTAL INITIAL GRANT	836,767	367,875	222,298	1,059,065	266,887	1,325,952	634,762
Projected Year 6	226,420	106,930	39,830	266,250	85,000	351,250	191,930
Projected Year 7	242,935	114,688	42,749	285,684	90,000	375,684	204,688
Projected Year 8	260,770	123,063	45,903	306,673	95,000	401,673	218,063
SUB-TOTAL EXTENSION	730,125	344,681	128,482	858,607	270,000	1,128,607	614,681
TOTAL PROGRAM	1,566,892	712,556	350,780	1,917,672	536,887	2,454,559	1,249,443

6062B

Bean/Cowpea Collaborative Research Support Program
Sub-Grantee: Kenya/UCD

	Act Exp Thru Year 3	Est Exp Current Year 4	Est Exp Year 5	Total Initial Grant	Projected Year 6	Projected Year 7	Projected Year 8	Total Ext Request	Total Grant & Extension
Salaries	156,463	94,433	137,790	388,686	133,965	143,080	152,925	429,970	818,656
Fringe Benefits	-0-	10,538	11,305	21,843	12,735	13,755	14,855	41,345	63,188
Equip & Fac	38,189	17,156	89,700	145,045	20,670	22,325	24,110	67,105	212,150
Dom Travel	5,886	4,803	8,325	19,014	5,795	6,260	6,760	18,815	37,829
Intnl Travel	55,072	8,578	14,850	78,500	10,335	11,160	12,050	33,545	112,045
Materials & Supplies	29,950	2,858	14,950	47,758	3,445	3,720	4,020	11,185	58,943
Other Direct Costs	7,678	2,232	15,145	25,055	1,485	1,605	1,735	4,825	29,880
Total Direct Costs	293,238	140,598	292,065	725,901	188,430	201,905	216,455	606,790	1,332,691
Indirect Costs	57,761	31,490	21,615	110,866	37,990	41,030	44,315	123,335	234,201
Total Costs	350,999	172,088	313,680	836,767	226,420	242,935	260,770	730,125	1,566,892

Equipment included in Extension Budget Request:

1. 2 IBM PC Computers - $14,000
2. Seed Planter-Allen Machine Co. - $5,000
3. LI-COR Leaf Area Meter - $6,800
4. Baker Laminar Flow Hood - $3,000
5. LI-COR Line Quantum Sensor - $1,400
6. LI-COR Photometer - $1,000
7. LI-COR Porometer - $6,000
8. Plant Water Status Console - $1,600
9. Enlarger - $1,500
10. Drying Oven - $1,500
11. Water Bath - $1,500
12. Micromanipulator - $3,000
13. Omega Co. Temp Humidity Monitoring System - $3,500
14. Omega Infra-red Pyrometer - $1,400
15. Refrigerator-explosion proof - $2,000
16. PH meter - $2,000
17. Electrophoresis Equipment - $5,000
18. Hand Thresher - $5,000

PROJECT REVIEW AND EXTENSION PLAN

MALAWI • MICHIGAN STATE UNIVERSITY (Initiated February 1982) • BEANS
Adams

GENETIC, AGRONOMIC AND SOCIO-CULTURAL ANALYSIS OF DIVERSITY
AMONG BEAN LAND-RACES IN MALAWI

INTRODUCTION

The seed color-pattern-size-shape regional census has been essentially completed. Some 112 different color-pattern types occur in Malawi, combining three classes for shape (length/breadth ratio) and a nearly continuous (from small to large) distribution for seed size. However, most Malawian beans are medium to large in size with red the most common color. Browns, whites, and yellows and variegated patterns are also common. Black is rare. Percent outcrossing has been measured to be from 0 to 2.25% in seeds from seven different plantings at two locations. Data are expected early in 1984 from the first multiple location tests concerning yields and yield stability of mixtures as compared with monotypic varieties. Heterozygote superiority is almost a foregone conclusion since hybrid vigor in beans is well-documented elsewhere. The multi-variate study has gotten underway from which the genetic distances within and between "land-races" will be described.

Female enumerators completed the socio-economic pilot study generating information in these categories: demographics, production, economics, storage, preparation, consumption and health. The data suggest that interest in a varietal improvement program will have to thoroughly understand and address a number of family farm management constraints (i.e., time, labor, ecological variations) and practices (i.e., saving seed). Long-term follow-up research has begun. Interestingly, one gets the tentative impression that from several standpoints particular kinds of beans--such as the red kidney Saaba, the mottled sugar bean, the round green Nyauzembe--are preferred, <u>and not as mixtures</u>. Why then, and how, are the over 2,000 seed-types maintained? There are five students on the project, one of which was a US student doing M.S. thesis research in Malawi. There are three Malawians engaged in academic work at MSU.

YEARS ONE THROUGH THREE REFERENCE GUIDE

The information referred to here has been compiled in separate documents included in Sections I and III of this report.

Three-Year Progress Report

1983 Annual Report: See Section III, <u>Technical Summary</u>, page 91.

Research Publications and Presentations: See
Section III, <u>Pulse Beat</u>, Spring 1984, Insert, page 4.

Project Evaluations

1983 Annual Report: See Section III, External Review Panel Report, page 37, and Follow-Up Chart Insert.

1983 Board of Directors Extension Rating: See Section I, page 25.

YEARS FOUR AND FIVE

Environmental factors will be addressed in this research through the following means.

1. Undertake screening of component lines from "land-races" for their reaction to infection by two major pathogens in Malawi, namely, halo blight incited by *Pseudomonas phaseolicola* and angular leaf spot incited by *Isariopsis griseola*.

2. Drought stress: Malawi, like other Eastern African countries, is subject to uncertain rainfall, as a result of which widespread and recurrent drought may periodically severely affect crop and livestock production. Beans, particularly when grown in association with maize, and furthermore because most of the soils are coarse-textured, are acutely subject to moisture stress during these drought periods.

   It seems possible that, as some Malawian farmers opined, some of the "land-race" mixtures may have generated individual genetic components having greater tolerance to or escape from drought. Therefore, the following is proposed:
   a. Commence screening Malawian germ plasm for drought tolerance by growing Malawian mixtures together with maize as a competitor on drought-prone soil, and
   b. Exploring various physiological and morphological characteristics of beans as indicators of drought resistance.

3. Use the multi-variate techniques, such as Principal Components Analysis, in characterizing the physical environment where seed collections have been made and which have/or will be subjected to structural analysis.

Field diversity will also be studied in relation to the factors which are listed below.

1. Stability
   a. Continue relative performance testing of component lines from "land-races," over successive seasons and locations, in comparison with simple and complex mixtures.
   b. Develop and employ electrophoretic methods of identifying specific genotypes in "land-race" populations in tracing genotypic frequency changes in mixed populations associated with seasons and locations.

2. Patterns of variability
   Complete the analysis of variability through the use of Principal Components Distance estimations

3. Hybrid superiority
   Establish the superiority level of hybrids by producing a large number of hybrids through hand-crossing, thence introducing the hybrids, suitably marked for identifying, into grower fields in typical farm plantings and determining their yield in both weight and numbers of seed.

Agronomic practices as an important factor in diversity maintenance will be more vigorously researched.

1. Performance of mixtures vs non-mixtures
   a. Conduct agronomic testing under farm conditions of using mixtures, including simple four-six component mechanical mixtures and complex biologically dynamic mixtures containing many genotypes. These tests must be conducted in association with maize and as mono-culture, over several seasons and locations.
   b. Sampling of each harvest must be practiced in order to determine the shifts that may be taking place in terms of frequencies of various components.

2. Fertilization
   a. Capability of nitrogen fixation through *Rhizobium* will be assessed by collecting Rhizobial strains from the Northern and Central Zones and testing various bean "land-races" (and components) against the Rhizobial isolates for N_2-fixing ability.
   b. Plant densities: A census will be taken of plant densities in fields of beans in various locations and seasons, for both monoculture and associated culture, in order to determine whether competition between plants is likely to play a role in differential survival and fecundity. This study should include maize as a major competitor.

Socio-cultural component issues, important in understanding the context of bean diversity, will continue its slow steady contribution to this project.

The pilot study carried out in northern Malawi has been completed and the data analyzed. It has suggested a number of issues which need further investigation. Especially since the pilot population was only twenty-five families, findings of potential significance must be followed up in-depth.

Thus, during year four of the CRSP a young woman has been identified who will live in the same region for a year, organizing and implementing the more in-depth study. The resident social scientist is expected to move to Malawi in the summer of 1984.

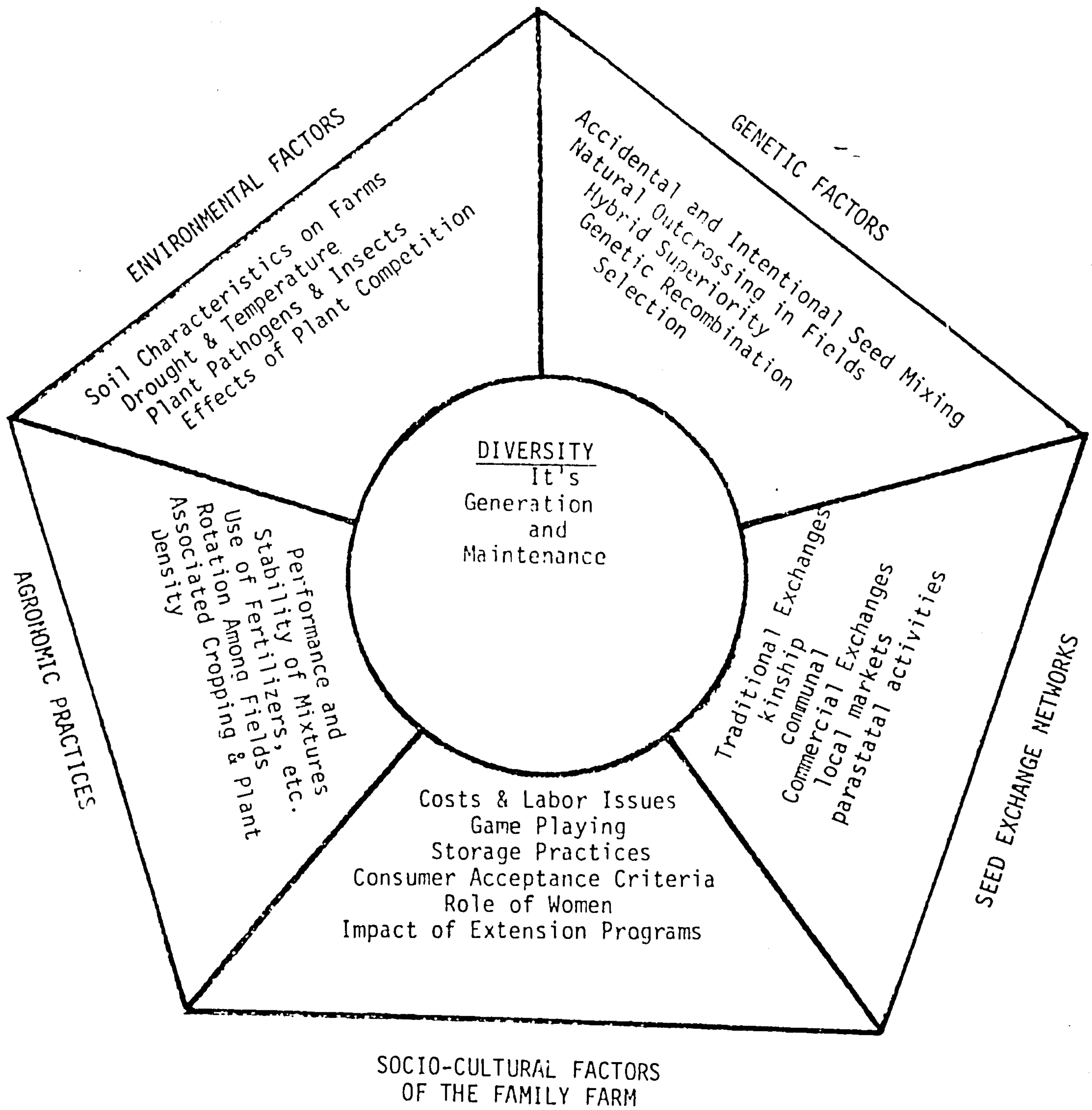
Graduate training involving three Malawian and two US students is proceeding; these students now accepted should continue for years four and five, and perhaps beyond.

EXTENSION YEARS SIX THROUGH EIGHT

The basic question dealing with factors responsible for generating and maintaining genetic diversity in the Malawian bean gene pool is proving to be a sufficiently broad, as well as fundamental, question that will continue to generate a rich array of individual research problems and outcomes. Thus there will be no change in the research plan question at this stage.

When data are in hand sufficient to encourage a preliminary synthesis, there will be developed a multi-faceted synthesis of the principal forces that seem responsible for the generation and maintenance of genetic diversity in beans in Malawi and for their acceptance by growers and consumers. Then this synthesis can be applied to a Latin American country or countries where mixtures are common to see whether the Malawian synthesis is country specific or whether it can be extended to many countries.

The pervasiveness of mixtures in the households of northern Malawi is becoming clearer. Even in the households with hundreds of pounds of beans stored as separate seed types, our pilot researchers found a small amount of mixed beans. It was also discovered that some mixtures are moved from field to field across seasons. During the extension years emphasis will be placed on mixtures, their interaction and their contribution. Along with such agricultural issues as mixture contributions to weed, disease, insect and other pest control and the mixture contribution to mixture component and yield stability, the research will look at an array of social issues and their interaction with agricultural issues which make up the criteria for acceptance among the varieties. For example, some of the factors which influence production are dynamic variables such as climate, insects, diseases and fertility but also numbers of consumers in a family, the pressure to generate additional money and government pricing policy. There are also relatively stable factors which year after year change very slowly or not at all such as daylength in the same field but also preferences for seed size for eating, the need to cover the risk variables and the female bean producers' low basic level of resources (time, energy and money for beans).



Pentagon of the Major Factors Affecting Diversity
in Beans in the Malawian Gene Pool

BEAN/COWPEA CRSP MALAWI PROJECT LOGFRAME (Shortened Version)

	NARRATIVE SUMMARY	CRITERIA OR OBJECTIVES INDICATORS	DATA NEEDS OR MEANS OF VERIFICATION	ASSUMPTIONS OR REQUIRED "GIVENS"
GOAL	Analysis of the biological/social bases for the maintenance of bean diversity in Malawi	1. Significant factors in each subarea (genetic, agronomic, sociological, cultural) identified 2. Factors concerned with production, distribution, utilization and consumption identified	1. Identification of relevant ecological zones 2. Farm household observations and surveys 3. Field and greenhouse studies on Malawi beans	1. Biological/social data can be collected on the same farm households in each region 2. Residents, especially women, will cooperate 3. Biological/social data can be integrated in a comprehensive analysis
PURPOSE	Provide information necessary to develop a viable bean improvement program supportive of small farmers, especially women and their families in Malawi	1. Survey and observations of small farm households throughout production cycle 2. Bean collections from each area throughout production cycle 3. Resident reports of socio-cultural factors	1. Multivariate analysis of data generated 2. Description of bio-social environment 3. Definition of roles of family members in farm household life cycle and the maintenance of diversity	1. A national bean program can help the bean farmers of Malawi 2. Residents, especially women, will cooperate 3. Bio-social data can be integrated in an analysis
OUTPUTS	1. Comprehensive report of analysis of bean diversity within context of farm family system 2. Recommendations for bean improvement plan for USAID, GOM and Bunda 3. Important contributions to relevant literature and Bean/Cowpea CRSP 4. Increased numbers of Malawian scientists trained	1. Multiple copies of report available for distribution 2. Report used by GOM in conjunction with Bunda College to develop long-term bean program for Malawi 3. US and Malawi scientists publish jointly in appropriate journals 4. Graduates from identified graduate programs	1. Computer printouts read and interpreted in relation to all other available data 2. Findings disaggregated by geographic region, point in production cycle and gender 3. Extensive notes kept by US and Malawi scientists throughout process 4. University records	1. Such a report can be valid, useful and appropriate 2. Positive use will be made of the information in support of small farm families 3. Information from this project will be useful to others 4. There are potential students prepared and available for advanced training
INPUTS	1. Materials, supplies and equipment 2. Survey and data gathering trips including collecting seed samples 3. Greenhouse and field space for multiplying and studying plants grown from the collections	1. Landrover, motorcycles, bicycles, irrigation and greenhouse equipment 2. Trained team of Malawi female researchers to gather socio-cultural data 3. U. S. researchers on site collaborating with Malawian scientists	1. Approvals requested received, equipment purchased 2. Personnel at appointed locations with support materials and logistics in order 3. Necessary approvals received, research plan begun	1. Necessary materials either available in Malawi or can be transported into country 2. Women to be hired and trained are available 3. Project personnel are compatible and can work together

MICHIGAN STATE UNIVERSITY

DEPARTMENT OF CROP AND SOIL SCIENCES
SOIL SCIENCE BUILDING

EAST LANSING · MICHIGAN · 48824

May 11, 1984

MICHIGAN STATE UNIVERSITY
RECEIVED
MAY 11 1984
Bean/Cowpea CRSP

Dr. Pat Barnes-McConnell
Bean/Cowpea CRSP
200 Center for International Programs
Michigan State University
East Lansing, Michigan 48824

Dear Pat,

I am pleased to respond to the questions directed toward the understanding of the significance of the Bean/Cowpea projects for which Michigan State University has principal investigator responsibilities.

1. Benefits to host country agriculture.

Malawi-MSU - an exceedingly wide range of genetic diversity exists in the bean production fields in Malawi. The individual bean types or land-races are selected by producers for special uses or maintained for production alone or in mixtures of types.

Production stability with minimal technological inputs may be a major benefit of growing mixtures. In addition, the project is evaluating germplasm for several characteristics of economic value, which will form the basis of a varietal development and/or seed production program at the national level.

Mexico-MSU - the project screens Mexican and exotic germplasm for both drought tolerance and N-fixation capability under Mexican conditions. The capacity of varieties to produce acceptable yields under conditions of moisture stress and to maintain a high level of nitrogen fixation is important to low cost production systems for limited resource producers.

Nigeria-MSU - utilization of cowpeas, especially in the diets of young children is limited by local tradition. To improve the diets of children through the use of cowpeas as a protein source, it will be important to understand the true relationship of cowpeas to perceived dietary problems.

2. Benefits to U.S. agriculture, especially the domestic interest of agriculture in your state.

Malawi-MSU - the diversity of germplasm in Malawi will provide a wealth of new germplasm available for potential incorporation into Michigan varieties and new understandings of genotype by environment interactions.

Mexico-MSU - the response of bean genotypes to moisture stress and the capacity of the bean plant to fix nitrogen under stress conditions will contribute significantly to production stability if incorporated into local varieties, and may limit the expense of purchase of fertilizer nitrogen.

Dr. Pat Barnes-McConnell
May 11, 1984
Page 2

Nigeria-MSU - a study of the nutritional qualities of cowpeas will identify ways that anti-nutritional factors can be alleviated through breeding or processing.

3. Extent to which your regular domestic research programs reinforce, compliment, or otherwise relate to the goals of the CRSP.

Domestic scientists have developed a large body of knowledge relative to the inheritance of economic traits in dry beans, to physiological and developmental properties that relate to adaptation, disease resistance, quality and yield, biological nitrogen fixation, and interaction between bean genotypes and their environment. Through the CRSP, these principles can be extended to and tested under diverse circumstances and applied as appropriate to new variety development situations. In cowpea utilization, the methodologies of breath hydrogen analysis are immediately available for dietary analyses in child nutrition.

4. Impact or influence of CRSP existence on your regular on-going domestic research program.

Scientists working in diverse environments but with mutual interests greatly influence domestic research by providing a much broader data base, new genetic resources, and a greater range of opportunity for resource evaluation. In the case of anti-nutritional factors, it is helpful to be able to evaluate these under conditions of high individual levels of product consumption. A particularly important element is the sharing of information, experiences, and germplasm among a community of dedicated researchers.

5. Impact or influence of CRSP existence on your regular on-going international research programs.

Benefits to on-going international programs include the linkages that result between U.S. and host country scientists, the training of investigators (especially young scientists) for effective program development in international settings, and an awareness of problems encountered by host country researchers.

Work under the auspices of this CRSP has been a valuable and stimulating institutional experience. It is important that this work continue and be allowed to mature to influence science in both the U.S. and host country settings.

Sincerely yours,

D.D. Harpstead

D.D. Harpstead, Chairman
Department of Crop & Soil Sciences

cc: Dean Anderson
Dean Isleib
Thayn Dutson

UNITED STATES OF AMERICA
AGENCY FOR INTERNATIONAL DEVELOPMENT
P.O. Box 30455 LILONGWE 3. MALAWI

TEL: 731 632
731 093

NICO HOUSE
SECOND FLOOR

April 4, 1984

Dr. Pat Barnes-McConnell
Director, Bean/Cowpea CRSP
200 Center for International Programs
E. Lansing Michigan 48824

Dear Dr. Barnes-McConnell:

The USAID Mission to Malawi and the Government of Malawi strongly support the concept and intent of the Bean/Cowpea CRSP Project in Malawi. But issues have been raised about (1) the amount of time the Principal Investigator, Dr. Edje, invests in this project and (2) accounting for funds. That these issues exist is unfortunate because the Ministry of Agriculture looks to Bunda College for leadership in Bean research. The Bean/Cowpea CRSP project is the most significant and best-funded biological research effort in the University of Malawi. Professor Edje is an ambitious, articulate, and dedicated scientist.

So far, the contribution of this research project to Malawi development is minimal, except for the very important contribution that it makes to development of the research system in Bunda College.

As you are aware, the concept of the CRSP is different from other types of S & T projects. The CRSPs will continue to be vulnerable to the criticism that they do not contribute to development so long as they fail to report findings in a way that can and will be used by developing countries. The Bean/Cowpea CRSP with its 18 researchable problems is more vulnerable than others. Who knows but that the findings of one or more of the other 17 areas of investigation may prove to be more valuable to Malawi than the one underway here? It is for this reason that we were so pleased to receive the summary report of the Small Ruminant CRSP which so completely summarizes the results of all components of that CRSP in a very readable format. We fully support the extension of the Bean/Cowpea CRSP component is Malawi. But the CRSP management will need to resolve these issues and assure both itself and the GOM that this component will contribute within the overall research plan in Malawi. All effort and funds invested in Malawi must fully contribute to solving the problem which has been identified.

We will be pleased to discuss this matter with you to assure successful continuation and completion of this Bean/Cowpea CRSP component.

Sincerely,

Sheldon W. Cole
AID Representative

4627 AMEMB LL MI

TO: DR.P.W. BARNES-MCCONNELL
BEAN/COWPEA CRSP
EAST LANSING, MICHIGAN 48824-1035

AMEMBAT 073
04/27/84

IN REFERENCE TO OUR LETTER DATED APRIL 4, WE DID NOT REPEAT NOT SUGGEST MISMANAGEMENT OF FUNDS ON THE PART OF HOST COUNTRY PI. A MISUNDERSTANDING APPEARS TO HAVE ARISEN BETWEEN DR. EDJE AND BUNDA COLLEGE REGARDING CRSP FROM THE STANDPOINTS OF THE TIME DR. EDJE SPENDS ON HIS RESEARCH AND OF HOW THE FUNDS ARE ADMINISTERED. BUNDA APPARENTLY REGARDS THE POSITION DR. EDJE HOLDS WITH THE COLLEGE AS HIS PRIMARY JOB AND LOOKS WITH SOME DISFAVOR ON THE TIME HE MUST SPEND AWAY FROM HIS RESPONSIBILITY IN ORDER TO CONDUCT HIS RESEARCH FOR CRSP.
IN REGARDS TO THE FUNDING, THIS ISSUE APPEARS TO HAVE BEEN RAISED BECAUSE DR. EDJE HAS NOT FELT IT NECESSARY TO INFORM BUNDA OFFICIALS OF CRSP BUDGETARY MATTERS. PERHAPS THE MOST EXPEDITIOUS AND AMENABLE WAY OF RESOLVING BOTH ISSUES IS FOR YOU TO REQUEST THAT DR. EDJE, AS COURTESY TO BUNDA AND MINISTRY OF AGRICULTURE OFFICIALS, SUBMIT RESEARCH PROGRESS REPORTS AND BUDGETARY ALLOCATIONS AT REGULAR INTERVALS THROUGHOUT THE LIFE OF THE PROJECT.
REGARDS
SHELDON W. COLE
USAID MISSION
AMERICAN EMBASSY
LILONGWE, MALAWI

MICHIGAN STATE UNIVERSITY
RECEIVED
APR 27 1984
Bean/Cowpea CRSP

4627 AMEMB LL MI
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REPLY VIA MCI/WUI - 101

SUMMARY OF BEAN/COWPEA CRSP COSTS

Sub-Grantee: Malawi/MSU

	US CONTRIBUTION				TOTAL	TOTAL	Total
	AID Contri.	Spent in HC	Non-Federal Contri.	Total US Contri.	HC Contri.	US & HC Contri.	Spent in HC
Cumulative through Year 3 (9-30-83)	154,358	63,489	12,343	166,701	24,125	190,826	87,614
Estimated Year 4	166,281	107,740	31,551	197,832	14,800	212,632	122,540
Estimated Year 5	254,730	147,975	35,585	290,315	13,000	303,315	160,975
SUB-TOTAL INITIAL GRANT	575,369	319,204	79,479	654,848	51,925	706,773	371,129
Projected Year 6	103,160	48,045	18,372	121,532	5,500	127,032	53,545
Projected Year 7	111,415	51,890	19,842	131,257	5,900	137,157	57,790
Projected Year 8	120,330	56,045	21,429	141,759	6,400	148,159	62,445
SUB-TOTAL EXTENSION	334,905	155,980	59,643	394,548	17,800	412,348	173,780
TOTAL PROGRAM	910,274	475,184	139,122	1,049,396	69,725	1,119,121	544,909

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Bean/Cowpea Collaborative Research Support Program
Sub-Grantee: Malawi/MSU

	Act Exp Thru Year 3	Est Exp Current Year 4	Est Exp Year 5	Total Initial Grant	Projected Year 6	Projected Year 7	Projected Year 8	Total Ext Request	Total Grant & Extension
Salaries	47,550	64,750	68,190	180,490	50,170	53,385	56,860	160,415	340,905
Fringe Benefits	2,195	3,210	2,920	8,325	1,990	2,150	2,320	6,460	14,785
Equip & Fac	17,259	24,750	67,925	109,934	5,360	6,590	7,920	19,870	129,804
Dom Travel	666	10,870	11,650	23,186	6,740	7,280	7,860	21,880	45,066
Intnl Travel	47,432	14,355	16,990	78,777	8,905	9,620	10,390	28,915	107,692
Materials & Supplies	6,402	19,690	30,160	56,252	12,215	13,190	14,245	39,650	95,902
Other Direct Costs	1,952	14,200	34,750	50,902	8,810	9,515	10,275	28,600	79,502
Total Direct Costs	123,456	151,825	232,585	507,866	94,190	101,730	109,870	305,790	813,656
Indirect Costs	30,902	14,456	22,145	67,503	8,970	9,685	10,460	29,115	96,618
Total Costs	154,385	166,281	254,730	575,369	103,160	111,415	120,330	334,905	910,274

Equipment included in Extension Budget Request:

1. Irrigation Pump - $2,000
2. Irrigation pipe, sprinkler heads and fittings - $3,000
3. Motorcycle - $1,000
4. Germplasm storage facility (temperature and humidity regulating equipment) - $10,000

6026B

PROJECT REVIEW AND EXTENSION PLAN

MEXICO • MICHIGAN STATE UNIVERSITY (Initiated March 1983) • BEANS
Adams

IMPROVING RESISTANCE TO ENVIRONMENTAL STRESS IN BEANS THROUGH GENETIC SELECTION FOR CARBOHYDRATE PARTITIONING AND EFFICIENCY OF BIOLOGICAL NITROGEN FIXATION

INTRODUCTION

Preliminary field screening experiments for drought tolerance in 1500 bean genotypes were conducted in Mexico (Durango) and more critical experiments involving fewer lines were conducted under stress and non-stress (drought and nitrogen) in Mexico (Iguala and Durango) and in the U.S. Estimates of numbers of rhizobia in soils at Iguala and Durango have been made and in Minnesota evaluations of competitiveness of rhizobial strains, nitrogen fixing capacity of host cultivars and of small-seeded ancestral lines have been made. Preliminary findings with respect to carbohydrate storage and remobilization under stress imply that the ability to remobilize dry weight from stems and/or roots to seed during drought stress does not, in and of itself, assure high yield. In one critical experiment (Iguala), both the highest yielding and lowest yielding entries remobilized stem dry weight. Others factors affecting drought tolerance in beans may include leaf size, duration and orientation, and properties of the root system.

A series of some sixty crosses have been made among lines tolerant and intolerant to drought and nitrogen stress. Over 200 F_3 families from crosses involving the top-yielding entry were produced for drought screening in Iguala. Four crosses have been selected for detailed biometrical genetic analysis of drought tolerance and its component factors. One female M.S.-Ph.D. student from Colombia and one male M.S. student from Mexico are pursuing their degrees at Michigan State University. Both attended the 1983 BNF Workshop at the University of Wisconsin.

YEARS ONE THROUGH THREE REFERENCE GUIDE

The information referred to here has been compiled in separate documents included in Sections I and III of this report.

Three-Year Progress Report

1983 Annual Report: See Section III, Technical Summary, page 100.

Project Evaluations

1983 Annual Report: See Section III, External Review Panel Report, page 39, and Follow-Up Chart Insert.

1983 Board of Directors Extension Rating: See Section I, page 25.

YEARS FOUR AND FIVE

Activities planned for the remainder of the original grant period are presented below. Eleven project objectives were stated in the initial project outline. Work undertaken in 1982 and 1983 pertains to five of these objectives; however, the studies are not completed and should be continued in 1984 and 1985.

These activities involve genotype screening under drought and nitrogen stress, initial carbohydrate remobilization studies in selected genotypes, estimation of Rhizobium population numbers in Mexican soils, the making of crosses among selected bean genotypes, and graduate student training.

1. Physiological
   a. Conclude carbohydrate and nitrogen analyses of plant part samples taken from field experiments conducted in Iguala, Durango, and Michigan.
   b. Determine the pattern(s) of storage and remobilization of carbohydrate in a limited number of selected genotypes grown under control and drought stress, using radio-active carbon dioxide or sucrose as a tracer.
   c. Determine, under highly controlled greenhouse conditions, levels of photosynthesis, and respiration, and certain morpho-physiological parameters such as stomate behavior and leaf water potential for selected bean and cowpea genotypes grown at carefully regulated levels of drought stress. This experiment is planned for Dr. Earl Watt, on leave from his post as IITA cowpea breeder in Goiania, Brazil.
   d. Make a comparative study of root growth and drought tolerant and drought prone bean and cowpea strains under highly controlled conditions, utilizing growth cylinders, glass-fronted boxes and tracing dyes.

2. Nitrogen Fixation Studies (Dr. P. Graham, University of Minnesota)
   a. Evaluation of bean cultivars for N2-fixation in a trial or trials on a low N sandy soil field site(s), with RIZ lines from CIAT, high and low fixing selections from the University of Wisconsin project, drought tolerant lines from INIA (Mexico), materials from the 1982-83 EP, and lines from Michigan State University previously tested either for drought tolerance or yield under low nitrogen. The tests would include both with and without N fertilization.
   b. In addition, Rhizobial strain trials would be conducted, comparing strain groups from Mexico, Colombia, Ecuador and Brazil.
   c. From experiments a) and b) there should be identification of high N-fixing drought tolerant lines, as well as efficient strains of Rhizobia. This should make feasible a follow-up trial, evaluating the ability of the good N-fixers to fix N under different conditions of droughty soil and/or high temperature. Such trials would probably be carried out both in Mexico and in Minnesota.

3. Genetic Studies

   a. Ninety-two (92) F_3 families of crosses involving MSU Strain N81017, the highest yielding entry under the drought test at Iguala in 1983, have been planted in December 1983 at Mazatlan, Mexico, for selection purposes and generation advance to the F_4. Seed increases of selected families obtained in early 1984 will be available for planting in Michigan and in Durango in Summer, 1984 under dryland conditions for drought selection.
   b. Sixty F_1 crosses involving drought tolerant, drought susceptible, and high and low nitrogen fixing lines from CIAT, INIA, University of Wisconsin, and Michigan State University have been planted in Mazatlan in December 1983 for

advancement to the F_2 generation, and hopefully, can be immediately replanted here for advancement to the F_3. If obtained, the F_3 families will be planted in late June of 1984 at Durango to study patterns of segregation for drought resistance utilizing such indicators as yield.

c. From among the sixty crosses noted in (b) above, F_1 seeds of 4 of them have been retained at Michigan State University for the production of back-crosses and selfed progenies. Two of these sets of progenies will be grown at MSU utilizing the Rain-Out shelter built in 1983 for the purpose of attempting to measure and classify them for various drought responses. The other 2 sets will be returned to Durango for a similar experiment under the conditions that prevail there.

d. Repeat these genetic experiments utilizing progeny rows as plots rather than utilizing individual plants, which will also make possible the calculation of parent-offspring regressions for estimating heritability and pre-potency.

e. From screening work carried out on an extensive scale in the field by INIA at Durango, many lines showing some tolerance or resistance to drought will have been identified. These selections will have to be evaluated for agronomic and consumer acceptability, and the best ones used in initial N-fixation trials. If found inefficient, crosses to good N-fixers will have to be made and carried forward to the F_3 or F_4 generations to be evaluated jointly for drought tolerance and N-fixation.

EXTENSION YEARS SIX THROUGH EIGHT

From inter-specific cross hybrids (Phaseolus vulgaris x Phaseolus acutifolius) made by Dr. Claire Thomas at the University of California at Riverside, in particular, their backcross-self progenies, the team plans to develop sets of "iso-lines" for comparison of drought and heat tolerance in relation to alternative expression for such traits as root growth, leaflet size, leaflet orientation, stomatal behavior, specific leaf weight, leaf expansion rate, leaf water potential, carbohydrate remobilization, and yield and yield components.

In the "iso-line" populations, nitrogen-fixation will also be evaluated and determination made of whether simultaneous selection for both drought resistance and nitrogen fixation is feasible.

Also utilized will be advanced generations of populations from crosses now being grown in Mazatlan for selection of drought tolerant lines, using as selection criteria, one or more of the physiological-morphological properties expectd to be shown as indicators from current work in this project and in the other CRSP projects bearing upon this question (UC Riverside and UC Davis). Some of these populations involved high nitrogen-fixing parents, and thus should be useful, along with populations from 3.e. above for selecting jointly for drought tolerance and nitrogen fixation. It remains to be seen, at this time, whether the selections which fix N well under temperate zone conditions will do so under sub-humid or semi-arid conditions. This selection experiment should throw some light upon that question, although it can also be approached more directly by the specific experiments referred to herein.

LOG FRAME MATRIX

Project Title: Mexico/Michigan State University

NARRATIVE SUMMARY	OBJECTIVELY VERIFIABLE INDICATORS	MEANS OF VERIFICATION	IMPORTANT ASSUMPTIONS
Program or Sector Goal: Develop bean varieties with a improved tolerance to drought & with high nitrogen-fixing capability in dryland conditions.	Measure of Goal Achievement: Development & release of bean varieties in major agronomic type(s) possessing higher levels of tolerance to drought & having improved N-fixing capability.	Performance trials conducted by INIA (Mexico), Michigan State University & the University of Minnesota.	Beans will continue to be an important food source in the diets of Mexicans; Uncertain rainfall will continue to be a problem in the central highlands of Mexico; small farmers will accept & use new varieties of beans.
Project Purpose: To mediate the effect of drought & low nitrogen availability upon bean production in the dry upland production zones of Mexico & to increase the stability of production in Michigan where drought stress occurs.	Condition that will indicate project purpose has been achieved: When bean growers in Mexico (dry uplands) & Michigan have been supplied with & accepted the improved varieties and/or practices, & adopted them into their production system.	When growers begin to purchase seed of the improved varieties in quantities sufficient to represent a substantial (greater than 20%) part of grower acreage each year.	That government agencies maintain incentives to seed & commercial edible bean production; that seed organizations participate in the increase & distribution of new improved varieties.
Project Outputs: 1. Improved drought and/or N-fixing varieties in one or more major classes of beans. 2. Trained research personnel. 3. Germplasm that can be introduced into other programs. 4. Ideas and/or technics of value to other projects.	Magnitude of Outputs: 1. Trained personnel--current & continuous, at a level of 1-2 M.S. students/year and 1 doctoral student every 3rd year. 2. Improved germplasm--some new lines identified annually. 3. Varieties--not in the immediate (1-2 years) future, but within a 3-5 year period.	1. University records of students trained and/or degrees granted. 2. Theses produced from the project or papers presented at meetings or conferences. 3. Research reports from the project annual summaries. 4. Eventually, varieties release notices or registrations.	That the project remain funded & that it receive appropriate cooperation & leadership from the institutions
Project Inputs: US--Land, laboratory & other facilities, technician & secretarial time & time of PI & Co-PI. Mexico--Personnel of INIA in Mexico City, Iguala & Guadalajara--Durango have all contributed time to the project. In addition, in Iguala, Mazatlan, & Durango, land, laboratories, labor, transportation, & equipment have been made available when required.	Implementation Target: Personnel $259,000 Equipment 97,000 Travel 52,000 Materials & Supplies 59,000 Other Direct Costs 45,000 Indirect Costs 52,000 Total 564,000	Annual project reports, trip reports, budget analyses.	Sufficient funding will continue to support project activities; staff will remain at full strength & committed to project goals.

MICHIGAN STATE UNIVERSITY

DEPARTMENT OF CROP AND SOIL SCIENCES
SOIL SCIENCE BUILDING

EAST LANSING · MICHIGAN · 48824

May 11, 1984

Dr. Pat Barnes-McConnell
Bean/Cowpea CRSP
200 Center for International Programs
Michigan State University
East Lansing, Michigan 48824

Dear Pat,

I am pleased to respond to the questions directed toward the understanding of the significance of the Bean/Cowpea projects for which Michigan State University has principal investigator responsibilities.

1. Benefits to host country agriculture.

   Malawi-MSU - an exceedingly wide range of genetic diversity exists in the bean production fields in Malawi. The individual bean types or land-races are selected by producers for special uses or maintained for production alone or in mixtures of types.

   Production stability with minimal technological inputs may be a major benefit of growing mixtures. In addition, the project is evaluating germplasm for several characteristics of economic value, which will form the basis of a varietal development and/or seed production program at the national level.

   Mexico-MSU - the project screens Mexican and exotic germplasm for both drought tolerance and N-fixation capability under Mexican conditions. The capacity of varieties to produce acceptable yields under conditions of moisture stress and to maintain a high level of nitrogen fixation is important to low cost production systems for limited resource producers.

   Nigeria-MSU - utilization of cowpeas, especially in the diets of young children is limited by local tradition. To improve the diets of children through the use of cowpeas as a protein source, it will be important to understand the true relationship of cowpeas to perceived dietary problems.

2. Benefits to U.S. agriculture, especially the domestic interest of agriculture in your state.

   Malawi-MSU - the diversity of germplasm in Malawi will provide a wealth of new germplasm available for potential incorporation into Michigan varieties and new understandings of genotype by environment interactions.

   Mexico-MSU - the response of bean genotypes to moisture stress and the capacity of the bean plant to fix nitrogen under stress conditions will contribute significantly to production stability if incorporated into local varieties, and may limit the expense of purchase of fertilizer nitrogen.

Dr. Pat Barnes-McConnell
May 11, 1984
Page 2

Nigeria-MSU - a study of the nutritional qualities of cowpeas will identify ways that anti-nutritional factors can be alleviated through breeding or processing.

3. Extent to which your regular domestic research programs reinforce, compliment, or otherwise relate to the goals of the CRSP.

   Domestic scientists have developed a large body of knowledge relative to the inheritance of economic traits in dry beans, to physiological and developmental properties that relate to adaptation, disease resistance, quality and yield, biological nitrogen fixation, and interaction between bean genotypes and their environment. Through the CRSP, these principles can be extended to and tested under diverse circumstances and applied as appropriate to new variety development situations. In cowpea utilization, the methodologies of breath hydrogen analysis are immediately available for dietary analyses in child nutrition.

4. Impact or influence of CRSP existence on your regular on-going domestic research program.

   Scientists working in diverse environments but with mutual interests greatly influence domestic research by providing a much broader data base, new genetic resources, and a greater range of opportunity for resource evaluation. In the case of anti-nutritional factors, it is helpful to be able to evaluate these under conditions of high individual levels of product consumption. A particularly important element is the sharing of information, experiences, and germplasm among a community of dedicated researchers.

5. Impact or influence of CRSP existence on your regular on-going international research programs.

   Benefits to on-going international programs include the linkages that result between U.S. and host country scientists, the training of investigators (especially young scientists) for effective program development in international settings, and an awareness of problems encountered by host country researchers.

Work under the auspices of this CRSP has been a valuable and stimulating institutional experience. It is important that this work continue and be allowed to mature to influence science in both the U.S. and host country settings.

Sincerely yours,

D.D. Harpstead

D.D. Harpstead, Chairman
Department of Crop & Soil Sciences

cc: Dean Anderson
Dean Isleib
Thayn Dutson

AGENCY FOR INTERNATIONAL DEVELOPMENT
AMERICAN EMBASSY
PASEO DE LA REFORMA No. 305
06500 MEXICO, D. F.

March 1, 1984

Pat Barnes-McConnell, Ph.D.
Director
Michigan State University
Bean/Cowpea CRSP Management Office
200 Center for International Programs
East Lansing, Michigan 48824

Dear Dr. Barnes-McConnell:

I am happy to respond to your letter of February 9 requesting comments with regard to the Bean/Cowpea CRSP projects. I was associated with the Bean/Cowpea CRSP in Brazil from the projects inception in that country; thus, my comments will be based on my perceptions of these projects.

1. In my opinion, the Bean/Cowpea CRSP projects in Brazil were and are highly effective mechanisms for the U.S. Government and U.S. universities to continue to have a positive influence on the direction of agricultural development in the more advanced developing countries such as Brazil, Mexico, and Colombia. The key to the success of the activities was the truly collaborative nature of the projects; i.e. the jointly planned projects were in areas of priority concern for the Brazilians and in most instances, the U.S. scientists worked as equals, not as "gringos" who dictated the terms of the research activities.

   One of the weaknesses of the project was that the lead institution sometimes went out on the street and hired scientists who were not previously associated with the university. These newly hired scientists often had problems in dealing with the administration of the lead institution. Another weakness was that some of the scientists, at least initially, did not have adequate Portuguese language training to begin working.

TELEFONO: 553-3333 EXTS. 3450/3453

2. The projects' contribution to the host countries' development can be measured in terms of the specific outputs and scientific accomplishments. Besides the useful scientific information that has come out of the projects, which will help to increase the production of beans and cowpeas in Brazil and other LDC's, the projects also benefit the U.S.institutions by expanding their capability to conduct research overseas. It is my observation that most U.S. universities do not have the experience and expertise to assist overseas development activities unless key members of the staff have participated in developmental projects such as CRSPs. I view the CRSP project as a long-term investment in the development of the expertise and scientific process for sustained attention to development problems in the LDCs.

3. I have frequently discussed the Bean/Cowpea CRSP projects with the host country government officials and can say that "without exception" the Brazilians are most pleased with the CRSP activities and would welcome increased participation in research projects with U.S. universities.

4. I do not hesitate to recommend the extension of the Bean/Cowpea CRSP projects through FY 88.

Sincerely,

Sam Taylor

Samuel Taylor
AID Representative

ST:mc
cc: P. Farley, LAC/SA

SUMMARY OF BEAN/COWPEA CRSP COSTS

Sub-Grantee: Mexico/MSU

	US CONTRIBUTION				TOTAL	TOTAL	Total
	AID Contri.	Spent in HC	Non-Federal Contri.	Total US Contri.	HC Contri.	US & HC Contri.	Spent in HC
Cumulative through Year 3 (9-30-83)	60,567	25,862	16,813	77,380	9,828	87,208	35,690
Estimated Year 4	103,724	52,228	26,710	130,434	29,180	159,614	81,408
Estimated Year 5	158,320	79,190	26,377	184,697	33,500	218,197	112,690
SUB-TOTAL INITIAL GRANT	322,611	157,280	69,900	392,511	72,508	465,019	229,788
Projected Year 6	75,170	37,590	12,527	87,697	15,900	103,597	53,490
Projected Year 7	80,385	40,195	13,397	93,782	17,000	110,782	57,195
Projected Year 8	86,015	43,010	14,335	100,350	18,200	118,550	61,210
SUB-TOTAL EXTENSION	241,570	120,795	40,259	281,829	51,100	332,929	171,895
TOTAL PROGRAM	564,181	278,075	110,159	674,340	123,608	797,948	401,683

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Bean/Cowpea Collaborative Research Support Program
Sub-Grantee: Mexico/MSU

	Act Exp Thru Year 3	Est Exp Current Year 4	Est Exp Year 5	Total Initial Grant	Projected Year 6	Projected Year 7	Projected Year 8	Total Ext Request	Total Grant & Extension
Salaries	18,740	52,215	50,480	121,435	43,130	45,780	48,645	137,555	258,990
Fringe Benefits	-0-	-0-	-0-	-0-	-0-	-0-	-0-	-0-	-0-
Equip & Fac	22,562	13,350	33,610	69,522	8,470	9,150	9,880	27,500	97,022
Dom Travel	975	3,675	5,660	10,310	2,330	2,515	2,715	7,560	17,870
Intnl Travel	1,854	6,900	10,640	19,394	4,380	4,730	5,110	14,220	33,614
Materials & Supplies	3,650	11,250	21,300	36,200	7,120	7,690	8,305	23,115	59,315
Other Direct Costs	185	7,814	23,500	31,499	4,325	4,670	5,045	14,040	45,539
Total Direct Costs	47,966	95,204	145,190	288,360	69,755	74,535	79,700	223,990	512,350
Indirect Costs	12,601	8,520	13,130	34,251	5,415	5,850	6,315	17,580	51,831
Total Costs	60,567	103,724	158,320	322,611	75,170	80,385	86,015	241,570	564,181

Equipment included in Extension Budget Request:

1. Micro-computer - $3,000
2. Printer - $1,500
3. Software - $1,000
4. Radiometer - $1,500
5. Sensor - $1,500
6. Leaf area meter - 3,000
7. Neutron soil moisture probe - $4,200
8. Infra-red thermometer - $1,300
9. Steady-state portable diffusion porometer - $6,000
10. Field Plot thresher - $2,600
11. Incubator/Refrigerator - $1,750

PROJECT REVIEW AND EXTENSION PLAN

NIGERIA • MICHIGAN STATE UNIVERSITY (Initiated November 1981) • COWPEAS
Markakis

MEDICAL ASPECTS OF FEEDING COWPEAS TO CHILDREN

INTRODUCTION

Research findings have been reported from the University of Jos, the University of Ibadan and Michigan State University (MSU). Trained interviewers in Jos administered a questionnaire to 798 families having young children. According to the recollection of mothers, 103 children (13% of the total) who ate cowpeas experienced gastrointestinal symptoms. Diarrhea was the most common symptom (in 42% of the afflicted children), followed by abdominal distention (23%), gassing (15%), abdominal pain, constipation and vomiting. In Ibadan a similar questionnaire was administered to 520 families with young children. Among them, 49 children (9.4% of the total) experienced abdominal symptoms following ingestion of cowpeas. Again diarrhea was the most common complaint (69% of all cases). At MSU six Nigerian cowpea varieties were analyzed for the type of oligosaccharides that are known to cause flatulence in adults. One Nigerian student is working toward a doctoral degree at MSU under the auspices of this project.

YEARS ONE THROUGH THREE REFERENCE GUIDE

The information referred to here has been compiled in separate documents included in Sections I and III of this report.

Three-Year Progress Report

1983 Annual Report: See Section III, Technical Summary, page 109.

Research Publications and Presentations: See
Section III, Pulse Beat, Spring 1984, Insert, page 4.

Project Evaluations

1983 Annual Report: See Section III, External Review Panel Report, page 41, and Follow-Up Chart Insert.

1983 Board of Directors Extension Rating: See Section I, page 25.

YEARS ... AND FIVE

The following activities are contemplated for the final two years of the original grant.

1. The University of Ibadan survey will extend their work to cover a total of 1,000 families. The families will be interviewed regarding the association of gastro-intestinal (GI) problems with cowpea ingestion in children. The survey data collected by the Jos and Ibadan surveys will be subjected to a thorough study with the help of the computer facilities at IITA. Should this study bear out the correlation between GI symptoms and cowpea consumption originally surmised, a verification of the correlation will be attempted. Nurses or trained students will be sent to the homes which reported ill-effects in children consuming cow-peas for an independent observation of these effects.

2. At the University of Jos the following experiment will be conducted to evaluate the absorption of cowpea oligosaccharides in children by means of the breath hydrogen (BH) test.

   Part I. Ten weaned infants will serve as a study group with the consent of their parents, while ten other infants will be the control group. The diet of the control group for four days will be based on 25 ml whole milk per kg body weight per day. The study group will have the following diet:

   Day 1. Milk (25 ml/kg)
   Day 2. Milk + lactulose 125 mg/kg
   Day 3. Milk + lactulose 250 mg/kg
   Day 4. Milk + lactulose 500 mg/kg

   BH tests will be conducted on both groups. Stool frequency and consistency will be observed. Symptoms will be monitored. From Part I conclusions will be drawn regarding the gut function on a known nonabsorbable carbohydrate, lactulose.

   Part II. The same subjects will be used as in Part I. The diet of the study group will contain a cowpea preparation instead of lactulose. The proportion of the cowpea preparation in the diet will increase from Day 1 to Day 4. Again BH tests will be conducted and stools and symptoms will be monitored. Part II will indicate whether children who manifest malabsorption toward lactulose respond similarly toward cowpeas. A positive response will point to the galacto-saccharides of cowpeas as the probable malabsorbed constituents.

3. At MSU the following studies will be conducted.
   a. Raw cowpeas of Nigerian origin as well as cowpeas cooked in traditional Nigerian ways (boiled, moin-moin, akara, etc) will be analyzed for oligosaccharides, trypsin inhibitors, hemagglutinins and minerals.
   b. Breath hydrogen measurements will be made in human adults in order to evaluate the absorption of cowpea oligosaccharides both as pure compounds and as constituents of cowpea preparations.
   c. An effort will be made to construct an apparatus for measuring hydrogen production in rats. If this arrangement can be shown to be sensitive to small differences in non-absorbable carbohydrate, it may be used for screening a large number of cowpea products.

EXTENSION YEARS SIX THROUGH EIGHT

No definite plans for those years can be drawn at this time chiefly because the feedback from the Ibadan and Jos teams' years four and five work is not available. The data generated will be reviewed carefully by the teams and next steps will be designed based on that information.

HC PI from Ibadan, Dr. Omolulu, has stepped down and asked to be replaced by Dr. Hussain who appears to have more time to give to the project. This change should cause no problems as Dr. Hussain has been a long-time participant in the project.

LOG FRAME MATRIX

Project Title: Nigeria/Michigan State University

NARRATIVE SUMMARY	OBJECTIVELY VERIFIABLE INDICATORS	MEANS OF VERIFICATION	IMPORTANT ASSUMPTIONS
Program or Sector Goal: Identify & remove the factors in cowpeas that cause gast. intestinal (GI) problems in young children.	Measure of Goal Achievement: Young children will be able to eat cowpeas without suffering (GI) problems.	Surveys will be conducted with families reporting GI problems in children consuming cowpeas. After problem agents are identified & new procedures developed to eliminate the problems, controlled studies will be conducted with the same families to determine that the problem has been eliminated.	Cowpeas will continue to be an important food source in the diets of Nigerians. Government officials & administrators at MSU, Ibadan, & Jos will continue to provide project support; institutions & personnel will remain stable & committed to project; families in Nigeria will accept new processing methods.
Project Purpose: 1. Verify the alleged relationship between cowpea consumption & ill effects in children. 2. Isolate the agent(s) causing the GI problems. 3. Develop new procedures that will eliminate or neutralize the agent(s) causing the problems.	Conditions that will indicate project purpose has been achieved: Young children can consume cowpeas without suffering GI problems.	Results obtained from interviews with mothers of children reporting GI problems; data obtained from hospital records.	Effective cooperation between medical personnel & families reporting problems; necessary & timely funding for equipment required to test and analyze research data.
Project Outputs: 1. Verification that cowpeas cause GI problems in young children. 2. Identification of the agent(s) causing the GI problems. 3. Develop new procedures for preparation of cowpea foods to eliminate GI problems.	Magnitude of Outputs: 1. GI problems in young children documented. 2. Food preparation procedures devised to eliminate GI problems.	Data from family surveys; nurse observations in homes; hospital records; medical school controlled studies.	Families will cooperate in interviews & in-home nurse visitations; hospital & laboratory staff will have adequate time & facilities to conduct tests; new procedures for food processing will be disseminated & available to general populace in Nigeria.
Project Inputs: MSU--PI, Co-PI, 2 consultants & appropriate secretarial staff providing consultation & chemical/biochemical studies of cowpeas. Univ of Jos--PI, Co-PI, & support staff & physical facilities. Univ of Ibadan--PI, 2 Co-PIs & support staff & physical facilities (hospitals, labs, homes).	Implementation Target: Personnel $234,000 Equipment 105,000 Travel 118,000 Materials & Supplies 32,000 Other Direct Costs 15,000 Indirect Costs 58,000 Total 562,000	Annual project reports, trip reports, budget analyses.	Sufficient funding to support project activities will continue; staff will remain committed to project goals; personnel changes will be minimal.

MICHIGAN STATE UNIVERSITY

DEPARTMENT OF CROP AND SOIL SCIENCES
SOIL SCIENCE BUILDING

EAST LANSING · MICHIGAN · 48824

May 11, 1984

Dr. Pat Barnes-McConnell
Bean/Cowpea CRSP
200 Center for International Programs
Michigan State University
East Lansing, Michigan 48824

Dear Pat,

I am pleased to respond to the questions directed toward the understanding of the significance of the Bean/Cowpea projects for which Michigan State University has principal investigator responsibilities.

1. Benefits to host country agriculture.

    Malawi-MSU - an exceedingly wide range of genetic diversity exists in the bean production fields in Malawi. The individual bean types or land-races are selected by producers for special uses or maintained for production alone or in mixtures of types.

    Production stability with minimal technological inputs may be a major benefit of growing mixtures. In addition, the project is evaluating germplasm for several characteristics of economic value, which will form the basis of a varietal development and/or seed production program at the national level.

    Mexico-MSU - the project screens Mexican and exotic germplasm for both drought tolerance and N-fixation capability under Mexican conditions. The capacity of varieties to produce acceptable yields under conditions of moisture stress and to maintain a high level of nitrogen fixation is important to low cost production systems for limited resource producers.

    Nigeria-MSU - utilization of cowpeas, especially in the diets of young children is limited by local tradition. To improve the diets of children through the use of cowpeas as a protein source, it will be important to understand the true relationship of cowpeas to perceived dietary problems.

2. Benefits to U.S. agriculture, especially the domestic interest of agriculture in your state.

    Malawi-MSU - the diversity of germplasm in Malawi will provide a wealth of new germplasm available for potential incorporation into Michigan varieties and new understandings of genotype by environment interactions.

    Mexico-MSU - the response of bean genotypes to moisture stress and the capacity of the bean plant to fix nitrogen under stress conditions will contribute significantly to production stability if incorporated into local varieties, and may limit the expense of purchase of fertilizer nitrogen.

Nigeria-MSU - a study of the nutritional qualities of cowpeas will identify ways that anti-nutritional factors can be alleviated through breeding or processing.

3. Extent to which your regular domestic research programs reinforce, compliment, or otherwise relate to the goals of the CRSP.

   Domestic scientists have developed a large body of knowledge relative to the inheritance of economic traits in dry beans, to physiological and developmental properties that relate to adaptation, disease resistance, quality and yield, biological nitrogen fixation, and interaction between bean genotypes and their environment. Through the CRSP, these principles can be extended to and tested under diverse circumstances and applied as appropriate to new variety development situations. In cowpea utilization, the methodologies of breath hydrogen analysis are immediately available for dietary analyses in child nutrition.

4. Impact or influence of CRSP existence on your regular on-going domestic research program.

   Scientists working in diverse environments but with mutual interests greatly influence domestic research by providing a much broader data base, new genetic resources, and a greater range of opportunity for resource evaluation. In the case of anti-nutritional factors, it is helpful to be able to evaluate these under conditions of high individual levels of product consumption. A particularly important element is the sharing of information, experiences, and germplasm among a community of dedicated researchers.

5. Impact or influence of CRSP existence on your regular on-going international research programs.

   Benefits to on-going international programs include the linkages that result between U.S. and host country scientists, the training of investigators (especially young scientists) for effective program development in international settings, and an awareness of problems encountered by host country researchers.

Work under the auspices of this CRSP has been a valuable and stimulating institutional experience. It is important that this work continue and be allowed to mature to influence science in both the U.S. and host country settings.

Sincerely yours,

D.D. Harpstead

D.D. Harpstead, Chairman
Department of Crop & Soil Sciences

cc: Dean Anderson
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AAO:EKMACMANUS
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INFO AMEMBASSY ABIDJAN

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ATTENTION S&T/AG

E.O. 12356: N/A
SUBJECT: AGRICULTURE - BEAN/COWPEA CRSP

1. UNDERSTAND YOU WILL SOON BE CONSIDERING A THREE YEAR EXTENSION OF SUBJECT CRSP.

2. AS YOU KNOW, NO BILATERAL FUNDS ARE AVAILABLE AT THIS TIME IN NIGERIA. YET, NIGERIA HAS VERY REAL NEEDS FOR TECHNICAL ASSISTANCE PARTICULARLY IN AGRICULTURE. THUS, CENTRALLY FUNDED PROJECTS SUCH AS THIS CRSP ARE OF UTMOST IMPORTANCE AND ARE GREATLY APPRECIATED BY THE GOVERNMENT.

3. THE IMPORTANCE OF BEANS/COWPEAS TO THE NIGERIA DIET CANNOT BE OVERSTATED. AS POPULATION CONTINUES TO INCREASE AND IMPORTATION OF FOOD PRODUCTS IS RESTRICTED BY FOREIGN EXCHANGE LIMITATIONS, THE DEPENDENCE ON BEANS/COWPEAS CAN ONLY INCREASE.

4. WE URGE EXTENTION OF THE CRSP AND CONTINUATION OF EFFORTS IN NIGERIA, HOMELAND OF ONE IN EVERY FIVE AFRICANS.
SMITH##

SUMMARY OF BEAN/COWPEA CRSP COSTS

Sub-Grantee: Nigeria/MSU

	US CONTRIBUTION				TOTAL	TOTAL	Total
	AID Contri.	Spent in HC	Non-Federal Contri.	Total US Contri.	HC Contri.	US & HC Contri.	Spent in HC
Cumulative through Year 3 (9-30-83)	85,363	33,848	16,310	101,673	13,877	115,550	47,725
Estimated Year 4	116,155	80,190	12,000	128,155	32,075	160,230	112,265
Estimated Year 5	177,480	150,380	22,800	200,800	60,150	260,430	210,530
SUB-TOTAL INITIAL GRANT	378,998	264,418	51,110	430,108	106,102	536,210	370,520
Projected Year 6	56,465	34,705	7,254	63,719	13,880	77,599	48,585
Projected Year 7	60,985	37,485	7,835	68,820	15,000	83,820	52,485
Projected Year 8	65,865	40,480	8,462	74,327	16,200	90,527	56,680
SUB-TOTAL EXTENSION	183,315	112,670	30,805	214,120	45,080	259,200	157,750
TOTAL PROGRAM	562,313	377,088	81,915	644,228	151,182	795,410	528,270

6062B

Bean/Cowpea Collaborative Research Support Program
Sub-Grantee: Nigeria/MSU

	Act Exp Thru Year 3	Est Exp Current Year 4	Est Exp Year 5	Total Initial Grant	Projected Year 6	Projected Year 7	Projected Year 8	Total Ext Request	Total Grant & Extension
Salaries	18,877	53,400	49,300	121,577	35,180	37,275	39,540	111,995	233,572
Fringe Benefits	860	-0-	-0-	860	-0-	-0-	-0-	-0-	860
Equip & Fac	14,053	23,715	56,550	94,318	2,630	3,560	4,565	10,755	105,073
Dom Travel	1,459	4,500	6,900	12,859	2,195	2,370	2,560	7,125	19,984
Intnl Travel	23,390	18,000	27,700	69,090	8,810	9,515	10,275	28,600	97,690
Materials & Supplies	5,010	6,750	10,000	21,760	3,180	3,435	3,710	10,325	32,085
Other Direct Costs	334	1,000	13,480	14,814	150	165	175	490	15,304
Total Direct Costs	63,983	107,365	163,930	335,278	52,145	56,320	60,825	169,290	504,568
Indirect Costs	21,380	8,780	13,550	43,720	4,320	4,665	5,040	14,025	57,745
Total Costs	85,363	116,155	177,480	378,998	56,465	60,985	65,865	183,315	562,313

Equipment included in Extension Budget Request:
- Data Module for High Pressure Liquid Chromatograph
- Microprocessor for Atomic Absorption Spectrophotometer

PROJECT REVIEW AND EXTENSION PLAN

NIGERIA • UNIVERSITY OF GEORGIA (Initiated April 1981) • COWPEAS
McWatters

APPROPRIATE TECHNOLOGY FOR COWPEA PRESERVATION AND PROCESSING AND A STUDY OF ITS SOCIO-ECONOMIC IMPACT ON RURAL POPULATIONS IN NIGERIA

INTRODUCTION

Wet and dry cowpea decortication techniques and a method to quantitate the extent of testa removal were devised. Pre-treating peas (wet/dry) improved mechanical decortication efficiency. Raw cowpeas exhibited high protein quality compared to other legumes; processing improved the quality further. Milling conditions which produced cowpea meal with similar particle size distribution to traditional cowpea paste were established. The addition of 60% water to 11%-moisture meal produced paste with flow properties and akara with physical-sensory characteristics similar to traditional products. Extrusion produced precooked cowpea flours with higher viscosity, greater pseudoplasticity, greater solubility and lower water binding than steaming-drum drying. Survival of fungi on cowpeas stored under various atmospheric gas conditions, temperatures and times was determined. Death of cells was enhanced at 37°C compared to 4° and 21°C and under air or vacuum compared to an atmosphere of nitrogen. Weevil infestation was less and sensory quality better in palm oil-coated, stored peas than those treated with peanut or corn oils. Sorption isotherm data were obtained for whole seeds and flour. An electronic device to monitor cooking time of seeds was developed. Sociocultural survey results were compiled. Implementing processing/preservation technologies should promote resourceful utilization of cowpeas by consumers. Two female students received MS degrees from the University of Georgia in December 1983, and in January 1984 one male Nigerian student began PhD course work at the same university.

YEARS ONE THROUGH THREE REFERENCE GUIDE

The information referred to here has been compiled in separate documents included in Sections I and III of this report.

Three-Year Progress Report

1983 Annual Report: See Section III, Technical Summary, page 112.

Research Publications and Presentations: See
Section III, Pulse Beat, Spring 1984, Insert, page 4.
Section III, Research Highlights Vol. 1, No. 4, 1984.

Project Evaluations

1983 Annual Report: See Section III, External Review Panel Report, page 43, and Follow-Up Chart Insert.

1983 Board of Directors Extension Rating: See Section I, page 25.

YEARS FOUR AND FIVE

The development of appropriate technologies and products to promote the resourceful utilization of cowpeas by Nigerian consumers remains as the primary focus of present and future project activities. The principal investigator, US institution and personnel, and Host Country institution and personnel are essentially unchanged from those identified in the original project proposal.

1. University of Nigeria
   a. Complete analysis of socio-cultural and socio-economic survey data and in conjunction with the nutritional survey data construct a clearer picture of the role and importance of the cowpea in the nutritional, social, economic and cultural patterns of the communities involved. Both survey instruments which have already been used in the Nsukka area will now be applied in a comparative study of Onitsha-urban area to widen the scope of analysis.
   b. With the expected installation of the Instron Universal tester and viscometric instruments, great emphasis will be placed on advancing the course of generation of physico-chemical data and on the related sensory attributes of cowpea, cowpea flour and cowpea-based foods.
   c. A complete package of cowpea flour manufacturing technology in prototype will be assembled to include the following unit operations: (i) pre-hulling; (ii) mechanical husking; (iii) cleaning/separation to obtain clean, dehulled grain cowpeas; (iv) flour milling; and (v) flour packaging. This prototype shall be operated and evaluated technically and economically as a basis for transferring the technology to a rural industry.

2. University of Georgia
   a. Optimal methodology to reduce the oligosaccharide content of cowpeas will be developed and integrated into an overall procedure for producing ready-to-use flour. This work was suggested and will be carried out by Mr. Ifendu Nnanna, a Nigerian doctoral student in the Department of Food Science at the University of Georgia.

      Recent studies both at UGA (Hudda, 1983) and at the Host Country institution (Ngoddy, 1983) have demonstrated the advantages of pretreating cowpeas prior to decortication. Pretreating consists of soaking the seeds followed by either decorticating the wet seeds or by rapid drying, then dry decortication. Others (Kim et al., 1973) have shown that soaking soybeans in pH 2.5 or pH 8.0 buffer for 15 hrs removed about 1/2 of the stachyose and raffinose present, while soaking in water followed by germination reduced the oligosaccharide content by 85%. The workers were able to stop the germination process after 24 hrs by either resoaking the seeds (anaerobic conditions) or by decorticating and degerming. Thus, undesirable changes and dry matter losses were minimized, while enzymes produced by germination continued to catalyze hydrolysis of oligosaccharides to simple sugars. Becker et al. (1974) incubated slurries of whole and pulverized California small white beans and observed extensive autolysis of a-galactosides and phytic acid. Temperature optima for these processes were established.

These observations indicate that it should be possible to achieve both a reduction in undesirable seed components and improved milling yield by a properly designed strategy.

Mr. Nnanna will begin his laboratory research in January-March, 1985. He expects to elucidate the effects of soaking (time, temperature, pH), and germination (time and temperature) followed by wet or dry decortication, drying and grinding on the yield and composition (starch, protein, oligosaccharides, phytate) of the resulting flours. Any changes in flour functionality (in terms of akara-making quality) will be correlated to these compositional shifts and to alteration in molecular properties of starches and proteins present.

b. Work will continue in the area of pre-dehulling treatments for both wet and dry processes. It will be necessary to acquire/design and fabricate a dryer for drying cowpeas in 8-10 lb batches. Drying data in terms of time, temperature, and an estimate of energy requirements will be obtained.
c. Appropriate experiments will be conducted to estimate energy requirements for various promising processes to make meal/flour from whole seeds.
d. An indepth investigation will be conducted of the rheological properties of cowpea paste with special emphasis on the effect of pre-dehulling treatments.
e. Milling and storage conditions for whole seeds and meal/flour will continue to be modified, refined, and eventually optimized throughout the course of the project. These conditions will influence the functional and nutritional quality of cowpea products and will be monitored on a continuing basis. Milling procedures and storage conditions will also influence the rates of death and growth of microorganisms found as natural contaminants on cowpeas; therefore, continual monitoring of the interacting effects of moisture, temperature, and time on microbiological quality of whole seeds and milled products will be made.

EXTENSION YEARS SIX THROUGH EIGHT

A village-scale processing plant will be installed in one or two rural locations in Nigeria for demonstration purposes. The impact of demonstration projects and cowpea products on the communities linked to them will be monitored using survey instruments (both nutritional and socio-cultural/economic). Support services in training, quality assessment, and product development will be provided to assist the diffusion process. Adoption of cowpea processing technology for the processing of other tropical grain legumes will be examined.

The scope of the project may also be broadened during this period to encompass the investigation of wider uses of cowpea flour. The first phase could be studies leading to the successful incorporation of cowpea flour into Nigerian wheat bread formulations. Previous work at UGA (McWatters, 1978; 1980; 1982a; 1982b) and elsewhere (Okaka and Potter, 1977) has investigated the substitution of cowpea flour in baked goods. The Host Country institution has personnel with expertise in baking and pilot-to-commercial scale baking equipment and is ideally suited to pursue such work.

Another phase would feature efforts to incorporate cowpea flour into novel extruded foods, alone or in combination with cereal flours. Small-scale extrusion of cowpea meal to produce prototype foods (Kennedy, 1982) with a wide range of textures has been demonstrated at UGA, as has extrusion of sorghum-cowpea-peanut blends to snack-like products (Falcone, 1983).

Further studies are needed to identify acceptable cowpea-based extruded foods, and to investigate their production on pilot-to-small commercial scale equipment. There is interest and engineering expertise (Ngoddy, 1983) in the Host Country to proceed in this direction. The ultimate accomplishment of such research might be to reduce the need for imported grains in Nigeria by demonstrating the incorporation of native grains and legumes (e.g., sorghum and cowpeas) into prototype snacks and even breads.

Log Frame Matrix - Nigeria/University of Georgia/McWatters
August 6, 1982

Narrative Summary	Objectively Verifiable Indicators	Means of Verification	Important Assumptions
Program or Sector Goal: Develop appropriate technology to increase the efficiency of processing and encourage increased utilization of cowpeas among Nigeria's rural population and urban poor.	Measures of Goal Achievements: Successful development of practically feasible techniques to: (a) process cowpeas to produce shelf-stable cowpea meal/ flour for utilization in traditional Nigerian dishes, and (b) store cowpeas prior to and after processing.	Interviews with consumers, comparison of data of cowpeas stored with and without treatment to prevent insect infestation and microbial spoilage, comparison of data of cowpeas processed by traditional and new methods.	Assumptions for Achieving Goal Targets: The need for cowpeas as an important food source in the diets of Nigerians continues to exist; Work will progress as planned without undue hinderance and delay by administrators at UGA, MO OR USAID.
Project Purpose: (a) Identify cowpea usage patterns and social and technical factors which prevent efficient utilization of cowpeas. (b) Develop appropriate technologies and products to promote resourceful utilization of cowpeas. (c) Train host country and U.S. graduate students in food science.	Conditions that will indicate purpose has been achieved: All the items identified in the Output category are completed.	Results obtained from interviews with consumers and small-scale producers of cowpeas; records of data obtained from storage, processing, functionality, and nutritional studies; completion of training programs by host country and U.S. graduate students.	Assumptions for Achieving Purpose: (a) Effective cooperation between administrative and research personnel at each institution and between collaborating institutions will continue. (b) Necessary and timely funding, equipment, supplies, facilities, and personnel will be available for project activities. (c) Students will fulfill requirements of training program.

Narrative Summary	Objectively Verifiable Indicators	Means of Verification	Important Assumptions
Outputs: (a) Identification of cowpea usage patterns and constraints which limit cowpea utilization. (b) Development of treatments to prevent insect infestation and microbial spoilage in field-dried, shelled cowpeas during storage. (c) Development of processes to produce a convenient, shelf-stable, functional, and nutritious cowpea product (meal/flour) and optimization of process conditions. (d) Training of host country and U.S. graduate students.	Magnitude of Outputs: (a) Cowpea usage patterns and utilization constraints identified. (b) Treatments to reduce storage losses devised. (c) Process to produce a convenient, ready-to-use cowpea product devised. (d) Host country and U.S. students trained in food science.	(a) Data from survey. (b) Data from storage, processing, functionality, and nutritional studies. (c) Publications and oral presentations. (d) Degree requirements fulfilled.	Output Assumptions: (a) Cooperation of all personnel responsible for timely development of the survey instrument and completion of the survey. (b) Full support from MO and USAID in speedy approval of project-related activities such as equipment purchase requests and travel requests. (c) Acquisition of Nigerian cowpea cultivars for research activities at UGA. (d) Availability of qualified host country and U.S. graduate students for training. (e) Improved communication between U.S. and host country institutions.
Inputs: Univ. of Georgia Principal Investigator, Co-Investigators (4), technical and secretarial support, laboratory equipment and supplies, pilot plant facilities, UGA administration support, graduate student candidates. Univ. of Nigeria Principal Investigator, Co-Investigators (7), technical and secretarial support, materials and supplies, graduate student candidates. MO and USAID Funding a[redacted]project operational su[redacted]rt.	Examination of project roster to determine continued involvement of personnel; examination of annual reports to evaluate availability of equipment, facilities, and and other resources to the project.	Annual project reports, trip reports, and budget analyses	Input Assumptions: (a) Sufficient funding to support project activities will continue. (b) Support by U.S. and host country institution administrations will continue. (c) Commitment to project objectives by U.S. and host country personnel will continue. (d) Host country and U.S. graduate student candidates will be available for project involvement. (e) Project management is efficient and not unduly burdensome fo[redacted]searchers.

The University of Georgia College of Agriculture
Experiment Stations • Georgia Station
EXPERIMENT, GEORGIA 30212
404 228-7263
OFFICE OF THE RESIDENT DIRECTOR

May 4, 1984

Bean/Cowpea CRSP Management Office
200 Center for International Programs
Michigan State University
East Lansing, Michigan 48824

Attention Management Office:

I sincerely apologize for the delay in responding to the questions which you sent to me. I hope that these responses will be of assistance to you in the preparation for the Bean/Cowpea CRSP extension review.

1. Benefits to host country agriculture. I can see several benefits. One is that it is an opportunity for host country scientists to work collaboratively with scientists in this country, gain exposure to current techniques and research technologies, and have access to sophisticated equipment and supplies which might be difficult for host country scientists to obtain without a CRSP. Host country scientists also have an opportunity to obtain germplasm from improved cultivars developed in this country. The collaborative effort also enhances the confidence of the host country in themselves to accomplish scientific efforts. Beans and cowpeas are often produced in mixed cropping systems. Bean and cowpea yields are quite low so that if these yields can be increased particularly cultivars that will still retain leaves to be used as fodder as well as increasing the yield of the plant would provide a tremendous advantage to the small farmer. Also, pest control in storage would be almost as beneficial as pest control under field conditions.

2. What do you see as the benefits to the U. S. agriculture particularly domestic interests of agriculture in our State? There are several benefits. One is that the cowpea is indigenous to Africa and Africian cultivars may be identified which can provide germplasm for incorporating pest resistance and/or tolerance into varieties presently grown in the United States. The CRSP broadens the prospective of U. S. scientists into what is happening in other parts of the world and may expose them to problems that do not yet exist in the United States. If and when they do become present in the United States, they will know how to deal with the situation.

3. To what extent do our regular domestic research programs reinforce, complement, or otherwise relate to the goals of the CRSP? I think that scientists with mutual interests, when they become better

acquainted with each other, cannot help but be advantageous to our country as well as the developing world by broadening the base for sharing questions and information to strengthen research efforts.

4. Much of the information that is stated above discusses the impact or influence of a CRSP on the regular ongoing domestic research program.

5. The impact or influence of the CRSP on regular ongoing international programs. I think it's too early to tell what the full impact will be of the CRSP existence upon regular ongoing international research programs. I think it is still not fully understood by AID people what the real potentials and impacts can be upon research. I think that collaborative research activities are far better than having our researchers go to the country, do the research, and leave. CRSP is providing the opportunity for the development of a trained cadry of host country scientific researchers so that research activities will continue after the departure of the U. S. scientists. I think that the collaborative relationship developing between scientists provides opportunities for host country scientists to be in touch with our people for sharing knowledge, questions, and support.

I hope these responses will meet your needs.

Sincerely,

Charles W. Laughlin
Associate Director

CWL:bzr

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AID 3/19/84
AAO:EKMACMANUS
AAO:~~EKMACMANUS~~
1. ECON:EWSHELTON, 2. AGR:CGOLDTHWAIT
AID-2 AMB DCM, ECON CHRON

EKM Km
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AMEMBASSY LAGOS
SECSTATE WASHDC, PRIORITY
INFO AMEMBASSY ABIDJAN

AIDAC

ATTENTION S&T/AG

E.O. 12356: N/A
SUBJECT: AGRICULTURE - BEAN/COWPEA CRSP

1. UNDERSTAND YOU WILL SOON BE CONSIDERING A THREE YEAR EXTENSION OF SUBJECT CRSP.

2. AS YOU KNOW, NO BILATERAL FUNDS ARE AVAILABLE AT THIS TIME IN NIGERIA. YET, NIGERIA HAS VERY REAL NEEDS FOR TECHNICAL ASSISTANCE PARTICULARLY IN AGRICULTURE. THUS, CENTRALLY FUNDED PROJECTS SUCH AS THIS CRSP ARE OF UTMOST IMPORTANCE AND ARE GREATLY APPRECIATED BY THE GOVERNMENT.

3. THE IMPORTANCE OF BEANS/COWPEAS TO THE NIGERIA DIET CANNOT BE OVERSTATED. AS POPULATION CONTINUES TO INCREASE AND IMPORTATION OF FOOD PRODUCTS IS RESTRICTED BY FOREIGN EXCHANGE LIMITATIONS, THE DEPENDENCE ON BEANS/COWPEAS CAN ONLY INCREASE.

4. WE URGE EXTENTION OF THE CRSP AND CONTINUATION OF EFFORTS IN NIGERIA, HOMELAND OF ONE IN EVERY FIVE AFRICANS.
SMITH##

SUMMARY OF BEAN/COWPEA CRSP COSTS

Sub-Grantee: Nigeria/UGA

	US CONTRIBUTION				TOTAL	TOTAL	Total
	AID Contri.	Spent in HC	Non-Federal Contri.	Total US Contri.	HC Contri.	US & HC Contri.	Spent in HC
Cumulative through Year 3 (9-30-83)	183,939	88,220	48,484	232,423	98,806	331,229	187,026
Estimated Year 4	155,370	70,421	58,418	213,788	76,600	290,388	147,021
Estimated Year 5	237,910	113,020	41,630	279,540	108,000	387,540	221,020
SUB-TOTAL INITIAL GRANT	577,219	271,661	148,532	725,751	283,406	1,009,157	555,067
Projected Year 6	105,930	47,715	19,405	125,335	45,600	170,935	93,315
Projected Year 7	120,005	54,338	21,889	141,894	51,700	193,594	106,038
Projected Year 8	135,205	61,485	24,574	159,779	58,000	217,779	119,485
SUB-TOTAL EXTENSION	361,140	163,538	65,868	427,008	200,900	627,908	364,438
TOTAL PROGRAM	938,359	435,199	214,400	1,152,759	484,306	1,637,065	919,505

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Bean/Cowpea Collaborative Research Support Program
Sub-Grantee: Nigeria/UGA

	Act Exp Thru Year 3	Est Exp Current Year 4	Est Exp Year 5	Total Initial Grant	Projected Year 6	Projected Year 7	Projected Year 8	Total Ext Request	Total Grant & Extension
Salaries	21,532	21,254	22,600	65,386	24,110	26,040	28,125	78,275	143,661
Fringe Benefits	-0-	881	1,410	2,291	1,045	1,130	1,220	3,395	5,686
Equip & Fac	75,771	81,389	95,000	252,160	12,855	17,885	23,315	54,055	306,215
Dom Travel	14,467	9,425	14,500	38,392	10,720	11,580	12,505	34,805	73,197
Intnl Travel	13,469	8,808	13,500	35,777	9,985	10,785	11,645	32,415	68,192
Materials & Supplies	40,164	20,356	51,300	111,820	27,935	30,970	34,250	93,155	204,975
Other Direct Costs	1,976	4,523	25,400	31,899	8,780	10,285	11,910	30,975	62,874
Total Direct Costs	167,379	146,636	223,710	537,725	95,430	108,675	122,970	327,075	864,800
Indirect Costs	16,560	8,734	14,200	39,494	10,500	11,330	12,235	34,065	73,559
Total Costs	183,939	155,370	237,910	577,219	105,930	120,005	135,205	361,140	938,359

Equipment included in Extension Budget Request:
1. Differential Scanning Calorimeter - $25,000
2. Personal Computer with Graphic, Data Acq. & Control Capability - $15,000
3. Programmable Sequencer - $3,000
4. Fiber-Tec Dietary Fiber Analyzer - $10,000

6026B

PROJECT REVIEW AND EXTENSION PLAN

SENEGAL • UNIVERSITY OF CALIFORNIA, RIVERSIDE (Initiated August 1981) • COWPEAS
Hall

A PROGRAM TO DEVELOP IMPROVED COWPEA CULTIVARS FOR PRODUCTION AND UTILIZATION IN SEMIARID ZONES

INTRODUCTION

Droughts during 1982 and 1983 caused farmers in the semiarid zone of Senegal to rely more heavily on cowpeas for security because cowpeas provided food when other crops failed. Recently, the Senegal Government gave higher priority to cowpea research. This project has contributed to training the national cowpea research team which has six scientists in Senegal. The breeder obtained an MS degree at the University of California, Davis. Another trainee is studying at the University of California, Riverside. The project is providing the national team with the materials and information for conducting an effective cowpea research program. Extremely early cowpea strains were developed which have produced high yields in extremely dry years in Senegal. Cowpea genotypes are being screened for adaptation to drought. High temperatures were identified as a production constraint. Heat tolerance has been discovered in certain strains and is being incorporated into cowpeas from Senegal. Rapid progress is being made toward the development of complete improved systems of cowpea production and storage for the major cowpea production area in Senegal. Cooperative linkages were established with IITA, SAFGRAD (Upper Volta), and WSARP (Sudan) to extend the outputs of this project to other regions.

YEARS ONE THROUGH THREE REFERENCE GUIDE

The information referred to here has been compiled in separate documents included in Sections I and III of this report.

Three-Year Progress Report

1983 Annual Report: See Section III, Technical Summary, page 120.

Research Publications and Presentations: See
Section III, Pulse Beat, Spring 1984, Insert, page 4.
Section III, Research Highlights Vol. 1, No. 1, 1984.

Project Evaluations

1983 Annual Report: See Section III, External Review Panel Report, page 45, and Follow-Up Chart Insert.

1983 Board of Directors Extension Rating: See Section I, page 25.

YEARS FOUR AND FIVE

The following activities are planned for the final years of the original grant and are presented by site of anticipated work.

Activities in Senegal

1. Increased emphasis on on-farm research including: testing of early cowpea strains selected by ISRA from UCR materials for their performance and acceptability under farm conditions; testing the sealed-drum method of cowpea storage; and testing a biological control method for hairy caterpillar.

2. Synthesis of available base-line data and collection of base-line data on cowpea storage methods and marketing.

3. Plant breeding and varietal testing--initiating the cowpea breeding program in Senegal including collecting and testing local cowpeas and evaluating heat-tolerant materials from UCR. Planning and conducting an improved varietal testing program in Senegal. The Breeder (N. Cisse) will visit IITA, Ibadan to discuss breeding and varietal testing, and UCR to attend the planning meetings and select genotypes from the UCR and UCD programs and learn how to use a computer system, which will be purchased for ISRA later in the year.

4. Rhizobiology--screen cowpeas for BNF using acetylene reduction, to Provide advice to the breeder concerning choice of parental materials. Develop an improved screening method for BNF based upon either acetylene reduction or ureide measurements in cooperation with scientists at UCR.

5. Plant Physiology and Agronomy--screen cowpeas for drought tolerance using the germination test developed by ISRA, evaluate the extent of flower abscission in Senegal by the heat tolerant cowpeas from UCR, and initiate field experiments to develop economic and practical fertilizer recommendations for cowpeas in Senegal.

6. Bioclimatology and Cropping Systems--evaluate experiments on cropping systems during the first three years and use hydrologic balance models to predict probable success of different cowpea cropping systems including a varietal intercrop (early erect varieties alternating in rows with prostrate later varieties).

7. Entomology--give emphasis to developing practical methods for controlling hairy caterpillar in the major cowpea production zone in the drier areas. Continue longer term research to develop practical methods for controlling flower thrips in the wetter production areas based upon the use of insect-resistant varieties and minimal sprays with pyrethroids.

Activities at UCR

1. Evaluate the extent to which high temperatures are a problem in cowpea production areas and predict the improvement in yield that could be obtained with heat-tolerant varieties.

2. Subject the heat-tolerant genotypes that have been developed to preliminary yield tests in California.

3. Continue developing the specific types of heat-tolerant cowpeas needed in Senegal.

4. Test a greenhouse system for screening photoperiod-sensitive cowpeas for tolerance to heat at flowering.

5. Continue to evaluate inheritance of earliness in cowpeas and effects of photoperiod and temperature on earliness.

6. Continue screening for cowpeas with improved rooting.

7. Complete evaluations of the nitrogen nutrition of cowpeas.

8. Conduct a B.S. training program for ISRA trainee S. Thiaw and try to develop a training program for Ms. K. Diop.

Activities at UCD

1. Evaluate cowpea genotypes collected in Senegal under California conditions.

2. Cowpeas with different canopy characteristics have been developed. The performance of these cowpeas will be evaluated at different plant densities and the inheritance of canopy characteristics will be determined. The objective is to develop the germplasm and information on inheritance and performance which will facilitate the development of varieties and management methods that result in increased yield potential.

Most of the activities described will continue during the fifth year but with increased emphasis on on-farm tests and cropping systems. Some of these activities will approach completion by the end of the fourth year. It is anticipated that experiment station testing of the early UCR cowpeas in Senegal will have been completed and that some of these varieties will have begun to be adopted by farmers. It is also hoped that improved storage methods and methods for controlling hairy caterpillar will also have begun to be adopted by farmers.

Preliminary yield tests of heat-tolerant cowpeas should begin in Senegal in the fifth year. Expansion of on-farm tests of practical fertilizer applications and cropping systems is anticipated.

Training programs for S. Thiaw and Ms. K. Diop in the US will only be in their initial phase at this time because ISRA would like them to obtain both B.S. and M.S. degrees.

EXTENSION YEARS SIX THROUGH EIGHT

Three main directions are proposed for this project for subsequent years.

1. Maintain Senegal/UC cooperation in research and training.

2. Expand UC/Senegal cooperation with IITA in research and training.

3. Initiate cooperative programs of research and training with cowpea projects in other developing countries such as the Sudan.

Maintaining Senegal/UC Cooperation is necessary in training because two ISRA trainees will be in the middle of their educational programs in the US, and because of the need to train more ISRA staff as present members of the ISRA cowpea team become promoted to higher level administrative duties.

Maintaining the supply of operational funds and equipment to ISRA is highly desirable and under the guidance and advice of the UC cooperators. Emphasis should also be given to increased research activities and training in on-farm research and on farming systems in relation to improving the production and utilization of cowpeas in Senegal. The major pay-offs for the first five years' activities will come in years six to eight.

Expanding UC/Senegal Cooperation with IITA is crucial for extending the products of the UC/Senegal project to other developing countries because of the mutual assistance possible between the CRSP and IITA.

Scientists from ISRA and UC have held extensive discussions with scientists from IITA which indicate the following possibilities for expanded cooperation. ISRA has recommended that certain early cowpea varieties from UCR should be included in the SAFGRAD/IITA trials which are conducted in many African countries. These materials may even be included in the 1984 SAFGRAD/IITA trials.

UCR has begun screening IITA cowpea strains for rooting characteristics, tolerance to high temperatures and sensitivity to photoperiod. Due to present financial limitations only few of the IITA strains have been screened; it would be beneficial to IITA to considerably expand this activity.

In addition, cowpeas developed for California will probably be extremely useful in the cowpea production areas of the world with low to moderate night temperatures and they could be provided by UCR to IITA regional programs in these areas. Also heat-tolerant cowpeas can be developed for the IITA regional programs in areas with high night temperature such as West Africa. It is likely that some of the CRSP materials being developed for Senegal will be useful in other countries in Africa.

The insect-resistant germplasm being developed by IITA should be integrated into the ISRA and possibly the UC breeding programs, and mutually beneficial projects could be developed for training at UC and IITA.

Initiating Cooperative Programs of research and training with cowpea projects in other developing countries will assist the Bean/Cowpea CRSP as a whole. UCR is already cooperating in the training of two cowpea scientists for a USAID project in the semiarid zone of the Sudan (the Western Sudan Agricultural Research Project, WSARP), and the PI for this project has been asked to visit that project in October 1984 to evaluate UCR cowpeas and other cowpeas that are under test at this time. This will be accomplished with CRSP Technical Assistance funds.

Comments Concerning Funding Requirements

The Senegal/UCR Cowpea CRSP can be continued effectively with a modest increase in the level of annual funding and following requirements concerning 50/50 allocation of funds. However, additional funds would be needed by UC to expand the cooperation between UC and IITA, and UC and WSARP. It would be most effective if these funds could be administered through the present CRSP agreement. It is recommended that the Management Office consider allocating CRSP funds or separate USAID funds for special projects between IITA and US CRSP institutions, and possibly between US CRSP institutions and other USAID projects or developing country organizations. In order to expand CRSP activities to meet worldwide needs for research and training in cowpeas, this additional funding mechanism is needed. The major US personnel and institutions in this project will remain the same.

Project Design Summary

University of California, Riverside/Senegal

August 1982

Narrative Summary	Objectively Verifiable Indicators	Means of Verification	Important Assumptions
Section Goal: Increase seed production and yield stability of cowpeas grown in hot semiarid zones by subsistence farmers.	Measures of Goal Achievements: Average seed yield of cowpeas will increase significantly, and variation in seed yield will decrease significantly for farmers in target locations by 1990.	On-farm experiments by farmers and extension workers in several locations within semiarid zones in which new cowpea cultivars and management methods are compared with traditional cultivars and methods.	Assumptions for Achieving Goal: Governments and international organizations place more emphasis on cowpea research, extension, and marketing, and an effective international network of cowpea breeders, agronomists, and extension workers is developed.
Project Purpose: 1) Develop cowpea cultivars with improved drought and heat resistance, and management methods that result in increased seed production and yield stability in hot, semiarid zones. 2) Develop improved cowpea production systems for subsistence farmers in the semiarid zone of Senegal.	1) With improved cultivars and management methods, average seed yields will increase, and variation in yield will decrease significantly compared with local controls in experiment station trials in hot, semiarid zones by 1985. 2) Practical, improved cowpea production systems are developed by ISRA which could be usefully adopted by subsistence farmers in the semiarid zone of Senegal.	1) Cooperative cowpea yield trials in different locations with wetter and drier conditions, and with different thermal regimes within semiarid zones over 5 years. 2) On-farm evaluation of the new cowpea production systems in comparison with traditional systems by extension workers and farmers.	1) Project funding is no less than original estimates, and adequate supplemental resources and support are available at the U.S. universities. 2) ISRA develops, maintains, and provides adequate support for a complete team of cowpea research and extension workers. Effective germplasm and advice (especially with respect to solving problems due to insect pests) is provided to the team by IITA.
Outputs: 1) Screening techniques for drought and heat resistance are developed and applied. Germplasm with drought and heat resistance is discovered and successfully incorporated into advanced lines which have genetic backgrounds which are suitable for specific uses within semiarid zones. 2. Identification of appropriate cropping systems for Senegal. Development of appropriate cultivars and management methods. A cowpea breeder/agronomist is trained for the permanent staff of ISRA.	1) Advanced lines will exhibit higher average seed yields and decreased variation in yield in trials where water is limiting and temperatures are high, than presently available cultivars. 2) New cowpea production systems will be productive, stable, profitable, and attractive to subsistence farmers in Senegal. A breeder/agronomist with appropriate experience and abilities will be working full time on cowpeas for ISRA.	1) Drought resistance will be evaluated by yield trials under controlled levels of drought. Heat resistance will be evaluated by yield trials in hot environments. Resistance to both drought and heat will be evaluated in hot environments where water is limiting. 2) Productivity, stability, profitability, and practicality could be evaluated by research and extension workers conducting experiments on stations and farmers' fields. The quality of the academic program and cowpea improvement program of the cowpea breeder/agronomist could be evaluated.	1) Earliness, increased partitioning of carbohydrate to reproductive tissue, and improved rooting are key factors limiting the adaptation of cowpeas to semiarid environments, and useful genetic variation is available for these characters. Genotypes can be developed with improved tolerance to heat which are not at the same time more susceptible to damage caused by moderately low temperatures. 2) Practical solutions to problems due to insect pests can be developed for Senegal. The level of cooperation between research and extension divisions, and effectiveness of on-farm research can be enhanced.
Inputs: Key personnel of ISRA and U.S. universities are needed on a long-term basis. Excellent experiment station facilities are needed. Certain items of equipment, resources, and supplies must be available at critical times (such as sowing, etc., to harvest).	Project rosters, attendance, and numbers of cooperative meetings, extent and quality of field experimentation, and reports from project personnel.	Annual reports, budget reports, and project reviews.	CRSP, U.S., and ISRA financial contributions are sustained at least at the original planned levels. Key ISRA and U.S. personnel will be available for the duration of the project. CRSP management and USAID personnel will continue to support the projects. The weather will be reasonably predictable during the growing seasons.

UNIVERSITY OF CALIFORNIA, RIVERSIDE

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COLLEGE OF NATURAL AND AGRICULTURAL SCIENCES
OFFICE OF THE DEAN
CITRUS RESEARCH CENTER AND AGRICULTURAL EXPERIMENT STATION
OFFICE OF THE ASSOCIATE DIRECTOR

RIVERSIDE, CALIFORNIA 92521

April 2, 1984

Dr. Pat Barnes-McConnell
Bean/Cowpea CRSP Management Office
200 Center for International Programs
Michigan State University
East Lansing, Michigan 48824

Dear Dr. Barnes-McConnell:

My own evaluation is that the cowpea project at UCR and the University of California has more than adequately met the intent of Section I.A.2.a.ii. described in the Preliminary Guidelines for Triennial Review and Three-Year Extension.

1. Benefits to Host Country (Senegal) Agriculture

The UCR/ISRA collaborative cowpea project has been operational for three years. During this short period, we have helped ISRA to create a dedicated Senegalese cowpea research team and conduct research that should soon result in improved cowpea production systems for farmers in one of the toughest environments on earth for growing crops--northern Senegal.

The Senegalese team has tested cowpeas with improved adaptation to drought, developed by UCR, under extremely harsh conditions in the semiarid zone of Senegal over three extremely dry seasons. These cowpeas are early and only required 60 days from sowing to harvest in Senegal while producing excellent yields. These tests also indicated that one of the local Senegalese cowpeas has substantial yield stability, even though it requries a longer growing season. We have concluded that farmers who grow both the best UCR cowpea and the best local cowpea will have a more secure farming system. During the summer of 1984, the ISRA cowpea research team will test this idea by evaluating the performance of these cowpea varieties on farmers' fields in Senegal in cooperation with extension personnel.

75 ANNIVERSARY

Dr. Pat Barnes-McConnell
April 2, 1984
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The UCR team has also developed cowpeas that can tolerate the hot conditions of Senegal. This work began by the discovery at UCR that two cowpea strains from Africa have heat tolerance while the majority tested were sensitive to heat. The ISRA scientists chose the best Senegalese cowpeas for use as parents. Scientists at UCR crossed in the heat tolerance and selected heat-tolerant progeny using the extremely hot conditions of Imperial Valley in the summer. Heat-tolerant cowpeas with genetic backgrounds suitable for Senegal were supplied to ISRA, and they will begin evaluating their performance in Senegal this summer. In addition, a field method has been developed at UCR for screening cowpeas for more extensive rooting, and it is being used by UCR scientists to develop cowpeas that can extract more moisture from soil under drought.

ISRA scientists, with technical assistance from UC scientists, are making substantial progress in developing improved management methods for cowpea that are suitable for the conditions under which Senegalese farmers have to struggle to make a living. This includes improved sowing densities and intercropping systems, fertilization practices, insect control measures, and methods for post-harvest storage.

Cooperating scientists at UC-Davis have provided technical advise, assisted in graduate education of Senegalese scientists, and made substantial progress in breeding cowpeas that partition more dry matter to grain. The emphasis of the UCD and UCR programs on breeding improved cowpeas for Senegal is viewed as being extremely important. The subsistence farmers of northern Senegal have few resources to help them tackle their harsh environment. Water is not available for irrigation in the cowpea zone, and the supply of agricultural chemicals is extremely limited. The major hope for improvement in farming conditions is new cowpea varieties that can resist the drought and heat and be productive in infertile soils.

2. <u>Benefits to US Agriculture, Especially the Domestic Interests of Agriculture in California</u>

The emphasis given by this collaborative project to cowpea breeding is particularly important for California. The cowpea industry in California presently depends mainly on a cowpea variety that was developed more than 40 years ago. New varieties are a critical need because the present variety is sensitive to heat and to a major disease--fusarium wilt. The CRSP made possible the discovery of the heat-tolerant cowpeas which are now being used to develop improved varieties for both California and Africa. Cowpea originated in Africa, and it is likely that other cowpeas obtained from Africa will have characteristics that will be useful in the California breeding program.

Dr. Pat Barnes-McConnell
April 2, 1984
Page 3

California is the major US producer of cowpeas for dry beans. The cowpea breeding programs at UCR and UCD are the major programs in the US for the development of cowpea varieties for dry bean production. Consequently, these programs are important for the cowpea-dry bean industries in other states, such as Arizona and Texas.

3. <u>Extent to Which Our Regular Domestic Research Programs Reinforce, Complement, or Otherwise Relate to the Goals of the CRSP</u>

The cowpea growers of California have provided grants which partially support the overall research programs of UC scientists working on the CRSP. They have provided 50% of the salary of a cowpea breeder/pathologist working in improving heat tolerance and resistance to disease for California and Senegal, while the CRSP provided the other 50%. UCR also provided critical research funds to assist this project. The cowpea growers have provided funds to the UCD program which is developing cowpeas with improved harvest index which would be useful to both California and Africa.

Work on improved management methods has less complementarity because cowpeas are grown under irrigation in California. However, the UCR CRSP scientists have developed cowpea management methods for California that result in more efficient use of water and nitrogen fertilizer, and this has important implications for Africa.

4. <u>Impact or Influence of CRSP Existence on Our Regular On-going Domestic Research Program</u>

The intense cowpea research, stimulated by the CRSP, has acted to promote cowpea research in non-CRSP research units on the Riverside and Davis campuses, e.g., in the departments of Nematology, Plant Pathology, and Soil Science at UCR and in Entomology at UCD.

In addition, the UCR administration, faculty and staff have been extremely supportive of this CRSP project, in many ways providing more resources to support this work than was asked for in the original grant. This is part of the overall philosophy of the University of California--that it has international as well as national responsibilities.

5. <u>Impact or Influence of CRSP Existence on Our On-going International Research Program</u>

The present policy of the University of California, Riverside, is to promote international cooperative research that makes good use of the expertise of our faculty and fits the goals of the University of California in research and education. However, UCR is not involved in contract research in which US

Dr. Pat Barnes-McConnell
April 2, 1984
Page 4

staff are posted overseas for extended periods of time. Consequently, this CRSP project is ideal in that it enables UCR to be involved in international research and contribute to international development in a manner which makes effective use of permanent faculty, while being consistent with the overall goals of the University of California.

Sincerely,

Lewis G. Weathers
Associate Dean for Research

LGW/ag

EMBASSY OF THE
UNITED STATES OF AMERICA

USAID/Senegal
Dept of State
Washington, D.C. 20520

March 30, 1984

Pat Barnes-McConnell, Director
Bean/Cowpea CRSP Management Office
200 Center for International Programs
Michigan State University
East Lansing, Michigan 48824

Dear Dr. Barnes-McConnell:

This letter is in response to your request for information on the effectiveness and usefulness of the Bean/Cowpea CRSP in Senegal. Please excuse the delay in responding.

The bean/cowpea CRSP is viewed by USAID and Senegalese agencies (including agricultural research and extension institutions ISRA and SODEVA) as a project with great importance to Senegal. Under marginal rainfall conditions, cowpeas are seen as having considerable potential as both a subsistence and cash crop. ISRA believes that many high yielding varieties have been developed through the CRSP program which are well adapted to Senegal's climatic and soils conditions. The results of the last two years have demonstrated the value of the Bean and Cowpea CRSP to the ISRA program and we have noted considerable interest in continuing this working arrangement between US and Senegalese researchers.

The Senegalese development agency in the Groundnut Basin, SODEVA, is aware of the CRSP program and in many instances have met with CRSP personnel and discussed progress made to date and the nature of farmers' constraints. There are still several obstacles to greatly expanding acreage and yields of cowpeas in Senegal and further research and field tests are required. Major problem areas are in insect control, storage and marketing. SODEVA is anxious to collaborate more closely in conducting field trials of new varieties and production techniques. Coordination among various research efforts and field trials can be further enhanced.

USAID feels strongly that an extension of the bean/cowpea CRSP would be appropriate. An emphasis for an extension should be placed on field testing techniques of production and storage, as well as the variety and other work now being done.

Sincerely,

John Balis
Agricultural Development
Officer

SUMMARY OF BEAN/COWPEA CRSP COSTS

Sub-Grantee: Senegal/UCR

	US CONTRIBUTION				TOTAL	TOTAL	Total
	AID Contri.	Spent in HC	Non-Federal Contri.	Total US Contri.	HC Contri.	US & HC Contri.	Spent in HC
Cumulative through Year 3 (9-30-83)	350,904	152,673	179,444	530,348	62,595	592,943	215,268
Estimated Year 4	323,107	161,553	77,940	401,047	64,620	465,667	226,173
Estimated Year 5	346,420	170,050	58,790	405,210	65,000	470,210	235,050
SUB-TOTAL INITIAL GRANT	1,020,431	484,276	316,174	1,336,605	192,215	1,528,820	676,491
Projected Year 6	281,320	137,140	48,060	329,380	54,800	384,180	191,940
Projected Year 7	303,825	148,110	51,905	355,730	59,300	415,030	207,410
Projected Year 8	328,130	159,960	56,057	384,187	63,990	448,177	223,950
SUB-TOTAL EXTENSION	913,275	445,210	156,022	1,069,297	178,090	1,247,387	623,300
TOTAL PROGRAM	1,933,706	929,486	472,196	2,405,902	370,305	2,776,207	1,299,791

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Bean/Cowpea Collaborative Research Support Program
Sub-Grantee: Senegal/UCR

	Act Exp Thru Year 3	Est Exp Current Year 4	Est Exp Year 5	Total Initial Grant	Projected Year 6	Projected Year 7	Projected Year 8	Total Ext Request	Total Grant & Extension
Salaries	125,217	113,885	106,520	345,622	109,470	117,425	126,020	352,915	698,537
Fringe Benefits	8,420	7,890	8,100	24,410	6,860	7,410	8,000	22,270	46,680
Equip & Fac	43,360	47,356	33,000	123,716	31,370	34,680	38,255	140,305	228,021
Dom Travel	20,509	12,020	18,500	51,029	10,485	11,325	12,230	34,040	85,069
Intnl Travel	30,833	18,163	28,000	76,996	15,865	17,135	18,505	51,505	128,501
Materials & Supplies	40,304	33,073	41,000	114,377	28,900	31,210	33,705	93,815	208,192
Other Direct Costs	1,930	32,518	41,600	76,048	27,540	29,745	32,125	89,410	165,485
Total Direct Costs	270,573	264,905	276,720	812,198	230,490	248,930	268,840	748,260	1,560,458
Indirect Costs	80,330	58,202	69,700	208,232	50,830	54,895	59,290	165,015	373,247
Total Costs	350,903	323,107	346,420	1,020,430	281,320	303,825	328,130	913,275	1,933,705

Equipment included in Extension Budget Request:
1. Peugot 505 Diesel Station Wagon - $13,000
2. Freezer & Assoc equip including installation on concrete pad - $20,000

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PROJECT REVIEW AND EXTENSION PLAN

TANZANIA • WASHINGTON STATE UNIVERSITY (Initiated June 1981) • BEANS
Silbernagel

BREEDING BEANS FOR DISEASE AND INSECT RESISTANCE AND DETERMINATION OF ECONOMIC IMPACT ON SMALLHOLDER FARM FAMILIES

INTRODUCTION

About ninety percent of planned year one and two activities related to breeding beans for disease and insect resistance and to determining of the role of beans in smallholder families are in progress. Hybrid populations are being screened, the incidence and impact of diseases and insects documented, the biotype variation established and family background socio-economic information gathered from bean growing regions. Findings to date included the following: the cultivar Kabanima was suited to high-cool areas, growing mixed bean cultivars reduced rust and angular leaf spot incidence and severity and increased yields 24 percent, cleaning seed lots reduced seed transmission of diseases and increased yield by 17 percent, oil treatment of seeds reduced storage losses by bruchids, and extracts from pepper and neem reduced injury from insects.

Survey results indicated that families in the Mgeta region farmed 2.2 ha, of which 0.5 ha were in beans. This constituted 14 percent of the total value of production. Families consumed 33 percent of the beans produced which represented 72 percent of their total dietary protein intake. The remaining 67 percent of the beans were sold and constituted 24 percent of the families' total cash income. Beans are intercropped with maize in November-December and monocropped in April-May. Two Tanzanian trainees are pursuing Ph.D. degrees in the US, five Tanzanians received in-service training and/or bean workshop training in 1983.

YEARS ONE THROUGH THREE REFERENCE GUIDE

The information referred to here has been compiled in separate documents included in Sections I and III of this report.

Three-Year Progress Report

1983 Annual Report: See Section III, Technical Summary, page 130.

Research Publications and Presentations: See
Section III, Pulse Beat, Spring 1984, Insert, page 5.
Section III, Research Highlights Vol. 1, No. 5, 1984.

Project Evaluations

1983 Annual Report: See Section III, External Review Panel Report, page 47, and Follow-Up Chart Insert.

1983 Board of Directors Extension Rating: See Section I, page 25.

YEARS FOUR AND FIVE

The original objectives of this project will be maintained. Through a breeding program, the research will develop high-yielding, widely adapted, disease and insect resistant cultivars of beans for the smallholder family and will estimate economic viability of the new cultivars and their impact on women's roles in the production, consumption, and marketing process.

The planned activities are as follow.

1. Continue the hybridization, screening, and testing of bean materials at several locations.

2. Continue the evaluation of economic impact of major disease and insect constraints to production and utilization.

3. Begin evaluation of nutritional characteristics of parental materials, develop methodology to screen cooking time of segregating materials.

4. Begin evaluation of drought tolerant parental materials and develop screening procedures for segregating hybrid populations.

5. Gather detailed crop specific information from farm families to establish acceptability criteria for future new cultivars. Utilize these findings to guide direction of the breeding program.

6. Identify potentially superior land races through multilocation trials that may serve as improved interim varieties while we are waiting for improved cultivars from our own breeding work.

7. Continue to identify insect pest resistant germplasm, integrate these resistant materials into the breeding program, develop appropriate hybrid screening methodology.

8. Begin assessment of BNF capabilities in parental germplasm, and evaluation of native Rhizobium populations on those parentals. Develop appropriate screening methodology to identify segregating hybrids with high BNF potential.

9. Continue to document biological and economic effects of intercropping on yield, diseases, and insects.

10. Publish research information on family socio-economic background data, on strains of BCMV present in Tanzania, on sources of insect resistance on intercropping effects, etc.

EXTENSION YEARS SIX THROUGH EIGHT

New activities proposed follow up the previous work presented. As the Tanzanian identify superior germplasm at the experiment station level through national trials, there will be need to carry out on-farm testing trials of these superior lines. After on-farm testing testing for several seasons, the best materials will be released as new cultivars. The Tanzanian extension service should be involved to help promote the new cultivars through the school systems and missionaries. After these new materials are in place for several seasons in some of the villages where extensive family socio-economic background data were initially gathered, their impact will be assessed on smallholder family work loads, income and nutrition, with special attention to the affects of these changes on the role of women in agriculture.

1. The original research objectives plus activities described will remain as outlined above and adjusted or expanded as appropriate as the data from earlier work come in.

2. WSU will probably accept extension if the matching fund requirement issue is resolved.

3. The Morogoro Faculty of Agriculture may eventually become the University of Morogoro, but bean project commitment will probably remain constant unless there is a diplomatic problem between the US Government and the GOT.

PROJECT DESIGN SUMMARY
LOGICAL FRAMEWORK

Life of Project:
From FY- 81 to FY- 85

Total US Funding $877,618

Project Title & Number: Title XII BC/CRSP WSU-Tanzania/Silbernagel Breeding beans (Phaseolus) for disease and insect resistance and determination of economic impact on small farm families.

NARRATIVE SUMMARY	OBJECTIVELY VERIFIABLE INDICATORS	MEANS OF VERIFICATION	IMPORTANT ASSUMPTIONS
Sector Goal: The broader objective to which this project contributes: (A-1)	Measures of Goal Achievement: (A-2)	(A-3)	Concerning long term value of program/project: (A-4)
Sector Goal: Self Reliance in food production for developing African countries.	An upturn in the average annual growth in farm production; which has declined to 1.3% for Africa since the 1960's, while birth rates have increased to 2.9%.	Agricultural statistics published by national govtm's, FAO or other international development groups like US-AID.	Food shortage in most of Africa will continue at least through year 2000 because of socio-economic conditions and the scarcity of developmental resources for rapid improvment in human and/or agricultural potential.
(B-1)	(B-2)	(B-3)	(B-4)
Program Goal: Improve Tanzanian bean production field levels and stability, while reducing labor inputs (mostly women's). Reduce storage losses.	Annual GOT national bean production will increase steadily with demand. Ample supplies are available at reasonable prices in village open markets, as well as large cities. Ultimately (2000) excess food beans should be available for export.	Long term village background studies and in-depth family interviews by project socio-economists. Regional and national agricultural production statistics.	a) That self reliance in food production, and food related research continue to be high GOT priorities. b) That GOT farmer education and extension service capabilities will be capable of "selling" the new varieties and improved production methods to small farmers in all parts of the country, quickly and effectively.

LOGICAL FRAMEWORK cont.

NARRATIVE SUMMARY	OBJECTIVELY VERIFIABLE INDICATORS	MEANS OF VERIFICATION	IMPORTANT ASSUMPTIONS
Project Purpose: (C-1)	Conditions that will indicate purpose has been achieved: End of project status. (C-2)	(C-3)	Affecting purpose-to goal link: (C-4)
Project Purpose: Evaluate and reduce production and storage losses due to diseases, and insects; thereby increasing yield, production efficiency, and small farm family income.	a) Small farmer trials of disease resistant interim varieties will show 50% yield increases by 1985. c) Family labor inputs required per kilo of beans consumed (or sold) will decrease significantly as growers utilize improved varieties and storage practices.	Village background studies and in-depth family interviews by project socio-economists.	a) That GOT bean transportation, storage and marketing infrastructure achieve a high level of economic efficiency. b) That normal weather conditions prevail in major production areas. c) That farmers will be given sufficient financial incentive to produce excess beans for sale.
Outputs: (D-1)	Magnitude Of Outputs necessary and sufficient to achieve purpose: (D-2)	(D-3)	Affecting output-to-purpose link: (D-4)
Outputs: a) Develop disease and insect resistant bean varities. b) Develop integrated farming systems management practices that lessen the severity of losses due to disease and insects. c) Develop socio-economic back-ground information, crop loss estimates, assess impact of new cultural practices and varieties on family income and labor required, especially women. d) Graduate students trained to continue research on above outputs and goals.	a) Several improved varieties produced and distributed by Tanseed, which small farm families accept and produce. b) Improved cultural practices adapted by growers which increase yields and production efficiency. c) Improved varieties, production and storage practices are economically viable. Utilization reduces labor, improves family well being. d) Trained students obtain advanced degrees in research fields required to continue bean program.	GOT regional and national statistics. Bean team field research. Published information. Family and village economic impact studies by team socio-economists. GOT and/or USDM employment rosters and research assignments.	a) That designated trained scientists remain on jobs, maintain bean research priorities and be given required research support. b) That the information and varieties developed by project, be disseminated by appropriate GOT agencies (i.e. Extension Service, Tanseed seed multiplication) to small farm families in other areas. c) Bean CRSP funding continued at or above ori

LOGICAL FRAMEWORK cont.

NARRATIVE SUMMARY	OBJECTIVELY VERIFIABLE INDICATORS	MEANS OF VERIFICATION	IMPORTANT ASSUMPTIONS
Inputs: Activities and Types of Resources: (E-1)	Level of Effort/Expenditure for each activity. (E-2)	(E-3)	Affecting input-to output link: (E-4)
<u>Inputs</u>: a) USAID-MSU Title XII Bean-Cowpea/CRSP program leadership and funding. b) WSU-USDA Principal Investigator-Plant Pathologist, office, Lab, Green-house, and field facilities and equipment. One grad student M.Sc. Plant Pathology. c) University of Illinois Co-Investigator, Agricultural Economist. Office and computer facilities. One grad student Ph.D. d) University of Dar es Salaam 1 Principal Investigator Plant Physiologist 2 Agronomists 3 Plant Pathologists 3 Entomologists 2 Plant Breeders 1 Soil Microbiologist 1 Soil Scientist 1 Socio-Economist 3 Grad Students	Personnel $228,181 Equip. $112,867 Travel $157,971 Materials & Sup. $ 43,881 ODC $166,747 TDC $728,423 Ind C $149,195 Budget $877,618	Annual reports and external review panels	a) That the diseases and insects presently causing production and and storage losses, and highly variable supply situations will continue b) That the need for beans as a staple source of dietary protein for a large part of the population will continue.

Information requested by L.L.B. and P.B.-Mc. for Triennial Review of Bean/Cowpea CRSP. Prep. by MJS 3/28/84

1. Benefits to Tanzanian and other East African Agricultural Communities

Improved cultivars (cvs.) resulting from this program will carry multiple resistance to the major diseases and insect pests. This will help increase and stabilize a vital food protein source, while reducing the need for reliance on chemical control of diseases and insects. Improved cooking ability of these lines will reduce the need for scarce fuel, and improved biological nitrogen fixing ability will reduce the need for imported fertilizer.

The socio-economic family background studies will help define the role of women in development agriculture. They will also help identify the acceptability criteria for new cvs, and serve as a standard against which to measure future progress.

The monoclonal antisera to Bean Common Mosaic Virus (BCMV) being developed by WSU will help identify BCMV strains present in different production areas; rapidly, inexpensively, and without a lot of sophisticated training, equipment, or facilities. This knowledge will greatly facilitate choice of correct sources of resistance (hybrid parents), and will improve the efficiency of the screening of segregating populations in order to recover the desired combinations of specific resistance factors needed in new cvs.

2. Benefits to U.S. Agriculture, especially the Domestic Interests of Agriculture in Washington State

A. Materials being introduced via the Bean CRSP from CIAT (Colombia) and Africa, plus germplasm lines being developed at Prosser, will have potential for utilization in the U.S. by domestic bean breeders. Selections will be made for adaptation to the northwestern U.S. seed production areas and, in particular, southcentral Washington. This becomes increasingly valuable to Washington State as the Federal (USDA) dry bean program at Prosser is reduced and possibly eliminated. The strong USDA dry bean program of Dr. Burke's has been very productive and accounts for most of the dry beans grown in the state of Washington. Dr. Burke is retiring (June 1984) and the materials developed through this Title XII program will keep Washington State active in the development of new improved dry bean germplasm materials from which area seedsmen and/or WSU can select new cultivars.

B. The monoclonal antisera to strains of BCMV which are being developed through this Bean CRSP, will be commercialized by private industry. Returns to a WSU Research Foundation from this operation will help support additional agricultural research activities at WSU. These antisera will help all U.S. public and private research and production agencies monitor for the presence of new dangerous strains, to make sure what they ship to other areas is not carrying seedborne virus. This capability is especially pertinent to the USDA Plant Introduction Service bean collection (about 8,000+ bean accessions from all over the world). This assurance of freedom from virus diseases will help protect the international reputation of the northwestern commercial seed production areas, as being able to reliably produce disease-free seed stocks. These antisera used in conjunction with the Prosser ELISA diagnostic laboratory will also make possible for the first time in history a rapid, inexpensive means of gathering epidemiological data on the occurrence and identity of BCMV in any production area of the world.

3. Extent to Which Your Regular Domestic Programs Reinforce, Compliment, or Otherwise Relate to the Goals of the CRSP

The bean breeding programs at Prosser IAREC have been in operation for about 25 years. The dry beans and snap beans developed here are uniquely resistant to a range of important virus diseases and root rots. Through the years USDA breeders have worked closely with WSU cooperators to improve nutritional quality (McGinnis, Koehler, Swanson), biological nitrogen fixation (Bezdicek), cold tolerance and halo blight resistance (Anderson-Mt. Vernon), and virus resistance (Mink). Most of these objectives are in line with the global goals of the BC/CRSP. Therefore the WSU bean program is able to make a significant contribution to the bean research needs of East Africa and the bean production global objectives of the Title XII BC/CRSP.

4. Impact or Influence of CRSP Existence on Your Regular On-Going Domestic Research Program

The BC/CRSP has been the most significant boost to the WSU-USDA bean program since its initiation. We now have the extra budget needed to address important research needs in the area of BCMV and halo blight that we simply could not have afforded otherwise, i.e. graduate student stipend and support for the monoclonal antiserum production (about $18,000 in FY84), land rental in Mt. Vernon to screen for halo blight resistance and cold growing season tolerance (about $2,500 in FY84). We now have the funds to travel to other centers of bean research around the world and to attend key meetings and workshops. In this way, I get to know the researchers, the problems, the solutions, and the germplasm that may benefit our domestic programs in a way never before possible. This international perspective not only helps identify solutions to our local and regional breeding and production problems, but also helps identify potential new markets for our growers, i.e. if we put anthracnose and halo blight resistance into our snap bean cvs we can sell seed in Europe where those diseases are important. It is important to visit those areas to get to know their market needs.

The opportunity to work collaboratively with a major international center of expertise (CIAT in Colombia) greatly magnifies our domestic program access to information and germplasm available nowhere else, and expands our research capability for both our domestic and international projects. The same applies to opportunities that grow out of cooperative efforts with principal investigators of other CRSP projects, both domestically and abroad (i.e. tolerance to heat, drought, cold, rust, anthracnose, nitrogen fixation, etc.).

Review Information

5. Impact or Influence of CRSP Existence on Your Regular On-Going International Research Program

Prior to the Bean CRSP, our bean program international activities were restricted to correspondence with scientists in other areas of the world, or on rare occasions, a PL-480 review trip, attendance at a CIAT bean breeders workshop, and one trip as a consultant to a US-AID Project in NE Brazil. The Bean CRSP has enabled me to spend a 3-month sabbatical at CIAT, attend a rust workshop in Puerto Rico, an integrated pest management workshop in Brazil, an international Congress of Phytopathology in Australia, and this summer I plan to visit several important bean research centers in England, Holland, France, and Germany. Those are all in addition to regular visits and workshops to the Tanzanian project and related programs in neighboring African countries like Malawi and Kenya. My exchange of information and germplasm with bean researchers in other countries has increased by severalfold as a consequence of participation in CRSP activities.

SUMMARY OF BEAN/COWPEA CRSP COSTS

Sub-Grantee: Tanzania/WSU

	US CONTRIBUTION				TOTAL	TOTAL	Total
	AID Contri.	Spent in HC	Non-Federal Contri.	Total US Contri.	HC Contri.	US & HC Contri.	Spent in HC
Cumulative through Year 3 (9-30-83)	338,624	159,206	74,560	413,184	54,130	467,314	213,336
Estimated Year 4	281,973	142,532	57,588	339,561	37,310	376,871	179,842
Estimated Year 5	433,030	212,335	73,565	506,595	48,750	555,345	261,085
SUB-TOTAL INITIAL GRANT	1,053,627	514,073	205,713	1,259,340	140,190	1,399,530	654,263
Projected Year 6	308,495	151,170	52,442	360,937	35,855	396,792	187,025
Projected Year 7	333,975	163,660	56,772	390,747	38,725	429,472	202,385
Projected Year 8	361,495	177,155	61,447	422,942	41,825	464,767	218,980
SUB-TOTAL EXTENSION	1,003,965	491,985	170,661	1,174,626	116,405	1,291,031	608,390
TOTAL PROGRAM	2,057,592	1,006,058	376,374	2,433,966	256,595	2,690,561	1,262,653

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Bean/Cowpea Collaborative Research Support Program
Sub-Grantee: Tanzania/WSU

	Act Exp Thru Year 3	Est Exp Current Year 4	Est Exp Year 5	Total Initial Grant	Projected Year 6	Projected Year 7	Projected Year 8	Total Ext Request	Total Grant & Extension
Salaries	150,678	64,367	78,200	293,245	62,960	68,795	75,100	206,855	500,100
Fringe Benefits	5,867	9,439	12,550	27,856	10,700	11,555	12,480	34,735	62,591
Equip & Fac	18,187	46,351	81,400	145,938	52,515	56,715	61,250	170,480	316,418
Dom Travel	29,207	25,338	39,000	93,545	28,685	30,980	33,460	93,125	186,670
Intnl Travel	32,665	24,902	38,400	95,967	28,245	30,505	32,945	91,695	187,662
Materials & Supplies	28,425	21,844	33,700	83,969	24,785	26,770	28,910	80,465	164,434
Other Direct Costs	7,198	48,040	85,500	140,738	53,325	57,590	62,200	173,115	313,853
Total Direct Costs	272,227	240,281	368,750	881,258	261,215	282,910	306,345	850,470	1,731,728
Indirect Costs	66,397	41,692	64,280	172,369	47,280	51,065	55,150	153,495	325,864
Total Costs	338,624	281,973	433,030	1,053,627	308,495	333,975	361,495	1,003,965	2,057,592

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NEW INITIATIVES

There have been several overtures and discussions of gaps in the CRSP Global Plan that might be served by expansion of existing successful projects, initiation of comparative research organized across projects or the development of new projects that might be organized for a finite time frame. Among the issues raised were research on seed production in the tropics, residual soil nitrogen, and the quality and production of leaves vis-a-vis seed yield (see Monograph No. 1, Section III). In addition, discussions have been held regarding cowpea work in the Caribbean (see UWI below) and the economics of legume production (see Uganda below), a topic that is addressed in the original grant but which the CRSP has been able to do heretofore only on a limited basis.

University of the West Indies

Encouraged by the USAID Mission in that area and previous interactions with the CRSP, UWI has again opened the issue of CRSP involvement. Their interest has been reviewed by the TC and BOD, both of whom support an investigation of its appropriateness. At a recent meeting in Washington, it was determined that such an investigation would be in order.

The new work in the Caribbean will be with cowpeas and could likely be an expansion of an existing CRSP project rather than a new project. Both the UWI principals and several CRSP project PIs are interested in this collaboration which will expand cowpea heat work, BNF and utilization issues. A small investigating team is planning a trip in July to determine the efficacy of this initiative. A report of that trip will be reviewed by the TC with eventual recommendations to the BOD.

Uganda

At the fall CRSP/CIAT Workshop, members of the faculty of Makerere University discussed the possibility of collaboration with the CRSP. A major need was economic studies related to bean production, an area which has not been fully addressed by the CRSP as requested in the CRSP grant document. Subsequent communications between the two groups have reinforced the interest of both.

The TC and the BOD have also reviewed this initiative and support a fact-finding trip to Uganda to discuss possibilities with Makerere and the USAID Mission in Kampala. The Washington, DC meeting on this issue also resulted in the necessary approval for the trip. Thus, for the summer of 1984 a small group is being constructed to make this trip.

There are CRSP projects in East Africa which would be interested in having Uganda's collaboration. Kenya is one significant possibility (both Kenya and Uganda were party to the discussion at CIAT which initiated this thinking). It is therefore unclear at the moment whether (1) a research topic of mutual interest will emerge, (2) a collaborative project through the expansion of an existing relationship would be appropriate, or (3) a new project in the CRSP provides the best opportunity for success. It is probably not accidental that the existing independent projects are beginning to rapidly move closer to one another as limited resources are maximized. The following paper, put together as a draft discussion piece, was written by an agricultural economist who expects to join the group. The CRSP is presently not in a position to extensively fund new initiatives but it is possible that new initiatives can be developed in a limited way with existing resources. Such initiatives would have to fit the needs of the CRSP Global Plan and complement the present work.

DRAFT DISCUSSION PAPER ON THE ORGANIZATION AND CONDUCT OF RESEARCH ON THE ECONOMICS OF DRY BEAN PRODUCTION IN UGANDA

Two research approaches are consistent with the stated objective to "compare and analyze the impact of national policy and farm level economic behavior on bean production and utilization in order to develop recommendations for participating national governments" and address the broad spectrum of issues identified on page 7 of the project proposal. These approaches will be referred to in this discussion as the "farming systems approach" and the "subsector approach," although clearly there is considerable variation in methods and objectives employed in research within either camp. Both approaches are largely descriptive in nature. This is appropriate given the existing dearth of information on dry bean production and marketing in East Africa at the present time. Both approaches take a broad "systems" orientation and there is a rather fuzzy line where the factors of primary concern in the farming system overlap with those of the subsector. By engaging in a two-pronged research effort, it would be possible to contribute significantly to a full understanding of the interactions of social, economic, and production factors from the farm to consumption, including the key policy questions.

Uganda is a country with very high agricultural potential and a history of intensive bean production, vying with Burundi for the position of largest dry bean producer in Africa over the past twenty years. In the past ten years, however, the research efforts necessary to support increased yields and improved productivity have been lacking. The delineation of research priorities is especially difficult given the lack of information on production practices and problems in Uganda's very diverse farming systems. Soil conditions, climate, principal crop combinations, and varieties preferred vary greatly from one area to the next. Although beans are a common crop throughout the country, it would be expected that farmer objectives and concerns with respect to bean production would differ between producers in the extensive cotton/finger millet system of the north, in the intensive coffee/cotton/banana system of the south central or the very intensive sorghum/bean system of the south west.

For these reasons it would be ideal to conduct both a subsector study of dry bean marketing and a farming systems study of bean production. The farming systems component might involve a rapid reconnaissance survey of barriers to increased production in each of the key farming systems, followed by a more in-depth farm survey to identify appropriate production packages for further experimentation and on-farm trials in selected regions of the country.

Ideally, interdisciplinary teams composed of both agronomists and economists would conduct rapid reconnaissance surveys in each of the major farming systems in Uganda which include bean production to any degree. Such a team effort could follow procedures comparable to those employed by CIMMYT. For a description, see Collinson (1981). The principal objective of such surveys would be to describe local production methods and identify issues of critical concern to farmers including the major barriers to increased productivity. This process could be expected to occupy a team of researchers (4 to 6 people) for 10 to 15 days in each of the designated farming systems. Clearly logistics, manpower, and vehicle resources would constrain the degree of comprehensiveness possible at this stage.

On the basis of these rapid reconnaissance surveys, two or more high priority areas would be identified for more intensive economic research on a small sample of producers. The extended survey is needed to document variables not particularly amenable to one-shot surveys. Examples of such variables include labor and cash flows, yields, harvest and storage losses, market transactions and consumption patterns. Key issues for emphasis in the in-depth survey as well as crucial variables for stratification of the sample of producers are indentified by the rapid reconnaissance surveys.

Prices and market opportunities are important, but exogenous, variables from the perspective of farmers. Subsector analysis demonstrates the linkages between farm level production decisions, market structure and coordination, national policy and demand questions, and consumer welfare. As succinctly defined by Shaffer (1983), "A subsector study focuses on the organization and performance of the marketing system for a particular commodity with emphasis on vertical coordination problems. Tracing the marketing channels and describing the operational characteristics of the system would be a first step in assessing the possibilities for institutional changes aimed to improving subsector performance." Such research places dry bean production in the context of market demand and determines the potential for further production expansion.

Improvement of market coordination and the reduction of marketing costs has been demonstrated to be essential to both the improvement of rural incomes and the reduction of consumer food bills. The marketing system is the communications link between consumers and government on one hand, and producers on the other. A description of the behavior and opportunities of actors at all levels, from suppliers of inputs such as seed and fertilizer, through production, assembly, shipping, wholesale, retail, and consumption, is needed to better design policy and to predict the impact of institutional changes on the performance of the system.

In Uganda, secondary data is limited and of questionable reliability. This is particularly true for the subsistence sector and especially for the last ten years. For this reason, a study of bean marketing will have to invest heavily in baseline data colletion in order to be able to describe adequately the flow of money, goods and services in the subsector.

The Alternative Rural Development Strategies Project (ARDS), which is being implemented by the Department of Agricultural Economics at Michigan State University under a Cooperative Agreement was authorized by USAID in 1977. The primary purpose was to build at MSU a skilled group of professionals to help AID Missions and developing countries in planning and developing strategic programs and projects in rural development. Research conducted under this agreement has concentrated on such central issues as (1) developing research approaches for the design of small farmer production technologies, including improved data analysis techniques for a better understanding of small farmer constraints and opportunities; (2) designing more effective and efficient rural marketing strategies through adjusting farm output to demand and to national food, employment, and income goals; (3) forging improved links between macro policies and rural needs and realities. As a result of the strong micro-research foundation MSU has gained in its work on farming and rural marketing systems, consideration is now being given to the extension of the Alternative Rural Development Strategies Cooperative Agreement with a particular focus on issues of food security.

Clearly beans and cowpeas, which are the primary protein sources for much of the population, constitute an important aspect of food security in East Africa. An investigation of the economics of dry bean production would benefit from drawing on the substantial expertise acquired over years of experience with farming systems and subsector research at MSU. A collaboration between the Bean/Cowpea CRSP and the ARDS project could sustantially strengthen the economic component of CRSP activities, further the research objectives of both parties, and promote efficiency in the use of financial and human resources.

Requirements

To carry out the work suggested above, the following would be necessary.

Personnel--a two-person expatriate team with backstopping in the US and funds for field staff.

Equipment--A vehicle, preferably a Landrover, a small PC and other equipment as may be necessary for Makerere to participate.

References

Collinson, M. P. "The Exploratory Survey: Content, Methods and Detailed Guidelines for Discussions With Farmers" extract from Farm Systems Newsletter No. 5, 1981. Nairobi.

Shaffer, James D. et al "Influencing the Design of Marketing Systems to Promote Development in Third World Countries" a paper presented at the International Workshop on Agricultural Markets in the Semi-Arid Tropics sponsored by ICRISAT, Hyderabad, India, October 24, 1983.