

**REPORT OF THE EXTERNAL EVALUATION PANEL**

**REVIEW FY 02B/03**

**BEAN/COWPEA COLLABORATIVE**

**RESEARCH SUPPORT PROGRAM**

**April 2004**

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**THE BEAN/COWPEA COLLABORATIVE RESEARCH SUPPORT PROGRAM  
(CRSP)**

An international community of persons,  
institutions, agencies and governments committed  
to collectively strengthening health and nutrition in  
developing countries by improving the availability  
and utilization of beans and cowpeas.

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## TABLE OF ACRONYMS

Al	Aluminum
ALS	Angular Leaf Spot
ANT	Anthraxnose
BCMNV	Bean Common Mosaic Necrosis Virus
BCMV	Bean Common Mosaic Virus
BGYM	Bean Golden Yellow Mosaic
Bt	<i>Bacillus thuringiensis</i>
CBB	Common Bacterial Blight
CC	Cross-cutting
CIAT	Centro Internacional de Agricultura Tropical
CRSP	Collaborative Research Support Program
DNA	Deoxyribonucleic Acid
ESA	East and Southern Africa
EEP	External Evaluation Panel
GMO	Genetically Modified Organism
HC	Host Country
HYV	High Yielding Varieties
IITA	International Institute of Tropical Agriculture
LAC	Latin America and Caribbean Basin
MAS	Marker Assisted Selection
MO	Management Office
Mn	Manganese
N	Nitrogen
NGO	Non-governmental Organization
P	Phosphorus
PI	Principal Investigator
RIL	Recombinant Inbred Lines
TC	Technical Committee
U.S.	United States
USAID	U.S. Agency for International Development
WA	West Africa

## PREFACE

The Bean/Cowpea Collaborative Research Support Program (CRSP) is an international partnership of U.S. and developing country institutions that engage in collaborative research and training. The Global Mission of the CRSP is to contribute to the building of human and institutional capacity of agricultural universities and national agriculture research systems and to the enhancement of bean and cowpea consumption, utilization and food security in Africa, Latin America and the U.S. through the generation of new technologies and knowledge and the equipping of professionals. The CRSP is funded by the U.S. Agency for International Development through the Office of Economic Growth, Agriculture and Trade. The Cognizant Technical Officer for the program is Jiryis Oweis.

The Bean/Cowpea CRSP began a new five-year grant on September 30, 2002, entitled “Regional Partnerships to Enhance Bean/Cowpea Consumption and Production in Africa and Latin America.” This grant adopted a new global strategy to promote bean and cowpea “Value-Chains” within three target regions; West Africa, East and Southern Africa, Latin America and the Caribbean Basin. The objectives of the program are to:

- Stimulate economic growth by developing new market opportunities for bean/cowpea grain and value-added products,
- Increase utilization and consumption by adding value to bean and cowpea grain and their by-products,
- Enhance human health and nutrition especially in children by increasing knowledge of nutritional constituents in beans/cowpeas and developing nutritious bean/cowpea food products,
- Ensure maximum access by women and minorities to technology and information,
- Increase the sustainability of bean and cowpea production systems in divergent agro-ecological zones, and
- Enhance the productivity and quality of beans and cowpeas through genetic improvement, utilizing both tools of molecular biotechnology and traditional plant breeding.

Within the Bean/Cowpea CRSP, the External Evaluation Panel (EEP) is the sole external consultative group that advises the Management Office (MO) on issues of administration, technical quality, and program planning and direction. Specific roles of the EEP as outlined in the *Bean/Cowpea CRSP Operations and Policy Manual* include: (1) To provide an external evaluation of the technical quality and progress of the research and training activities by U.S. and Host Country scientists and collaborators, (2) To assess the ability of CRSP scientists to complete the objectives outlined in the approved annual research and training workplans, (3) To assess the technical direction of Bean/Cowpea CRSP research relative to the achievement of global program goals, (4) To assess the performance, productivity, project management, and commitment of U.S. and HC Principal Investigators (PIs) and their respective universities/institutions in the Bean/Cowpea CRSP and (5) To recommend to the MO ways to strengthen the effectiveness and efficiency of the Bean/Cowpea CRSP and to propose new directions for research and training for purposes of future planning.

In fulfilling this function, the present document reports the EEP's evaluation of the Bean/Cowpea CRSP for FY 02B/03 (August 1, 2002 through September 29, 2003). The evaluation was based in large part on a review of the FY 02B/03 Annual Research and Training Progress Reports of the three regional projects and of the MO utilizing criteria presented in a *Scope of Work*. In addition to providing an assessment of the success of PIs in initiating the collaborative projects and achieving the objectives of the research and training activities established in the FY 02B/03 workplans, the EEP was asked to provide recommendations to the MO regarding ways to strengthen and enhance the effectiveness of the activities. This EEP report, therefore, is considered important since it represents the first evaluation and external feedback received by the MO, the U.S. and HC PIs, the Board of Directors and USAID regarding activities in the new Bean/Cowpea CRSP grant.

Irvin E. Widders  
Director  
Bean/Cowpea CRSP

## **Ideal Global Research Program for Thematic Areas**

**As a context for our review of the first year progress, EEP members were asked to describe the essential elements of an ideal research program in each of four cross-cutting thematic areas. One of the purposes of this exercise was to have a common basis for assessing progress toward the objectives for individual research activities. The elements of an ideal program that were agreed upon in the EEP discussion are presented below in summary form.**

### **Socio-Economics and Market Development**

There is no universal agreement about what the socio-economic components should be in any CRSP but it is interesting to note that a consensus has emerged over the years that the role of social and economic research components should be strengthened. In the early days of the CRSP, nearly three decades ago, these programs were almost entirely animal and plant science research projects with little emphasis on economic, sociological or anthropological activities.

Perhaps due, in part, to the recognition of its importance but also to the broadening of their objectives, almost all of the CRSPs now have significant social science components. The Bean/Cowpea CRSP is no exception having strengthened these components as the program has adjusted to changing priorities and perceived needs. For example, the concept of a “value-chain strategy” suggests that economics and marketing are of major concern, not just increasing production of beans and cowpeas.

It is important that the socio-economic research in the Bean/Cowpea CRSP be designed so as to be supportive of the objectives, not serving an end in itself. Especially, with the current project (the “value-chain strategy”) a multidisciplinary research team is appropriate, with the economist or sociologist a member of the team, not a separate activity serving a separate purpose.

The nature of the Bean/Cowpea CRSP program also implies a “problem solving” approach to the socio-economic research component. That is, the economics or marketing research activity should be designed to solve a problem that has been identified as a constraint to achieving the CRSP objective, not just to spin off a dissertation or get a journal article published. The MO and EEP should judge success based on problem solving and economic or social impact.

The main contributions socio-economics research activities should make to the Bean/Cowpea CRSP--and on which they should ultimately be judged--include:

- Shed light on the bean and cowpea production, marketing and consumption system in the region and help administrators and researchers understand the system and how it can be improved.
- Assist plant scientists in evaluating characteristics that add-value to beans and cowpeas.

- Help understand the barriers to adoption of high yielding varieties (HYV) and how these barriers can be overcome.
- Evaluate market potential for improved cultivars.
- Assess consumer demand and preferences.
- Provide measures of the economic and social impact of the CRSP, both ex-ante (predictive) and ex-post (historical).

### **Adding Value to Promote Increased Utilization and Consumption and Enhancing Health and Nutrition of Target Populations**

An ideal research program in this area would follow the normal procedures used in industry for developing new products for consumers. This involves the following steps:

1. Assess current status of products in the marketplace, assess current nutritional status of population subgroups, and assess current market information on sales and utilization of products. Utilize indigenous universities, GMOs, private industry, including multinationals, professional societies, industry organizations, health organizations, and government agencies.
2. Identify gaps that exist for products in the marketplace or for nutrient supply to target populations. Focus on those factors or products within the purview of the CRSP.
3. Prioritize the gaps identified in step 2. Utilize stakeholders, GMOs, and government agencies to establish these priorities.
4. Develop a plan (resource needs, timeline, milestones, evaluation, etc.) to fill the gap. Select projects based on priorities, resources, and time. The project team will take the lead but again stakeholders, especially consumers, need to be engaged in this process.
5. Carry out the project(s) according to the plan.
6. Assess fulfillment of the objectives of the project(s) within the constraints of resources and time. Measure the success of the project through follow up to assure that the project has had impact.

### **Agronomy and Cropping Systems**

The following issues should be considered as “ideal” for a global bean/cowpea research program.

- The so-called Research (R) and Technological Development (D) approach should be followed. R&D has its origin in industry, but it is expanding rapidly into agriculture, and in the last few years into agricultural research. A client-oriented model of



agricultural R&D should be applied to basic, strategic and adaptive research, as well as to extension activities. Thus, the client for basic and strategic research could be viewed as the applied and adaptive research community. The client for applied and adaptive research could be viewed as extension workers, NGOs, market agents and even farmers. In general, public sector research systems are characterized by poorly integrated functions, lack of interaction among staff and research agendas that are set by researchers.

- GMO varieties and biosafety issues should be a part of any current and future Bean/Cowpea CRSP research agenda. GMO research is very expensive and a long-term task, which will require more accurate demand assessment.
- Grain quality and productivity objectives should also be pursued.
- Seed production systems represent a major constraint to farmers' adoption of new improved varieties. An ideal research program must address this constraint.
- An ideal research program will include cropping system diversification. Single cropping systems are generally inconsistent with good agronomic practices. Bean or cowpea-based systems must be tested if a sustainable agriculture is to be achieved. Thus, environmental concerns must be an important part of any research agenda. Yield increase is no longer the most important parameter to be looked after in the forthcoming agriculture!
- Improved varietal testing and validation – farmers must be involved in these issues. It is a classical misunderstanding to think that researchers validate new cultivars. The only way to do it is through farmer's involvement (validation), which in fact explains why in many regions new varieties have not been adopted.

### **Genetic Improvement and Biotechnology: Components of an “Ideal” Global Research Program for the Bean/Cowpea CRSP**

The ideal research program contains both global and regional components.

Global components:

- Development of cutting-edge technologies in molecular biology
- Post-graduate training programs
- Development of databases of resistance sources and breeding pedigrees

Regional components:

- Establishment of multidisciplinary teams of investigators
- Regional evaluations of germplasm, breeding lines, and advanced lines
- On-farm, farmer participatory evaluation trials and marketing studies
- Continuous release of new varieties
- Efficient seed production and distribution systems
- Socioeconomic and marketing studies of new varieties and future options

- Workshops
- Scientific and technical publications

## **EVALUATION OF THE WEST AFRICA REGIONAL PROJECT**

### **WA1-A1 Developing Cowpea Market Opportunities in West Africa**

The marketing component of the West Africa Regional Project is aimed at improving market opportunities for cowpeas and cowpea products in order to stimulate economic growth. Building on research in the previous phase, which produced a general picture of cowpea marketing and trade in West Africa, research in the current phase consists of four distinct studies: (1) coastal shipping, (2) market value of cooking time and sugar content, (3) the value of market information and (4) potential demand for cowpea-based products.

The marketing component is well designed to contribute to the objectives of the West Africa project and the Bean/Cowpea CRSP. It is carried out by a competent and experienced team of investigators who are based in Niger, Senegal, Ghana, Nigeria and the U.S. Because it builds upon work in the earlier phase of the CRSP, this component is not handicapped by the usual start-up problems and no deviations from the approved workplan were noted.

Progress in the first year appears to be quite good, aided perhaps by the fact that it continues and builds upon work by some of the same investigators in previous research projects. An exception to the overall good progress was the coastal shipping study, which was delayed, and the survey of consumer acceptance of cowpea products was not completed as planned because of unanticipated problems.

The technical quality of the research appears quite high and the methodology used is consistent with contemporary economic approaches. Research output based on publications cited is quite high, in part because some publications are the result of earlier work.

This component has an unusual number of Ph.D. students associated with it (five active during some part of the year). On the one hand, it is commendable that these students have been recruited for advanced training and conduct research on this topic, it also signals a note of caution. Dissertation research in economics is often long on quantitative methodology and short on application to real world problems. Questions about the impact of the dissertation research will have to be addressed when the five-year evaluation is undertaken.

### **WA1-A2 Economic Evaluation of Proposed Technologies (Cropping Systems) for the West Africa Region**

Because of the delay in project startup, the finalization of cowpea production budgets for alternative goals (e.g., grain only, hay only, dual purpose grain and hay) will continue in FY 04. However, it seems very difficult to draw conclusions on sustainability of production systems considering that only two sites were included in the study.

## **WA2-A1 Development of Cowpea-Based Value-Added Foods with High Nutritive Health Values Preferred by Consumers and Food Processors**

The research reported for this period is entirely consistent with the workplan for this project. The investigators are to be congratulated for recognizing the importance of obtaining information on consumer preferences on a variety of products before they completely designed the research program. Doing preference studies in the developing as well as the developed countries (at the International Food Technologists meeting) is to be congratulated. The technologies that are being investigated are appropriate.

The research that has been reported on the technology seems appropriate. The investigators are using appropriate statistical design in the studies. The most striking evidence that the research is of high quality is that papers are being published in the most respected scientific journals for food science and technology.

Outstanding progress has been made on this project. The PIs have demonstrated appropriate collaboration among themselves in the experimental procedures. The West Africa group has been successful in expanding collaboration with The Royal Ahold Corporation and the African Facility Development Fund. This represents an excellent opportunity to transfer the technology to small and medium sized companies. The U.S. contingent successfully developed a working arrangement with Inland Empire Foods by jointly sponsoring a booth at the International Food Technologists (IFT) meeting. The PIs have been aggressive in highlighting the progress on this project as evidenced by the symposium at the IFT meeting. The project appears poised for demonstrating impact in West Africa.

This is an outstanding project and the EEP encourages continued funding. However, the project is carried out much like a bilateral project. The PIs should be encouraged to expand the project to include other regional partners.

## **WA3-A1 Enhancing the Sustainability of Intensified Cowpea-Based Cropping Systems in the Sudano-Sahelian Zones of West Africa and in the U.S.**

Multi-factorial agronomic experiments involving cowpeas and cereals (wheat and sorghum) were initiated at two sites in Niger and one site in Texas. In Niger, the sowing date was later than optimal due to delays in the transfer of funds to the Institut National de Recherches Agronomiques du Niger (INRAN). Because the rains ended unusually late this year, yield data are not yet available. In Texas, a crop rotation experiment was initiated under no-till conditions following the first rains that were sufficient for germination. Soil water extraction by the previous crop (wheat), coupled with an extreme drought during the summer, resulted in yield failure for sorghum and cowpea grain.

Mean dry matter (DM) yield was 3065 kg ha<sup>-1</sup> for sorghum. DM yield for cowpeas was 676, 1222 and 1696 kg ha<sup>-1</sup> for CB46, UCR1340 and UCRCC26, respectively. At harvest, crude protein (CP) varied from 15 (CB46) to 29% (UCR1340), reflecting different stages of maturity. Soil water distribution at harvest associated with different treatments reflects the extremely dry conditions under which crops were grown. Nonetheless, water distribution manifests

differences among rotation phases for water extraction and among cowpea varieties. Sorghum extracted the greatest amount of water from the profile. Among the cowpea varieties, extraction appeared to be greatest for UCRCC26 and least for UCR1340. Even though these preliminary results are from a very dry year and a rotation system that is only just beginning, the amount of good quality fodder produced by UCR1340 (29% CP) with minimal water extraction is encouraging and it is very promising to overcome fodder shortage both in West Africa and in the U.S. There are intentions for intense networking and linkages with stakeholders by the PIs.

**WA4-A1      Development of Improved Cowpea Cultivars with Increased Yield Potential, Tolerance to Biotic and Abiotic Stresses, and having Grain Quality Traits Preferred by Farmers and Consumers for Three Target Agro-Ecological Zones, the Sahel and the Sudan/Guinea Savanna Regions in West Africa, and the U.S. Southwest**

The research report was consistent with the approved workplan. Three objectives were advanced. Screening trials were conducted in the Institut de l'Environnement et de Recherches Agricoles (INERA), Burkina Faso, University of California-Riverside (UC-R) and Institut Sénégalais Recherches Agricole (ISRA), Senegal. Most of the trials in Senegal were lost due to drought.

Cowpea germplasm with levels of resistance equal to or greater than the resistant checks were identified for aphids, thrips, pod sucking bugs and striga. New crosses were made to combine multiple insect and striga resistance with good seed quality. Other crosses were advanced. In spite of drought, ISRA-819 and Melakh produced more than other cowpea varieties in on-farm trials. Backcrosses to increase seed size of CRSP cultivars 'Mouride', 'Melakh', KVx61-1, and other varieties were made. Crosses were also made to incorporate the recently identified 'sweet' trait and striga resistance into elite CRSP cowpea varieties and lines.

Molecular polymorphisms were observed between parents ('Bambey 21' and 'Mouride') in 120 RIL lines screened in ISRA, Senegal. Other RIL populations are being developed and screened for molecular markers in UC-R. Major genes appear to control sucrose content in one cross.

Good working partnerships were demonstrated with colleagues in Burkina Faso, Senegal, UC-R, and IITA. Other relationships were established with several NGOs for on-farm trials, seed production and storage. Germplasm was distributed to cowpea scientists throughout the world. A CRSP database on important cowpea genotypes was initiated. A workshop on Marker-Assisted Selection (MAS) was held at UC-R in February 2003. Three scientific publications were published. The CRSP project was used to leverage other grant funds.

The on-going breeding trials offer potential to develop multi-resistant and high quality cowpea cultivars. In spite of set backs in Senegal, good progress was made in screening germplasm, making crosses, and advancing generations. On-farm trials should also include an analysis of the marketability of new cultivars.

**WA4-A2      Assessment of the Nematode Incidence and Speciation in West African Soils, Identification of Genetic Resistance to Nematodes in Cowpeas, and the Development of Strategies to Control Nematodes in Cowpea-Based Cropping Systems**

The research report was consistent with the approved workplan. Two objectives were advanced. Surveys of root and soil for presence of nematodes were conducted on about 75 fields in both Burkina Faso and Senegal. Of all sampled sites in Senegal, 100 percent had *Scutellonema cavensessi* nematodes present. Five other general parasitic nematodes were also identified. In Burkina Faso, 12 general parasitic nematodes were found. Good collaboration in conducting the field assays was obtained in Senegal and Burkina Faso.

Experiments were initiated in Senegal and Burkina Faso to assess the extent of yield loss caused by *Scutellonema* and *Meloidogyne*. These results are pending.

Live cultures of the most important nematodes have been initiated for screening. *Scutellonema* cultures were sent to the UC-R Nematode Isolation and Quarantine Facility, and after some initial problems, successful live cultures were established.

The results of the screening trials will be useful to identify potential parental lines for resistance breeding and to assess nematode damage levels under different environmental conditions and cropping systems. Collaboration on three publications was observed.

This project is a new activity for the Bean/Cowpea CRSP and its initial progress is very encouraging. One recommendation for this project is that the nematode surveys be extended to include cowpea production regions in Eastern and Southern Africa.

**WA5-A1      Molecular Genetic Improvement of Cowpeas for Growers and Consumers**

The research activities for FY 02B/03 were consistent with the approved workplan, but progress in completion of the three objectives was limited.

*Agrobacterium tumefaciens* LB 4404 was used to infect explants of genotype ITH98-13-1 by co-cultivation. Shoot survival when exposed to kanamycin and bialaphos selection agents was low. Those that did survive were chimeric transformants. Inefficient morphogenic cells at the time of transformation was proposed as the problem. Another complication was that one of the principal scientists working on this project left and was unable to complete the study. A new student is being recruited to continue the work.

Three Bt protein preparations were tested in artificial diet for effect on Maruca larvae and LD50s were calculated. Problems occurred with mold growth on the diet. The Bt gene cry1Ab seems to be the most promising candidate for use in transformation.

Another set of studies were done to isolate genomic DNA from eight cowpea lines, but the nonradioactive detection system used in the study did not work well.

Given the inherent difficulty of transforming cowpea using *Agrobacterium*, it is not clear why other techniques, such as the electrical transformation techniques, are not being more actively pursued. Another recommendation would be to use a number of genetically diverse cowpea cultivars, as some genotypes may be less recalcitrant to transform than others.

Overall progress in this project was poor to inconsistent. The report was also confusing, with most of the methods presented in the results section. Problems occurred with key personnel changes and contamination of the artificial diets with fungi showed poor laboratory techniques that are surprising considering the PIs involved in this work. It was not clear what role Ghana plays in this project or what activities were conducted at the Savanna Agricultural Research Institute (SARI). Even the *Maruca* Bt feeding trials were done in Purdue.

The EEP recommends that this project be given another year of funding to see evidence of progress. If, at that time, no advancements are observed, other laboratories should be invited to participate in this project.

**WA5-A2      Development of a Comprehensive Management Plan Which Incorporates the Use of Bt Transformed Cowpea Lines to Control Maruca and Alpha-Amylase Inhibitor Transformed Lines to Control Cowpea Weevil in West Africa**

No results were reported. The reason given as to why the Savanna Agricultural Research Institute (SARI) studies were not conducted was that there were delays in establishing a subcontract between Purdue University and SARI-Ghana. Why this delay occurred was not explained. Purdue received funding for this component activity, but their activities were not reported either.

It is not clear why this project is being initiated at this time. There are still major obstacles for implementing an effective genetic transformation system in cowpeas, and it may be many years before GMOs are available for field testing. Nor is it clear whether the \$300,000 leveraged funds from USAID are complementary or different from the CRSP project.

**General Comments on the Conduct of the CRSP in the West Africa Region**

1. Several of the projects were able to leverage funds for the project from other sources. It would be helpful to have the leveraged funds reported with the following information: source of funds; total funds; funding period (inclusive dates); funds expended in the reporting year.
2. Several projects appear to be bilateral rather than multilateral. Efforts should be made to include other countries in the region in the project. This should not imply that the EEP is recommending that the CRSP funding in a particular project simply be spread thinner. Other sources of funding should be approached including the local USAID mission.

3. Given that there are three regions in this CRSP, each region should take advantage of progress made in other regions by adopting and adapting procedures and techniques that have been proven to succeed. This especially includes instrument surveys for consumers and other groups.
4. None of the projects identified the corresponding Ministry of Agriculture as a cooperator in the project. Perhaps the CRSP team could be instrumental in bringing together the Ministers of Agriculture for an update on progress and seek cooperation and collaboration through these ministries.
5. In several of the annual reports it was difficult to discern the methodology that was used in the project. It was mixed in the Approach section and the Results section. A clear, concise description of the approach and methodology would be appreciated.



## **EVALUATION OF THE EAST AND SOUTHERN AFRICA REGIONAL PROJECT**

### **ESA1-A1 Developing Bean and Cowpea Market Opportunities in Eastern and Southern Africa (ESA)**

This component of the ESA Regional Project was designed to focus on (1) market structure, (2) pilot testing of a methodology for price quality relationships, (3) pilot test of market for improved bean seeds and (4) supporting other components of the ESA project. Progress during the first year appears to be rather spotty; however, it may be too early to judge its ultimate success. Reported progress on market structure was limited to literature review and the annual report focuses too much on the detailed findings of the literature on cross-border trade flows with little explanation of the relevance to the CRSP. An exception is the suggestion that there may be marketing opportunities for Malawi in South Africa, which if confirmed, would have significant implications for bean production and marketing in Malawi.

The objective of support for other ESA components is laudable but there is scant information about the contribution that was made in the first year. Certainly that objective should be emphasized in future years.

Given that so little progress has been made in East and Southern Africa in economics and marketing in the past, this report holds out the promise for better results and greater impacts in the future.

### **ESA2-A1 Enhancement of the Use of Quality Criteria for Crop Programs of Beans and Cowpeas in the ESA Region**

This project focuses on products utilizing cowpeas grown and consumed in Mozambique. Presumably the project will expand to other countries in ESA and will also investigate products made from beans. The work that is reported appears to be consistent with the workplan but all of the work appears to have been done in Mozambique with none being done at Texas A&M.

The technical information that has been generated to date is routine and does not add significantly to our understanding of cowpea and bean utilization in Mozambique. Did the investigators expect that the cowpeas and beans produced in this region would behave characteristically different than those produced elsewhere? Presumably the PIs will be able to step up the level of research. The progress is very minimal. It must be expected that progress will increase substantially as the project gears up.

There is little evidence of collaboration among the PIs since all of the work to date has been conducted in Mozambique. Again, the EEP will expect that the U.S. collaborators will have significant input into the research as the project progresses. Although there is mention of contact with consumer and agricultural research organizations, there are no names presented and no evidence of a follow-up plan.

There is no evidence of impact to date. It is difficult to comment on technical direction since so little has been accomplished to date. However, the collaborators at Mozambique should be

congratulated for initiating the project even though there were delays in funding. The fact that cowpea leaves are an important component of meals is an important revelation. No work was done on beans. Presumably that work will be initiated in the very near future. The PIs have identified appropriate strategies to address the research questions. The EEP will expect to see increased evidence of progress in the next annual report and that other countries in the region will be participating in the project.

**ESA2-A2      Development of Technologies to Facilitate the Introduction of Low-Cost, Value-Added Bean- and Cowpea-Based Food Products**

The research reported is consistent with the workplan. Has scarifying the surface (including slitting) of the beans or cowpeas been thoroughly investigated as a method to increase the rate of water imbibition and cooking?

The research results have not generated substantive technical advances but I would not expect them to. The project is straightforward. The use of micronization has been adapted from earlier research and is not original in this project although it is expected that the PIs could make substantial contributions by discovering complementary procedures that augment the action of the infrared heat, semi-moist processing method.

The level of progress appears to be appropriate to the time that the PIs have worked on the research activity. There is little evidence that the PIs have been collaborating. Most of the work appears to have been done in Mozambique and South Africa. Although the research results have been communicated to the “utilization and nutrition researchers at a regional meeting,” there is no evidence that it had an impact. The PIs should follow up with the attendees to see if their research results have actually motivated additional research or adaptation and adoption of the technology. Since the project is just starting, there is little progress. Future support should depend on enhanced research productivity.

**ESA3-A1      Enhancement of Child Survival and Rehabilitation of Malnourished Children through the Development of Inexpensive Bean/Sorghum/Maize Foods**

The research is well developed and the workplan is consistent with the objectives. The PIs are to be congratulated for moving expeditiously with the cancer study so they could use those results to drive further investigations. The results of the feeding study on mammary cancer are very interesting and should be helpful in generating more research funds. The survey of household utilization of beans and cowpeas should also provide direction to the research projects. Given the time the PIs have had to conduct research, progress seems appropriate. The collaboration between the investigators appears to be excellent.

It is too early in the studies to demonstrate impact. The project has the opportunity to significantly enhance children nutrition and recovery from malnourishment especially if the products are palatable to children. They need to clearly demonstrate the acceptance of these products by children.

This is an exciting area of research and the EEP is pleased to see it included in this CRSP. It is suggested that the surveys be expanded to include other countries in ESA. There also needs to be follow-up on the light red beans to determine why they offered no protection against breast cancer. Further identification of the bioactive components should also be an active part of this project. Although the project is just underway, the technical direction appears appropriate, and support for the project should continue.

### **ESA-CC1-A1 Improving Soil and Water Management for Intensified Bean Production in Malawi in the Dry Season, taking into Account Labor and Capital Constraints of Women and Resource-Poor Farmers**

This is a study to test different water use and management technologies for intensified bean production in an area characterized by resource-poor farms, many of which are operated by women. The soil component was dropped for budgetary reasons. The study's ultimate goal is to address labor and capital constraints associated with dry-season bean production. Experienced investigators, located at Bunda College and Michigan State University (MSU), have an established research track record.

The project appears to have gotten off to a good start despite delays in funding and administrative problems. A baseline survey in the selected area was completed which should provide a picture of practices and constraints but the data is yet to be tabulated and analyzed. A planned study to better understand marketing constraints had not gotten underway during the time period of this report and a graduate student remains to be identified to begin work on it while studying at MSU.

The approach has considerable merit. It addresses serious technical bean production problems and at the same time it attempts to deal with the gender issue. A limitation of this research activity is that even if successful it represents but one relatively small area of Malawi. Its value would be greatly enhanced if the design included plans to extend the results to a larger area of the region.

### **ESA4-A1 Edaphic Constraints to Bean Production in Eastern Africa: The Selection of Bean Cultivars and *Rhizobium* Having Tolerance to Low N and P, and Ability to Grow at Acid pH**

The progress report describes some initial results and problems identified. Proposed experiments, activities and methodologies are suitable to get substantial achievements on bean production in soils having such limiting factors as low concentrations of N and P, low pH, Mn and Al toxicity.

The research progress during FY 02B/03 seems to be acceptable. Some observations and considerations are listed below:

- This report shows progress made in relation to the screening and the selection of bean cultivars with tolerance to low P and low pH in soils, with some promising results. Nevertheless, some data are still being analyzed and additional cultivars remain to be tested.

- In relation to the evaluations of cultivar differences in Al and Mn toxicity, it is reported that the development of appropriate screening procedures is close to completion.
- Significant results are promised toward the end of this project period.
- Some of the microbiological studies programmed in the original workplan, involving *Rhizobium* selection and inoculant tests are running with National Science Foundation (NSF) grant support and few results were reported other than the selection of some outstanding strains of *Rhizobium*. However, the PIs reported that important studies had to be cut out of the workplan due to a significant reduction in CRSP funds designated for the edaphic project.

Effective collaboration is evident in the report. Important activities were performed at Sokoine University of Agriculture (SUA) and at University of Minnesota (UMN). Nevertheless, no activities were related to the group from Pennsylvania State University. Maybe the research activity can be strengthened with a more effective participation of researchers (collaborators) and institutions. The partnership of graduate students contributing to the project through their thesis work is reported. This is very important and the participation of more graduate students should be encouraged.

The reported networking seems to be suitable considering the research objectives and achievements. Well-known investigators and institutions with recognized expertise are fully involved in the subjects covered by the project. Besides that, PIs are planning new important linkages that surely will amplify the existent networking.

Beans are the main source of protein for human nutrition in many poor societies. Acid pH, low concentrations of N and P, toxic levels of Al and Mn, are important limiting factors for good productivity of this vegetable. The majority of Eastern African soils exhibit these limitations and the costs to overcome these problems are usually very high and almost prohibitive for most farmers, especially the small-scale farmers. In the U.S., farmers are better able to manage the limiting factors of their soils, nevertheless, sometimes soil acidity is a real problem where heavy N fertilization is applied to poorly buffered soils. This research activity will directly impact farmers' bean production. Finally, with the possible results that would be obtained in the project, farmers could have more economic and sustainable agriculture.

To enhance the likelihood of greater impact from this project, PIs need to come back to some of the original objectives as outlined in the workplan. Budget problems caused implementation delays and elimination of some important activities (field test of inoculant rhizobia; studies with molybdenum, expansion of the workplan for other areas; etc). Without these activities, the likely impact of this project will be diminished. Additional activities involving crop management would be interesting. One of the experiments proposed in objective 1, but not contemplated for the current workplan, shows the concern of the PIs regarding this subject. They proposed to study the dominant cropping systems in Tanzania in monocrop and associated with corn. Studies involving microorganisms other than *Rhizobium* should be very promising. In this report it is observed that some interesting work has been conducted with *Bacillus subtilis*, looking for alternatives to disease control and growth promotion. Studies related with mycorrhiza fungi would also be worth considering.

It is known that selection and breeding work with bean lines and cultivars are essential. However, microbiological studies involving N fixing bacteria and even other plant growth promoters are also very important and necessary. The MO should find ways to support these studies and facilitate the implementation of the activities as originally presented in the workplan. The EEP expects more interactions among PIs in the future. It is an excellent opportunity to exchange experience and expertise once this (ESA4-1) and the LAC4-A1 activities become complementary. The EEP also commends the project leader for leveraging funds (\$688,000).

#### **ESA5-A1      Development of Cost-Effective and Sustainable Seed Multiplication and Dissemination Systems for Improved Bean Cultivars that Meet the Needs of Limited-Resource Bean Farmers**

In Malawi, six hectares of Kalima and Nasaka seed were produced. However, production was very low and only 3.5 metric tons (583 kg ha<sup>-1</sup>) of seed were produced (1.5 metric tons of Kalima and 2 metric tons of Nasaka). Multiplied seed from seven other released CRSP varieties was necessary to maintain seed viability and produce enough seed to meet the demand. It is interesting to note that lots of effort is being devoted to establishing linkages with other institutions. However, actions and interactions seem to be punctual. The program leader must discuss with all participants and establish reasonable minimum quantities of seeds for each new material and for the whole program demand, for example.

It is necessary to use more creative strategies to get involvement of all the partners. Instead of asking what quantity of seed can be offered, ask what is the demand for the seed? As stated in the report, just one partner demanded 21 metric tons of Nasaka seeds, and the total offer was 2 metric tons. The project team must give thought to the overall plan of this activity in order to accomplish its proposed goals. It is very frustrating to promote new materials without having enough seed stocks to back up the induced demand. This has been a classical error of almost all research systems in third world countries. Thus, in objective 2 successful results could aggravate this situation even more. It is very dangerous to promote a new material having 200 kg of seeds to be distributed! This fact could compromise the entire credibility of a good breeding program. The EEP suggests that from now on, for every improved variety to be released, a marketing plan should be developed. The MO should assist in providing the minimum guidelines for this plan.

In Washington, results from a bean farmer survey indicate that 37 small-scale farmers are currently growing dry beans and 80% of them are located in western Washington. More than half of the small-scale farmer respondents and none of the larger-scale respondents were women. These results follow the national trend where 90% of women farmers are small-scale farmers. Two-thirds of the small-scale farmers saved bean seed from their crop. Primary problems of dry bean production were identified, as well as the type of production system most used. Studies of that nature allow the research team to better establish research priorities in regards to bean seed systems in the state.

**ESA5-A2      Development of Methodologies and Approaches to Evaluate Agricultural Technologies in Target On-Farm Environments to Promote their Adoption in East and Southern Africa and the U.S.**

In Malawi, due to turnover of field extension staff, the trials were not planted in 2003, consequently, there has been little progress made in FY 02B/03. For the FY 03 and 04, efforts have been made to run the planned on-farm trials with Concern Universal in Dedza and another NGO in Champhira. The project's research assistants, Ng'onga and Matapwata, will assist in on-farm trials in Rumphu and Thyolo, respectively. World Vision-Malawi and ActionAid-Malawi will collaborate during FY 2003 and 2004. Two M.Sc. students at Bunda began their course work in August 2003. One student is majoring in Agronomy and will focus on the biological aspects of the on-farm trials such as the performance of the advanced breeding lines as compared to the check varieties. The second student is majoring in Rural Development and Extension and will evaluate farmer perceptions of the advanced breeding lines in comparison to the check varieties.

In Washington, the report presents results from on-station trials in 2001 and 2002, as well as some early field season data for 2003.

It seems reasonable to have a meeting with the project members and to make a comprehensive analysis of all the problems that have arisen since this activity was initiated. It is acceptable to expect some risk when carrying on-farm trials, however, problems could be overcome with more communication among project participants and more project leadership and involvement of all actors.

**ESA6-A1      Develop Bean Cultivars for East and Southern Africa with Enhanced Resistance to Diseases and Insects**

There was limited progress overall during FY 02B/03 because of a number of factors, including: (1) late funding which delayed or prohibited plantings, (2) drought and (3) limited disease pressure.

A number of CRSP bean lines were submitted to the Southern African Bean Yield Trial (SARBYT) and Southern African Bean Evaluation Nursery (SARBEN) trials run by the CIAT/PABRA network. One CRSP line, BCMV-B2, now in advanced yield testing, performed well across a number of sites. This line may be recommended for release. Because of its small seed size and brown seed color, further on-farm trials are needed to determine its acceptance and marketability by farmers. Other bean lines with high levels of resistance to ALS were identified for crossing to Tanzanian adapted materials.

In Malawi, several promising lines have been identified as potential varieties and next seasons on-farm trials will be critical to determine farmer acceptance of these materials. The National Bean Yield Trials - Bush Bean Types were grown at five locations in Malawi, and yield and disease evaluations were made. Two small-seeded red lines from CIAT showed good adaptation and yield. Two sugar-types from Bunda had acceptable yields and good seed

quality. The National Climbing Bean Trials had low yield and there was a problem with soil variability in Bunda.

At Oregon State University (OSU), the backcross breeding program to incorporate arcelin 2 and 4 alleles into 'Rojo' continued as planned. Some cross incompatibility has been found, but is expected to be overcome with an additional backcross. Bruchid feeding trials at SUA indicated that *Arc-4* materials do not have resistance to *Acanthoscelides* bruchids, but some *Arc-2* containing lines showed partial resistance. The on-farm trials with *Arc-1* bean lines did not produce reliable results. Crosses at OSU with a tepary source of bruchid resistance did not produce viable seed.

In conclusion, most of the planned activities for this project were not implemented, or if done, had inconclusive results. Greater regional collaboration with PABRA/CIAT is encouraged. Considering that *Acanthoscelides* is the predominate species of bruchids in the African bean producing regions, a reliance on arcelin resistance will not add significant protection. For *Acanthoscelides*, it may be wiser to promote the use of vegetable oils (a 70's technology), as the most effective means of seed protection.

It is important for this project to show evidence of progress through the release of new bean varieties.

#### **ESA6-A2 Use Marker-Assisted Selection to Improve Selection Efficiency in East and Southern Africa and U.S. Programs**

Advances were made in all three objectives. Six Tanzanian cultivars representing the major market classes were screened for the presence/absence of resistance linked markers. Some of the markers that are available for selection do not function in these cultivars. Another RIL population developed by Dr. Miklas is being evaluated for the *bc-3* anthracnose resistance gene in the cis orientation. Likewise, a RIL population developed by Grafton and Miklas will be used to identify a marker for the *Ur-3* rust resistance gene. Marker data for Phg 1 gene for ALS resistance still needs to be generated. Crosses and backcross were made and populations advanced between the recurrent African parents and donor sources for resistance to BCMNV, rust, CBB and ANT. A gene cluster for halo blight resistance was reported.

This project has made good progress in one year. Most impressive was how they were able to adapt their plan of work based on unfolding results so that no time was lost, and new advances were made. There was limited interaction with Tanzania and Malawi during this first year of activities. The techniques and results of this project will be applicable not only for Africa, but for the Latin American and North American bean breeding programs as well.

#### **Evaluation of East and Southern African Regional Project Annual Technical Progress Report**

During FY 02B/03, there were a number of significant advances made within the East and Southern African Regional Project of the Bean/Cowpea CRSP. There were also some projects

that made little progress in completion of their planned activities. These activities need to be reviewed at the end of the next fiscal year for evidence of progress.

Preliminary assessments of the bean marketing systems in Tanzania, Malawi and Mozambique provided new information about the limitations, potentials and trends of cross border trade, in-country markets and market forces. Nutrition studies looked at the importance of cowpea grain and leaf consumption in Mozambique. Highly nutritious composite food preparations using bean-corn-fish and bean-rice-fish foods were evaluated. Preliminary data on the effect of black bean consumption on slow growth of mammary cancer is extremely exciting.

Breeding programs were conducted in Tanzania, Malawi and in U.S. institutions, with mixed progress in some activities. Several breeding lines have been identified for release in Tanzania and Malawi, and progress needs to be seen in this area. Seed production is going to be a major limiting factor in the distribution and adoption of these materials, and this activity needs reinforcement. CIAT/PABRA, NGOs, as well as local farmer groups will be important partners in these activities.



## **EVALUATION OF THE LATIN AMERICA AND CARIBBEAN BASIN REGIONAL PROJECT**

### **LAC1-A1 Assessment of Constraints to Expanding Bean Supply in Central America**

Progress is reported on three objectives: (1) assessing the profitability of bean production in El Salvador, (2) strengthening seed supply and distribution in Honduras and (3) characterizing the dispersion of abiotic and biotic constraints in Central America, Mexico, the Caribbean and North America.

Except for Objective 3, the research under this activity focuses on relatively narrow issues and a smaller geographical area than the title implies, "Productivity, sustainability, and marketing assessment in Central America." During FY 02B/03, the research was largely confined to Honduras and El Salvador. Although important, the scope of the study and the geographical area covered were relatively limited. Consideration should be given to broader regional issues relating to constraints to expansion of bean supply. Perhaps the activity leaders have a vision of how to build on past studies within the region and how to address these broader issues, but that vision was not shared in the report.

A much broader objective 3 will produce, in collaboration with CIAT, a "bean atlas." This seems like a useful undertaking and work is progressing satisfactorily.

Although the technical quality of the research by this component was high, the annual progress report was poorly organized and written. The EEP recognizes that information from multiple studies was compiled into a single report, however it would have been desirable to edit and use a similar writing style for the reporting of progress. It was also noted that the PIs reported on five objectives while only three appeared in the original workplan, causing some confusion among the reviewers. The MO and Regional Facilitators are encouraged to establish guidelines for the preparation of reports (i.e., reduce paragraph length, limit use of unnecessary acronyms, etc.) and to work with PIs to improve report quality and readability.

### **LAC1-A2 Enhancement of the Sustainability of Bean Production Systems Through Technology and Policies that Improve Production Management**

The Instituto Nicaraguense de Tecnologia Agropecuaria (INTA) shared data on bean technology adoption, Michigan State University (MSU) developed statistical analysis methods, and MSU conducted a training workshop for INTA staff. Eight agricultural economists and women-in-development staff were trained in statistical analysis methods for farm household data using SPSS. In addition, INTA purchased a site license for the use of SPSS 11.5 in Spanish. Using the knowledge and statistical software acquired, INTA regional staff conducted statistical analyses of technology adoption tailored to their regional needs during the workshop. The workshop materials were refined into staff papers in both English and Spanish.

The Honduras research plan for field testing resistant and susceptible bean varieties was postponed until FY 04 due to a delay in funds, making it impossible to conduct research during the postrera season of FY 03.

**LAC1-A3      Enhancement of Demand and Market Opportunities for Beans and Value-Added Products from Central America and the U.S.**

This component has the rather straight forward objectives of studying (1) the structure of the bean subsector in Central America, (2) the demand for value-added bean products in the U.S. that are imported from Central America and (3) trends in U.S. dry bean imports and exports. When completed it should add some key information to the knowledge base that is essential for the value-chain strategy.

Progress is ahead of schedule due to the unanticipated availability of non-CRSP funds to begin work on objective 3. The approach and methodology seem appropriate for attaining the objectives and investigators are well qualified to successfully complete the study.

When completed, the challenge will be to make use of the findings across the regional project and educate the community of scientists about the implications. For example, findings about marketing opportunities for bean and bean products in the growing U.S. latino population should inform bean breeders in the U.S. and Central America about characteristics that new varieties should exhibit.

**LAC2-A1      Enhanced Bean Utilization in the U.S. and Central America**

The PIs have a very justifiable explanation of the lack of progress on the project from the Costa Rican PI. The research is consistent with the workplan, and, as the PIs point out, the workplan is a traditional roadmap in product development.

The research is being published in high quality peer-reviewed journals. Given the funding situation, the progress appears to be reasonable.

The PIs appear to be making attempts to get together to discuss research and to present research findings. The connection to the Kellogg Company is especially intriguing. I suggest that they carry the collaboration to the Kellogg contacts in Honduras and Costa Rica as well. Presumably the PIs will follow up with potential manufacturers of products to determine their interest in actually manufacturing products developed in this project. The PIs indicated that an industrial advisory board consisting of members from companies in the U.S. and LAC would be created. That should move forward especially on this project. Also, the work in Honduras needs to be accelerated. As the project continues to develop it could also consider adding participation from other countries in the LAC. The technical direction is appropriate, and funding for the project should continue.

**LAC3-A1      Increasing Knowledge on the Nutritional and Health Benefits of Beans and Cowpeas as Related to Reducing the Incidence of Cancers and Chronic Diseases**

Eliminating Objectives 2 and 4 and adding Objective 5 has significantly modified the workplan for this project. Eliminating Objective 2 is not so critical but Objective 4 is very important. It

is unfortunate that there will be no investigation of effective approaches to educate school children and care givers of the importance of eating beans. Presumably the investigators knew the approximate amount of the budget when they submitted the proposal. The excuse that Michigan State University (MSU) charged full indirect cost on the whole project is not very compelling.

The evidence of high quality research/substantive technical achievements is not present because of the limited time that the PIs had to conduct research. Progress is minimal except for the new Objective 5 (mammary cancer and effect of beans). It is expected that significant progress will be made during the next year on the project. In the report on progress, why weren't light red beans included in the determination of phenolics? The PI from MSU is to be commended for obtaining additional funds for the project.

The PIs may need to get together since they have modified the project so significantly by eliminating two of the objectives and added another.

It is too early in the project to have significant impacts to report. The PIs should make every effort to bring Objective 4 back into the project including working with the CRSP staff to identify additional funding sources. The real impact of the project will be in getting people to change their eating habits to include more health promoting food like beans into their diets. The project has worthy objectives and is important in the overall scheme to enhance consumption of beans and cowpeas.

### **LAC-CC1-A2 Gender Participatory Research in Improvement of Bean Varieties and Seed Production Systems in the Andean Highlands of Ecuador**

This component has three objectives: (1) participatory evaluation with women and ethnic minority groups of improved varieties of beans, (2) improve local seed production and distribution systems and (3) identify and document best practices. The geographic location of this research/development activity is a relatively small and isolated rural area in Ecuador, home to a large Afro-Ecuadorian population.

The approach is to rely on participatory research methodology and the creation of Committees of Agricultural Investigation (CIAL, is the Spanish acronym), which are elected by participants. Two CIALs were organized by the project and a baseline study using survey information was conducted as called for in the methodology. Work has progressed quite well in spite of funding delays and administrative problems.

One CIAL seems to be achieving the intended results but the second had the misfortune of having their trials become infected with common mosaic virus, leading to abandonment. Nevertheless, there is good reason, based on the first year's operation, that the project will achieve its objectives.

An important question to consider is whether this project will have any significant regional impact even if fully successful in achieving all of its objectives. Even though this activity may have a great impact on the economic well being of the farm families participating in it, the

impact on the region may be quite small, if measurable at all. Yet, this is the question that is likely to be posed at the end of the grant period.

Although some may question whether this activity is appropriate for a CRSP, which is viewed as *research*, the EEP believes it is a useful demonstration of the CIAL model as a means by which technology can be diffused. The EEP encourages the project leadership to explore ways in which the knowledge gained can be applied in the region. The low cost of this activity (\$20,000), the high quality of the work and its ultimate success will greatly mitigate the above concerns.

#### **LAC4-A1 Genetic Improvement of Bean Adaptation to Low Fertility Soil**

The overall goal of this activity is to develop new bean genotypes with better yield in low fertility soils of Latin America. The FY 02B/03 progress was achieved in three areas: (1) identifying bean genotypes with greater P efficiency, (2) understanding physiological traits conferring P efficiency in bean and (3) evaluating Mn tolerance in bean breeding lines. Most traditional breeding has not focused on edaphic stresses, with a few exceptions, such as the successful case of maize and soybean in the Brazilian Cerrado.

Low P field research sites were identified and prepared in Honduras and Costa Rica. These sites will be essential tools for future selection and breeding efforts. In Honduras, a recurrent selection program was initiated to improve bean adaptation to low P and drought. Substantial genetic variation was observed for two promising P efficiency traits, root hairs and adventitious rooting, in the field in Costa Rica. Also, a genetic map for adventitious rooting was developed. An evaluation of 70 breeding lines showed substantial variation for Mn tolerance and a rapid screen for Mn tolerance was validated in regional field trials. This screening is particularly important for Mn since the severity of Mn toxicity is influenced by rainfall and light intensity and, thus, very difficult to control in field conditions.

It is interesting to observe that results from this activity could easily be extrapolated to many other parts of the tropical world, where poor soil fertility is a primary constraint to bean and cowpea production mainly in developing countries. Thus, the EEP recommends more support to this line of research and more interactions with activity ESA4-A1. Also, the EEP congratulates the project leader and participants for the excellent networking and for receiving leveraged funds amounting \$319,000 dollars.

#### **LAC5-A1 Develop Improved Bean Cultivars for the Lowland Production Regions of Central America and the Caribbean**

CRSP has made significant progress in Central America and the Caribbean region in the development of improved small red and large-seeded bean cultivars. One of the upcoming stars, Amadeus 77, has been released in multiple countries. Several promising lines with good seed characteristics and multiple constraint resistance are in the pipeline. Good progress is being made in breeding for increased resistance to BGYM and web blight. Good progress has been made in identifying parents and screening progeny of crosses for resistance to low soil fertility and drought. MAS is being used in a number of cases to identify specific genes in

segregating populations. Breeders from the region contribute significantly to the project and it is a pleasure to read of their successes. Overall collaboration within the region is excellent. CRSP responded to the termination of the CIAT PROFRIJOL network and is providing much needed assistance to maintain the regional bean nurseries. This project will have a major impact in the region.

#### **LAC5-A2     Develop Sustainable Disease Management Strategies for Bean Rust and Web Blight**

Significant advances were made in the project's workplan during FY 02B/03. The bean rust mobile nursery has been a simple, but effective tool in characterizing rust races around the world. This information is being used to target and combine rust resistance genes. In Michigan, six lines with four genes for resistance to rust, plus resistance to both mosaic and necrotic forms of BCMV were released as varieties. The detached leaf test (DLT) for web blight screen was also shown to be effective. New subgroups of *R. solani* web blight associated with distinct symptoms were found. CRSP was instrumental in identifying the presence of BCMNV in San Juan Valley, Dominican Republic, which had contaminated foundation seed stock. This seed was subsequently destroyed to prevent the spread of the virus. Both qualitative and quantitative response to CBB was seen among 14 pathovars tested. This work aims to establish a set of differential lines based on compatible vs. incompatible disease reaction. Molecular markers are being used for selecting specific rust resistance genes. The *Ur-7* gene was mapped on an existing linkage map constructed using recombinant inbred lines.

This project has been successful in its first year. Effective interaction between PIs and collaborators has accelerated progress toward achieving the research objectives. The PIs are also networking outside of their areas of responsibilities, as seen with the studies conducted in Mozambique. This program shows great potential in making impact and will provide breeders with the next generation of resistant germplasm.

#### **LAC6-A1     Development of Improved Bean Cultivars for Highland Production Regions**

The new emphasis on screening both bush and climbing beans in Ecuador for a broad range of agronomic, phenological, disease and yield traits is to be encouraged. There are a number of populations and breeding lines in the pipeline that offer potential for the development of superior varieties. It was encouraging to see farmer participatory work included in this program, as the success of new varieties will depend on many factors, including socio-economic traits.

Developing bean lines with greater resistance/tolerance to drought will be a long-term project, but the use of sites with different types of drought stress is important. Root rot resistance is complicated by a number of biotic and abiotic factors, but is of growing concern in areas with low soil fertility and drought stress. Greater root diameter/biomass seems to be critical for resistance. It is not clear how a more robust root system will affect yield, maturity and other agronomic traits.

Several bean varieties have been released in Michigan.

Overall, this project is going well and is on track with its work plan. Continued collaboration with CIAT and other Andean countries is encouraged. No major changes are recommended.

#### **LAC6-A2 Identification and Deployment of Resistance Genes for Anthracnose, Rust and Drought In Beans for the Highlands Using Modern Molecular Genetic Tools**

Considering that the identification of anthracnose races infecting beans in Ecuador is a major activity of this program, there was no explanation why only two isolates were collected, both from the Santa Rosa sub-station. Considering that CIAT carried out a fairly extensive evaluation of anthracnose race diversity in Ecuador, should this activity even be a priority?

Breeding for anthracnose resistance was initiated using G2333 (Co-42 gene) as a resistant parent, and backcrossed into six Ecuadorian varieties. Considering that there are a number of improved varieties from CIAT and CRSP that already contain the Co-42 gene in appropriate Ecuadorian - Andean backgrounds, why was it necessary to go back to G2333 as a donor parent? This would save at least one cycle or more of backcrossing. The MAS methodology for identifying anthracnose resistance gene was transferred to the INIAP breeding group at Santa Catalina.

The drought and rust breeding objectives proceeded as planned. In addition to developing RIL populations for identifying resistant markers, other crosses combining diverse resistance sources have also been initiated.

This project needs to take greater advantage of work done by CIAT and PROFRIZA in the past and move forward from there.

#### **Latin America/Caribbean Basin Regional Project Summary**

The Latin American and Caribbean Basin Regional Project (LAC) has six components. It involves five U.S. Lead Universities (Michigan State University, Pennsylvania State University, Purdue University, the University of Nebraska and the University of Puerto Rico), who are collaborating in research and training activities with National Agriculture Research Programs and universities in Costa Rica, Dominican Republic, Ecuador, Haiti, Honduras, Jamaica, Mexico and Nicaragua.

Although most activities are in their first year, a considerable amount of excellent scientific information has become available. The EEP offers the following points for consideration:

- Project leaders are expected to adhere to the approved workplans and report on that research unless approved by the MO.
- Scientists in several activities could collaborate more among themselves and PIs are encouraged to pursue more creative ways to interact across the three Regional Projects. For example, most of the edaphic constraints found in the Latin American and the Caribbean

Region are similar to those found in Africa. Therefore, information availability and flow among scientists could speed the end results.

- A stronger interaction is expected from socio-economists and bean breeders. The LAC region has accumulated a tremendous amount of information and knowledge on bean research from past years, so scientists should be careful to avoid “reinventing the wheel,” but to utilize this precious but already available information.
- A more consistent marketing plan should be adopted for new improved variety release. The MO should provide further guidelines on this.
- When circumstances justify, PIs should consider the involvement of South American bean/cowpea producer countries other than Ecuador.
- When appropriate, PIs are encouraged to utilize a participatory research approach for varietal improvement of beans and related technology transfer within a Local Committees of Agricultural Research (CIAL is the spanish acronym). It is wise to keep in mind that a donor’s view of Science is sometimes different from those used by academicians. In this view, scientific results that produce excellent papers with no impact on the well being of communities, particularly the poor ones, are considered of little value. Among the three Bean/ Cowpea CRSP Regional Projects, LAC has one of the best opportunities to achieve and give quantitative evidence of impact.

## EVALUATION OF CROSS-CUTTING ACTIVITIES

### **CC1-A3      Bean and Cowpea Based Foods for Micro and Small-Scale Enterprise Development: Integrating Perspectives from Food Technology, Nutrition and Agricultural Economics**

This cross-cutting activity consists of a workshop and a website focusing on opportunities for bean and cowpea-based small-scale enterprise development. The workshop would involve many of the CRSP PIs. The web page would share information on small-scale bean/cowpea-based enterprise development.

No progress was reported and the activity was postponed until the second year of the project. The report notes that discussion is underway regarding new directions for the component. The EEP understands that this activity is no longer active.

### **CC2-A1      The Impact of Bean Research in Michigan**

This study has the objective of estimating the rate of return and net present value of CRSP sponsored breeding activities at Michigan State University (MSU). To do so requires that a considerable amount of data be collected regarding the breeding program, including varieties released, varietal adoption, germplasm utilization by private seed companies and benefits in terms of yield increases.

Progress reported consists of a rather large amount of descriptive data about the structure of the bean subsector in Michigan, the breeding program, and CRSP/MSU supported varieties released and adopted.

The more valuable analysis on rates of return apparently has not yet been done and no description of the plans and methodology for this analysis are given. The methodology for estimating rates of return to research investments is well documented and there is no reason to doubt the investigators' capabilities to utilize accepted estimating techniques but it would be reassuring to see them spelled out. Also, there was a notation in the "Leveraged Funds" section about a Research Assistant funded by MSU but the training table notes that the Research Assistant was no longer working on the impact study.

Estimates of rates of return to CRSP research investments could be extremely useful evidence of impacts when the five-year evaluation is undertaken. The EEP encourages the PIs and collaborators to complete the planned analysis as soon as possible.



## EVALUATION OF TRAINING

### **Degree Training**

One of the strengths of the CRSP programs has been the degree training programs. This continues to be the case with the Bean/Cowpea CRSP. Today, a greater portion of the training is being done at regional universities. This serves three purposes: (1) strengthens and supports host country universities, (2) focuses graduate thesis research on local problems and needs and (3) lowers overall training costs. A total of 49 students were receiving degree training; 9 were completing their degrees during the current work plan, and 5 were pending. Only 5 students had discontinued their study program. There was a good balance between Masters and Ph.D. students and the large majority of students were from the host countries. About half were studying in U.S. institutions and half in HC institutions.

One concern was that there are a large number of Ph.D. students in Agriculture Economics. Is the number of Ph.D. level economics studies, compared with other disciplines, appropriate for the mission of the CRSP considering that many of these students historically do not return to their HC after their degrees are completed?

### **Short-Term Training**

Because of budget allocations and communication problems, 11 out of 20 workshops and short-term training events were not held as planned. A number of these events have been rescheduled for later, but for others, no information was given. A follow-up on these events is needed.

## **EVALUATION OF THE MANAGEMENT OFFICE (MO)**

The EEP was asked to review and evaluate the effectiveness of the MO during the first year of the new grant, FY 02B/03 and was provided a scope of work that included a list of detailed questions covering a wide range of management issues. These questions were used as a starting point and a guide for our review but in exercising our independence, the EEP selected and framed those issues on which to comment for this review and evaluation.

Our comments and recommendations presented here are based on written material provided to the EEP as well as oral discussions with the MO staff during the EEP meeting, in February 2004. Comments and recommendations are organized around four major areas of responsibility: (1) providing administrative support, (2) exercising program leadership, (3) assessing program structure and organization and (4) fulfilling obligations to USAID.

### **Providing Administrative Support**

An important function of the MO is to provide administrative support to all elements of the CRSP, including financial and accounting oversight. This is a huge challenge given the number of U.S. and Host Country institutions involved and the USAID record keeping and reporting requirements. The challenge was further complicated during the first year of the new grant by (1) the unexpected need to relocate the MO office on the Michigan State University campus and (2) an unplanned delay in USAID funding. It is significant that both circumstances were beyond the control of the MO.

These two unanticipated events created an enormous administrative workload, coming on top of the heavy workload associated with closing out one grant and starting up the new program. The EEP commends the MO for successfully completing the transition in spite of these handicaps. This accomplishment is a tribute to the dedication and commitment of the MO staff to the CRSP.

Funding delays by USAID and the necessity of additional paperwork also imposed an added burden on all CRSP participants, especially principal investigators, collaborators and their staff. Significantly, however, none appeared to blame the MO for their frustrations and delays based on comments in the first year progress report. While there is no way to measure the costs of the funding delays by USAID, the impact on the program was certainly significant. When it became apparent that USAID would not be able to fund the new grant as planned, funds were allocated under the old grant for a two month extension (August 1 to September 29, 2003) after which the new grant was funded. This created a paperwork nightmare all up and down the CRSP organization! The EEP suggests that USAID review procedures for grant funding to find ways to minimize the transaction costs associated with transitions between grants.

The increased number of subgrants and Memorandums of Understandings (MOUs) in the new grant imposed an added paperwork burden on all participating institutions. The lack of timely completion of paperwork by some institutions also contributed to start up delays. The EEP

believes the MO should hold these institutions accountable by tying future funding to timely completion of these essential documents.

The MO has made a special effort to minimize transaction costs in administering the current grant as encouraged by USAID. The EEP applauds this effort but must point out that ironically, a large fraction of total transaction costs incurred by the CRSP are necessary to comply with USAID requirements and adjust to funding uncertainties.

### **Exercising Program Leadership**

Providing leadership for the Bean/Cowpea CRSP is perhaps the most essential function performed by the MO, notwithstanding the important role played by the TC. At the end of the day, it is the MO that must account for any failure to lead the program to successful completion.

The MO is to be commended for exercising strong program leadership in this first, difficult year of the grant. The MO staff appear to be very well informed about the personnel working on the projects and the progress on the projects and they make good use of the technical expertise represented in the TC. The MO is also to be commended for their commitment to institutional capacity building as evidenced in part by the special effort to strengthen weak institutions in Africa.

The MO emphasizes a “collaborative leadership style” in exercising program leadership, relying heavily on the TC and PIs for technical guidance. The EEP believes that this is appropriate but we also recognize that there are circumstances in which decisive action by the MO is called for. We encourage the MO to make tough unilateral decisions when needed. The EEP expects the MO to exercise their authority to make shifts in funds between projects, when appropriate, as an exception to the normal decision-making process.

An essential element of program leadership is a clear vision of the program objectives and how they are to be achieved. The EEP is convinced that the MO leadership has such a vision for the Bean/Cowpea CRSP and has articulated that vision clearly to all participants and clientele.

One additional suggestion to facilitate even further understanding of the projects and the problems they face is for the EEP to occasionally meet in one of the host countries. Prior to meeting, the EEP as a group or individually could spend one or two days in a host country conducting a thorough review of the projects.

### **Assessing Program Structure and Organization**

The Bean/Cowpea CRSP, organized around three regional projects, thematic areas and research activities, is rather complex. The MO is assisted in governance by a Board of Directors, composed of Institutional Representatives, and a Technical Committee (TC) made up of PIs from each region plus a representative from CIAT and IITA.

With 11 U.S. universities, 22 Host Country institutions and 32 research activities, a hierarchical organizational structure is necessary. Organizing around three regional projects, while not perfect, is working quite well. An unintended consequence is that there is little interaction or coordination across regions on activities associated with each thematic area. For example, training needs in LAC as compared to needs in Africa are not routinely evaluated or vetted. The EEP recommends that the MO and TC give more attention to this deficiency but it is too early in this grant period to make any changes in organizational structure.

### **Fulfilling Responsibilities to USAID**

The ME/MO has special responsibilities to USAID as the major source of funds for the Bean/Cowpea CRSP. Not only is USAID a donor but it is also a partner in a larger international development effort. The 11 participating U.S. universities contribute a significant portion of the costs of the CRSP and they also lend much needed political support for international development. Thus, not only does the Bean/Cowpea CRSP have special responsibilities to USAID that go with any grant, there are shared responsibilities as partners to further international agricultural development.

This context is important for it implies that participating universities and USAID have responsibilities to each other and share joint responsibilities for furthering the cause of international agricultural development. The Board for International Food and Agricultural Development (BIFAD), which originated the CRSP concept, serves as an example of that shared responsibility.

A current issue that illustrates the tensions associated with that joint responsibility is a proposal by USAID to re-bid the ME for all CRSPs upon the expiration of the grant. There are pluses and minuses to this proposal. Clearly competition is beneficial in that it can sharpen one's dedication to progress but there are also transaction costs to consider. Following the "if it ain't broke don't fix it" philosophy, the EEP suggests that a peer review process be employed to determine whether or not the ME/MO is performing fully satisfactory. If so, we see no reason to incur the additional costs of re-competing. On the other hand, if performance is less than fully satisfactory then USAID should open the ME to full competition.

In fact, a review process is already required by the CRSP Guidelines, which with only minor modifications could serve this purpose. The Administrative Management Review Team, which normally conducts a review of the ME/MO near the end of a grant could be tasked to conduct a comprehensive evaluation of the ME/MO. This evaluation could serve as the basis on which USAID decides whether to open the ME to competition. The EEP proposes this process as a reasonable compromise on this contentious issue.

The EEP offers two additional suggestions to both the MO and USAID for strengthening the partnership. First, the MO and USAID should "market" the CRSP as the agricultural research arm of the USAID. Although the International Agricultural Research Centers also serve as an important resource for missions, the Bean/Cowpea CRSP is unmatched as a cutting edge research network for these important food crops. Second, both USAID and the MO should vigorously pursue mission buy-ins to the Bean/Cowpea CRSP. Even though past efforts have

not been successful, changed circumstances and the turn over of mission personnel may improve the chances of success in the future.

**BEAN/COWPEA CRSP FY 02B/03 EXTERNAL EVALUATION PANEL**

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