

**AMENDMENT TO TECHNICAL APPLICATION
FOR
DRY GRAIN PULSES COLLABORATIVE RESEARCH SUPPORT PROGRAM (CRSP)**

Submitted August 28, 2009

A. PERSPECTIVES ON GLOBAL FOOD INSECURITY AND POVERTY

The Global Hunger Index indicates that unacceptably slow progress is being made to reduce food insecurity worldwide, especially in Sub-Saharan Africa. A third of Africans still suffer from malnutrition and over 120 million Africans – Africa’s “ultra poor” – suffer chronic hunger.

Josette Sheeran, World Food Program Executive Director, highlighted the impact of the current economic crisis on the hungry, by stating, “as the financial crisis hits the hungry even harder, we must sustain unprecedented efforts to meet the urgent food and nutritional needs of the most vulnerable people, while promoting smallholder farmers and agriculture.”

The reality is that food insecurity and hunger, however, are closely tied to poverty. The countries with the highest indices of food insecurity are invariably the countries with comparatively low incomes.

The high food prices that were widely observed in 2008 most severely impacted poorer households, especially those of urban poor, considered to be the most vulnerable. In Central American countries, retail prices of common dry bean reached unprecedented levels, exceeding \$1 U.S. per lb, prompting certain countries (e.g., Honduras and Nicaragua) to temporarily prohibit bean exports. These and other governments in Latin America and Africa recognized that beans and cowpeas are critical staple foods in diets of the poor and if they didn’t intervene to ensure access to affordable grain, the poor would be protesting and rioting.

Higher costs of staple foods, including pulse grain, cut into the budgets of poor households, placing at great risk undernourished infants and children. A major consequence of undernourishment is reduced present and future productive potential of a society.

Increasing the production and marketing of food staples is considered vital by NEPAD and CAADP to address the structural imbalance in supply and demand of food supplies, reduce food prices, and increase incomes and revenue needed for poor families to purchase food. Increasing the production and productivity of staple foods will also stimulate higher rates of agricultural growth and contribute to sustainable reductions in food insecurity in Africa.

An integral part of any strategy to address “food insecurity” is to increase the production in and marketing of key food staples by (1) increasing agricultural productivity and production, (2) increasing regional trade in food staples, and (3) promoting sound market-based principles to ensure that staple food systems are working effectively.

Although most programs recognize the economic and nutritional importance of such energy rich staple foods as cereals (maize, rice, cassava, etc.), few agencies and governments give due recognition to pulses as vital “staples” for nutritional, food and economic security. Not only are pulse crops such as common bean, cowpeas, pigeon peas, lima beans, lab-lab, etc. integral and essential components of sustainable agricultural systems throughout Africa and Latin American countries, but pulses are also critical components of nutritious diets by providing essential protein, fiber and micronutrients.

The Comprehensive Africa Agriculture Development Programme (CAADP) aims to stimulate agriculture led development in such a manner as to eliminate hunger and reduce poverty and food insecurity. CAADP Pillar III (Framework for African Food Security) recognizes the important linkages between poverty, hunger and malnutrition ---and thus the enormous threat posed by chronic hunger and malnutrition to the current and future productivity of Africa.

Key objectives of CAADP's Pillar III are:

- 1) To improve risk management by vulnerable populations whether resulting from climatic or economic shocks,
- 2) To increase supply of affordable food commodities through increased production and market linkages,
- 3) To increase economic opportunities for the vulnerable particularly through value addition to agriculture production (e.g., processing, handling, transport, etc.), and
- 4) To increase the quality of diets through diversification of food (especially protein and micronutrient rich foods) among target groups.

The four Thematic Foci of the Dry Grain Pulses CRSP closely align with these objectives of Pillar III.

- To reduce bean and cowpea production costs and risks for enhanced profitability and competitiveness,
- To increase the utilization of bean and cowpea grain, food products and ingredients so as to expand market opportunities and improve community health and human nutrition,
- To improve the performance and sustainability of bean and cowpea value chains, especially for the benefit of women, and
- To increase the capacity, effectiveness and sustainability of agriculture research institutions which serve the bean and cowpea sectors and developing country agricultural industries.

The reoccurring themes in the food security agenda for both the CAADP and Dry Grain Pulses CRSP programs include risk management, increasing productivity, value addition, increasing quality of diets for improved human nutrition, and improving linkages among stakeholders in commodity value chains.

B. POTENTIAL CONTRIBUTIONS OF THE DRY GRAIN PULSES CRSP TO ADDRESS GLOBAL FOOD INSECURITY AND POVERTY

The Dry Grain Pulses CRSP is well positioned to support USAID's efforts to reverse the growing problem of global hunger, food insecurity and poverty utilizing the additional funding to be received in FY 2010-12. Critical dimensions of a comprehensive food insecurity and rural poverty amelioration strategy where the Dry Grain Pulses CRSP believes it can make substantial contributions through research, outreach/technology dissemination and human resource development include:

- Increasing resilience of resource-poor farmers to shocks and threats in pulse production systems
- Increasing profitability and sustainability of pulse-based production systems
- Increasing small-scale farmer access to and competitiveness in local, domestic and regional pulse markets
- Increasing consumer access to information on the nutritional value of pulses and to affordable nutrient dense pulse foods

Increasing Resilience

Achievement of food security objectives requires technologies and knowledge that better enable vulnerable populations to cope with and manage shocks, stresses and threats that affect their ability to sustainably produce, access and/or utilize food staples such as pulses. Examples of “shocks, stresses and threats” which farmers face in many developing countries of Africa and Latin America include increased costs of petroleum-based inputs for crop production (e.g., nitrogen fertilizer, energy, etc.), climate change and associated abiotic stresses, increased incidences of pest outbreaks, lack of access to affordable and quality pesticides (due to increased marketing of inferior quality and incompletely labeled agrochemicals from Asia), market perturbations caused by food aid imports, and growing challenges to access and participation in regional and global food supply chains.

The Dry Grain Pulses CRSP proposes to focus on integrated pulse crop management technologies that reduce dependency on expensive nitrogen fertilizers by maximizing biological nitrogen fixation, that improve water use efficiency through the planting of improved varieties adapted to drought, and that minimize the need for use of caustic and expensive synthetic insecticides by implementing integrated bio-control measures for insect management.

Increasing Profitability and Sustainability

Resource-poor pulse farmers must find low cost means to increase productivity while not compromising on grain quality. This presents a challenge for small-scale farmers since they cannot achieve economies of scale within their production system. When farmers decide to incorporate technological inputs there must be a reasonable assurance of an acceptable return on investments or a reduction in the crop production risks in unpredictable abiotic and biotic environments.

The breeding and dissemination of improved common bean and cowpea varieties with adaptation to abiotic stresses such as drought, resistances to economically important diseases and insect pests represents, plus high yield potential and yield stability, presents a cost effective strategy in increase cropping system productivity. The Dry Grain Pulses CRSP will focus on multiplying and promoting the adoption and planting of improved bean and cowpea varieties with the appropriate spectrum of agronomic traits for adaptation and production in the distinct agro-ecological zones of Africa and Latin America.

Sustainability and profitability are not competing objectives, since profitability is a critical factor determining ultimate sustainability of any farming system. On the other hand, a sustainable system must include practices that improve soil health and fertility, that conserve biodiversity, and that do not adversely affect environment quality and human health. Pulse (legume) crops are unique in that they have the capacity to biologically fix atmospheric nitrogen, thus reducing the need for expensive nitrogen fertilizers (reducing production costs) and improving soil productive potential.

The Dry Grain Pulses CRSP proposes to achieve sustainability objectives by (1) developing integrated crop management technologies and strategies to substantially enhance biological nitrogen fixation in bean and cowpea-based cropping systems and (2) by deploying bio-control measures (e.g., the introduction of beneficial predatory insects, insect parasitoids, insect viruses, etc.) for insect pest management in cowpea in the Savanna regions of West Africa.

Increasing Access and Competitiveness in Markets

Pulse crops, especially common beans (*Phaseolus vulgaris*) and cowpea (*Vigna unguiculata*), are strategically important to food security and poverty alleviation since they are both cash crops for large numbers of small-scale resource-poor farmers as well as staple foods for high percentages of the population in both Sub-Saharan Africa and Central and South America. Since pulses are internationally traded commodities, pulse farmers are presented with the opportunity to participate in local, domestic

and/or external markets. Studies reveal established and expanding market grain sheds for individual pulse commodities within specific regions of Africa and the Americas as well as trade opportunities between these continents. As examples, Nigeria and Senegal represent growing markets for cowpea grain produced in West Africa, while Brazil, Mexico and South Africa are major importers and consumers of common bean. Pulse farmers in countries within the respective market sheds are strategically positioned to exploit domestic and regional market opportunities as well as respond to intermittent grain shortages within the region due to under crop failures.

Small-scale farmers however are faced with the real challenge of accessing and participating in domestic and regional markets due to low grain volumes, instability of supply and typically inferior grain quality as demanded by the market place (i.e., processors, grain wholesalers and retailers, etc.).

In recognition of this access issue, the Dry Grain Pulses CRSP proposes to focus future research efforts on better understanding constraints to smallholder pulse farmer (including women) participation in domestic and regional markets and in trade, and to recommend appropriate interventions and public policy changes.

To increase competitiveness of pulses in the market place, the Dry Grain Pulses CRSP will continue to direct research and outreach activities toward the development of technologies that will reduce the cost to produce a unit quantity of a pulse grain or by increasing its value (e.g., improved grain quality, enhancing nutritional value, processing of nutritious foods, etc.).

Increasing Nutritional Security

Food security cannot be effectively achieved without simultaneously achieving nutritional security. Although food security concerns apply to both rural and urban poor, the urban poor are most vulnerable to experiencing nutritional insecurity due to the lack of access to a diversity of affordable and nutritious foods. The rural poor can typically grow and harvest a wide diversity of nutritious pulses, leafy vegetables and native plants, fruits, etc. to supplement starchy staple foods (i.e., cereals, tubers, etc.) in their diets. The urban poor are constrained by the inability to afford quality nutritious foods, exposure to poorly nutritious convenience foods, and information on health diets.

The Dry Grain Pulses CRSP will contribute to nutritional security objectives by promoting among target populations (i.e., children and adolescents, pregnant women, etc.) diversified high nutritional-quality diets which incorporate increased consumption of pulses. As food staples that provide essential protein, micronutrients and complex carbohydrates, beans and cowpea-based diets represent an affordable and effective strategy to achieve nutritional security. Beans and cowpeas are culturally accepted foods and typically available at comparatively low prices in markets in developing countries, but unfortunately not appreciated for their nutritional value and health promoting benefits. Consumers need to have access to nutritional information and access to nutritious flavorful pulse-based value added foods in order to make more healthy dietary choices.

C. PROPOSED TECHNICAL APPROACH FOR USE OF ADDITIONAL FUNDS

The Dry Grain Pulses CRSP proposes a multi-faceted approach to address the problem of growing hunger and food insecurity utilizing the additional funds from USAID for expenditure during the remaining three years of the current five-year award (FY 2007 -2012). The proposed technical approach reflects a commitment (1) to maintain and build upon a strong foundation of research and human resource development which are considered essential for a long-term food security strategy, (2) to invest in critical new areas of research and outreach to address major constraints to sustainable increases in pulse production, marketing and utilization, and (3) to promote and disseminate pulse technologies with high

promise for developmental impacts in target developing countries of Sub-Saharan Africa and Latin America. The global Pulse CRSP program activities will be underpinned by ex-post impact assessment to learn from past CRSP successes and failures, as well as research on pulse value chains to assess ex-ante potential for impacts that can provide the Management Office and the Office of Agriculture in USAID with information and tools to make informed future CRSP research and outreach investment decisions.

1. Strategic New Investments in Pulse Research and Technology Dissemination to Address the Global Food Crisis

The Dry Grain Pulses CRSP proposes to establish a Phase III program involving three-year projects (October 1, 2009 – September 29, 2012) that address strategic research and technology dissemination needs related to the global food crisis. These projects would be complementary to existing Phase I and future Phase II projects which are being implemented as part of the Technical Application approved by USAID in 2007 for the five-year award period.

The technical foci of Phase III projects were determined as a result of a consultation with the Technical Management Advisory Committee (TMAC) in April 2009 and a prioritization process. The criteria used by Management Office in choosing the priority focal topical areas for Phase III projects included:

- Alignment with Global Program Themes established in the approved Technical Application for the Dry Grain Pulses CRSP (2007 – 2012)
- Potential impact on the global food crisis in developing countries in Sub-Saharan Africa and Latin America
- Priority technical themes and topical areas on pulses not addressed by Phase I and II projects
- Contribution to wide spread dissemination and adoption of improved technologies, knowledge and management practices, increased trade, commercialization and consumption of pulse grain and value-added products, and/or the formulation of policies that facilitate the functioning of viable commodity value-chains in developing countries.
- Complementary to and not duplicative of current research, training and technology dissemination programs on pulses supported by other donors (i.e., AGRA-Rockefeller, Gates Foundation, McKnight Foundation, etc.) and involving institutions in Africa and Latin America (e.g., NARS, IARCs, etc.).
- Reflect an understanding of and an alignment of research activities with the Presidential Initiative to End Hunger in Africa (IEHA) and subsequent related documents generated by USAID.

In anticipation of an increase in the authorization ceiling for the Dry Grain Pulses CRSP award (2007-12) and an increase in annual funding for the final three years of the award, the Management Office prepare and issued a Request for Proposals (RFP) on July 22, 2009. Prior to its issuance, the RFP was reviewed by the Office of Agriculture, EGAT, USAID.

On July 22, 2009, the Management Office issued an Amendment to the RFP requiring all proposals to include plans and activities to ensure extension and dissemination of research outputs with the ultimate goal of achieving broad quantifiable developmental impacts which benefit stakeholders of pulse value chains, especially resource-poor farmers and consumers of pulses. The RFP and the subsequent Amendment can be accessed at www.pulsecrsp.msu.edu/.

The intent is to fund approximately five Phase III research, technology extension, institutional capacity building projects of three-year duration which address the priority topical areas of (1) Enhancing biological nitrogen fixation in bean and cowpea production systems, (2) Achieving

nutritional security for improved health of target populations, and (3) Improving the performance and sustainability of pulse value chains. A total of \$2,700,000 has been budgeted for Phase III projects, providing a total of between \$500,000 and \$600,000 for each sub-awarded project. A minimum of one award and a maximum of two awards will be made in each of the three priority topical areas. The ultimate distribution of awards among the topic areas will be a function of the quality of the proposals received in response to the RFP.

The following describe justifications and the technical foci for the three priority topical areas as presented in the RFP of June 25, 2009.

a. Enhancing Biological Nitrogen Fixation (BNF) in Common Bean and Cowpea Production Systems (Under the Theme of “Reducing Production Costs and Risk”)

The competitiveness and sustainability of bean and cowpea value-chains is contingent upon the ability of farmers to grow and supply grain in adequate quantities at competitive prices with the desired quality attributes to domestic, regional and/or global markets.

The competitiveness and sustainability of pulse production systems however are in jeopardy. In developing countries, resource poor farmers frequently apply limited or no inorganic or organic fertilizers to meet the mineral nutrient requirements of pulse crops. Since the pulse based production systems are not being managed to maximize biological nitrogen fixation, pulse grain yields are frequently low and soil degradation occurs. In situations where farmers have access to capital and chemical fertilizers, nitrogen (N) fertilizers are being applied to pulse crops at unjustifiably high rates in an effort to increase yields. As a consequence, the high cost of the nitrogen fertilizer inputs is contributing markedly to increased production costs and diminished profit margins. Moreover, high rates of nitrogen leaching into ground waters and nitrous oxide emissions are resulting from the synthetic N fertilizer applications, potentially contributing to environmental contamination and global climate change.

The cost of chemical nitrogen fertilizers and its usage on crops have increased dramatically within recent decades. The rising cost is in part attributable to the high energy requirements for the Haber-Bosch process to convert nitrogen gas (N_2) from the environment to ammonia. Consequently, resource poor farmers cannot realistically afford and acquire costly nitrogen fertilizers and must seek alternative means of providing for the nitrogen requirements of the crop.

Pulse crops, being legume species, have the capacity to fix N_2 when in a symbiotic relationship with rhizobia bacteria in the soil and therefore provide in part for their own nitrogen needs for growth. Most farmers are not taking advantage of this capacity to reduce the need for fertilizer inputs. In fact, research has demonstrated that nodulation and biological nitrogen fixation (BNF) are suppressed when mineral fertilizer salts are applied to pulse crops.

Enhancement of BNF in bean and cowpea production systems would be an effective strategy to increase the productivity and profitability of food cropping systems while reversing the degradation process of soils. Pulse crops can play a vital role in both improving the sustainability of cropping systems and achieving soil and environmental stewardship objectives in developing and developed countries. This role becomes even more important when one recognizes that pulse crops are being frequently displaced to more marginal farmland in order to accommodate increased production of higher value crops including maize and soybean for “biofuels, and horticultural crops. While increases in yield on nutrient poor soils without the requirement of high N inputs helps farming systems to remain profitable, one must also

consider the economic value of the environmental benefits accrued from the biological nitrogen fixation as compared to the application of synthetic nitrogen fertilizers.

Previous research has demonstrated that common bean has the potential to fix between 20 and 80 kg of N per ha per growing season depending upon the genotype, population of *Rhizobium*, and environmental conditions. If inoculation and soil amendments are added to increase nodulation and N₂-fixation rates, up to 90 kg of fixed N per Ha have been reported. In Brazil, yields of up to 4,000 kg/Ha of bean grain have been achieved without the use of N-fertilizer. Similar rates of BNF have been reported for cowpea.

The consensus among scientists is that significant genetic variation in BNF capacity exists among edible pulse genotypes and that this genetic potential has not been fully exploited. Bean and cowpea breeding programs in the U.S. and abroad have invested few resources in the selection and development of improved genotypes with high nitrogen fixation capacity combined with high yield potential. Likewise, limited research has focused on maximizing BNF and on improving soil health through integrated crop management of pulse-based agricultural systems.

Research proposals are being sought which achieve the following:

- Breeding of improved bean and cowpea varieties with high biological nitrogen fixation capacity (i.e., early nodulation, improved symbiosis with *Rhizobia*, high efficiency N₂ fixation, etc.) in combination with desired agronomic traits so as to reduce the need for nitrogen fertilizer applications.
- Use of molecular genetic tools to elucidate the genetics of BNF and to identify markers to facilitate the selection of high BNF capacity genotypes of common bean and cowpea.
- Development of technologies which contribute to increased biological nitrogen fixation processes within a pulse-based cropping system (i.e., use of inoculants in combination with other integrated crop management strategies, etc.) so as to improve the productivity, profitability, and sustainability of agricultural systems on degraded soils.

b. Achieving Nutritional Security for Improved Health of Target Populations (Topical Area under the Theme of “Increasing Utilization”)

Increasing global consumption and utilization of pulses is necessary for growth of markets and the value chains of these commodities. Although the contribution of pulses to the food security of poor households in Africa and Latin America is well recognized, few appreciate the important nutritional and health benefits accrued when pulses are integrated into diets. Pulses are known to be one of the best food sources for inexpensive quality protein as well as to provide essential micronutrients, anti-oxidants, and complex carbohydrates for prolonged energy and dietary fiber. Unfortunately, however, insufficient research data is available to clearly establish the link between pulse consumption and health consequences. For improved nutrition and good health to be driving forces for increasing consumption and utilization of pulses, consumers, public officials, and the business sector need to have access to quality scientific data so as to direct and shape food policy decisions, marketing strategies and consumer education programs.

Under- and mal-nutrition continue to be prevalent among children and adolescents from poor families in Africa and Latin America. This vulnerable population lacks consistent access to staple foods of high nutritional composition at an affordable price. Without adequate protein and micronutrients in diets, malnourished children experience impaired growth, poor cognition, and weak immune systems all of which adversely affects their physical and academic performance and even increase the risk of diseases in adulthood. Pulses which are either prepared from grain or in processed form provide a food-based solution to child malnutrition in many countries, especially those where pulses are staple foods in diets and available at affordable prices.

Obesity and associated chronic diseases are reaching epidemic proportions in many developing countries, especially among adult urban populations, due to more food choices. The World Health Organization (WHO) has declared that diabetes is currently the number one health problem in the world. Nutritional research indicates that regular pulse consumption reduces the risk of chronic diseases including cardiovascular disease, type 2 diabetes and cancers plus enhances satiety. The constituents in beans and other pulses that confer health promoting properties and reduce the risk of chronic diseases are poorly understood. In order for pulses to assume a greater role and be promoted as an ideal staple food for addressing the growing global epidemic of chronic diseases, additional research is required to elucidate the bio-functional properties of pulse grain and ingredients that confer health benefits. This information would greatly enhance the potential to genetically improve pulse grain for composition of health promoting constituents and for the development of nutritious health-promoting processed pulse-based foods.

Recent data indicates that pulse consumption tends to decline when consumers are presented with greater food choices (e.g., resulting from the emergence of supermarkets) and have greater disposable income for food purchases. Due to the association of pulses with traditional diets, there is a general lack of public appreciation for the health and nutritional benefits of eating pulses. To reverse such trends, educational programs based upon excellent science and clinical studies are required to influence decision makers and inform public health officials and health care providers. Policy makers need to also have a better grasp of the economic value of nutritionally improved diets with greater vegetable protein (e.g., from pulses) in terms of reduced health care costs and increased productivity.

Research proposals are being sought which address the following:

- Identify bio-active compounds in beans and cowpeas that provide specific health benefits (e.g., reduce type-2 diabetes risk, etc.) and increase understanding of the functional properties of these constituents.
- Investigate the contribution of bean and/or cowpea consumption in diets through selected interventions (e.g., school lunch programs, food aid, etc.) and clinical studies to growth, physical performance and cognition of young children, bio-indicators of type-2 diabetes, and/or on the progression of HIV to AIDS.
- Estimate the long-term costs to society in terms of lost productivity, increased health care, etc. resulting from shifts away from bean/cowpea consumption as staple foods in diets.

c. Improving the Performance and Sustainability of Pulse Value-Chains (under Theme of same title)

Successful commodity value-chains that extend from producers to consumers are a pre-requisite to achieving impacts, as they determine the scope and scale of the adoption and uptake of new technologies and practices generated by research. Well-functioning value-chains are characterized by strong and interconnected sub-sectors where products pass through a chain of activities (e.g., production to processing to marketing to consumption) such that at each activity the product gains some value.

Beans, cowpeas and other pulse commodities are still produced in many parts of the world under the traditional system of subsistence agriculture. Such a system is characterized by a simple, shorter value chain, as most of the production is either consumed by the farmers themselves or sold in nearby informal markets. However, there is also a growing segment of the developing world in which beans, cowpeas and other pulses are shifting or already shifted from subsistence-oriented production to a more specialized and market-oriented system. Such a market-oriented system is characterized by a greater reliance and importance of input and output delivery systems and increased integration of agriculture with other sectors of the domestic and international economies. With this structural transformation, many functions formerly conducted on the farm, such as input production and output processing, are shifted to off-farm elements of the economy.

One implication of this structural transformation process is that driving down the real cost of pulse commodities to consumers requires increased attention to fostering technical and institutional changes in both the *on-farm* (i.e., input systems and production) and *off-farm* (i.e., processing, transportation, marketing, etc.) elements of the pulse value-chains. Research agenda to foster such technical and institutional changes thus needs to be guided by a clear understanding of the constraints and opportunities along the value-chain (i.e., both on-farm and off-farm) to drive down the real cost of pulse commodities. Increasing such understanding and identifying strategies to alleviate the constraints and pursue manageable opportunities is thus an important research theme that the Pulse CRSP proposes to undertake. One of the aims of this research theme is to enable the MO to identify and prioritize research that is most likely to result in the adoption, uptake and impacts of the outputs generated by the CRSP collaborative research efforts and thus increase the potential return on research investments by USAID.

Research proposals are being sought to achieve the following objectives:

- Increase understanding of constraints to smallholder pulse farmer (including women) participation in domestic and regional markets and in trade, and to identify appropriate technical and institutional interventions that could effectively reduce costs and increase profitability and competitiveness of smallholder pulse farmers.
- Identify "weak links"/constraints in the functionality of dry grain pulse value-chains in major pulse producing/consuming countries/regions.
- Increase understanding of the economic, environmental, social, and health/nutritional value of benefits generated by the pulse sector in selected countries.

2. Extending Outputs of Pulse CRSP Research

a. Expanding Phase II Projects for Increased Technology Dissemination

In response to USAID’s request (14 July 2009 letter) to increase resources in CRSP activities that “promote the extension of technologies”, the Dry Grain Pulses CRSP proposes to increase the total budgeted support for Phase II projects from \$2,469,170 to \$2,963,004, a net increase of 20%. To qualify for increased funding, PIs of continuing Phase II projects¹ would be required to present acceptable workplans for activities that promote and/or contribute to the dissemination of technologies and knowledge, which resulted from or were directly related to Phase I research activities, utilizing the additional funds. Since the purpose of increasing financial support for Phase II projects is to leverage greater investments in technology extension activities, final budgets for the eight projects may not be uniform. Principal Investigators will need to justify an increase in budget based upon the strategic importance of the new technology, the effectiveness of the proposed plan to promote and disseminate the technology, and the potential for impact on a significant number of beneficiaries (e.g., resource-poor farmers, etc.) over a broad geographical area.

The Management Office, however, recognizes that certain Phase II projects will not be in a position to be introducing a new technology or practice for commercial use during Phase II due to the long-term nature of certain areas of agricultural research (e.g., plant breeding, integrated crop management approaches which incorporate multiple new technologies/practices, etc.). It must be remembered that in certain agro-ecologies, only two years of field experimentation may have been completed during Phase I, which is certainly not adequate to be recommending management practices with any degree of confidence. In such cases, PI will be required to provide a timeline of when research outputs will become available for promotion and extension to appropriate target groups, plus a long-term plan.

The Management Office also believes that technology dissemination must be in conjunction with a strong on-going foundation of agronomic research activities. Well established and productive agriculture research programs in developing countries will develop a “technology pipeline” which results in a continuous stream of outputs over time that can be of great benefit to stakeholders of pulse value chains. The best use of Dry Grain Pulses CRSP resources is therefore to commit long-term financial support to strong and productive HC pulse research programs (with periodic evaluation to ensure accountability), and to use incentives to ensure that these programs plan for and form appropriate partnerships with private sector organizations, NGOs, etc. for the dissemination of technologies and knowledge.

b. Targeted Investments to Disseminate Promising Technologies in Strategic Countries/Regions

The Dry Grain Pulses CRSP will make targeted investments in strategic host countries and regions to introduce and disseminate promising technologies with high potential to benefit resource poor cowpea and common bean farmers. With the \$400,000 that is budgeted, the Management Office will work with NARS, NGOs, Ministries of Agriculture, farmer organizations, IARCs, and certainly USAID country and regional missions to design and implement two or three effective 2.5 year technology dissemination projects (April 10, 2010 – September 29, 2012). In an effort to identify the “best bets” of promising technologies and to consider the most effective approaches for transfer of the new CRSP technologies, the

¹ A decision on the continuation of the current Phase I projects in to Phase II will be based upon continued interest expressed by the U.S. and HC PIs, project performance, and continued relevance to USAID strategic objectives.

Management Office will solicit concept papers from institutions supported through or affiliated with ongoing sub-contracted Dry Grain Pulses CRSP projects. Based upon the merits of the ideas put forth in the concept papers and apparent interests and commitments of matching support from potential partner organizations, the Management Office will select and approach appropriate partners to design and implement a viable technology dissemination project.

As a result of consultations with various experts, the Management Office proposes to direct its initial investments during the balance of the current five-year Dry Grain Pulses CRSP award to (1) promote and disseminate seed of improved varieties of bean and cowpea, and (2) the implementation of a comprehensive bio-control program for the management of economically important insect pests on cowpea in West Africa.

1) Promotion and Dissemination of Seed of Improved Varieties

a) Dissemination of Seed of Improved Black Bean Varieties in Haiti and Guatemala

The Dry Grain Pulses Project in Central America and the Caribbean has developed black bean cultivars with enhanced levels of disease resistance and tolerance to abiotic stress. During the upcoming year (FY10), the project plans to multiply basic seed stocks of these cultivars. This will enable the project to produce and disseminate during 2011 and 2012 larger quantities of seed of these bean cultivars to farmers. The proposed effort should help farmers in Haiti and Guatemala to produce more beans and lower production costs.

In Haiti, the project proposes to produce and distribute locally 20 tons of seeds of the improved varieties Arifi Wurite, XRAV 40-4, Pinto 47, and MEN 2201-64. From 2001 to 2004, Aifi Wuriti was among the most promising black bean lines in the VIDAC and ECAR regional performance trials conducted in Central America and Haiti. This cultivar has early maturity, resistance to BGYMV, BCMV and tolerance to high temperature and drought. XRAV-40-4 is an erect black bean line with resistance to BGYMV, BCMNV and BCMV. This line also has earlier maturity and good yield potential. Pinto 47 has resistance to BGYM, BCMNV, BCMV and rust and has performed well in lower fertility soils. MEN 2201-64 is a black bean line with good yield potential and resistance to BGYMV and BCMV. The Ministry of Agriculture Seed Program in Haiti has already demonstrated the capacity to partner with NGO's such as Operation Double Harvest, ACDI VOCA and ORE to produce bean seed in the irrigated lowlands for distribution to small-scale farmer producer associations. The National Seed Service will provide training to the producer associations concerning seed production and storage techniques so that the benefit from this effort will be sustainable. The SANREM CRSP plans to establish a project on the Central Plateau of Haiti that would benefit from increased availability of seed of improved black and red mottled bean cultivars. During 2011 winter planting season, 1,333 farmers will each receive 15 kg of seed (sufficient to plant 2500 m²). This will translate into 330 additional hectares of land planted and a bean seed increase of 231 metric tons which can be used to plant > 3,500 ha of these improved bean cultivars the following year. This amount of seed could be distributed to > 15,000 farmers. The National Seed in Haiti will develop the capacity to produce *Rhizobium* inoculum that will be distributed to farmers with the seed. This should increase biological nitrogen fixation and yield and reduce dependence on fertilizer.

In Guatemala, the project will collaborate with ICTA in the multiplication and dissemination of ICTAZAM and ICTA Ligero in the southeastern and northern regions. ICTAZAM is an erect black bean cultivar that has resistance to BGYM, BCMV and web blight and tolerance to higher temperatures. ICTA Ligero is an early maturity black bean with resistance to

BGYMV and BCMV. The bean research program in Guatemala has already made plans to promote ICTAZAM and ICTA Ligerero. The additional resources from the Dry Grain Pulse CRSP will permit this effort to be accelerated. Seed production will be conducted by ICTA in collaboration with national seed companies, such as Semillas del Trópico and AGROVESSA, on irrigated lowlands with technical support from ICTA Bean Research and Seed Production Programs of the Ministry of Agriculture of Guatemala. Seed distribution will be realized through ICTA, seed companies and other partner institutions including NGO's. The goal will be to produce 25 metric tons of certified seed. One thousand farmers will each receive 25 kg of certified seeds, sufficient to plant 0.5 ha during the 2011 planting season. This will translate into 500 additional hectares of land planted and a bean seed increase of 400 metric tons of beans. During 2012, the goal will be to distribute certified seed to plant at least 1 ha/farmer to 8,000 farmers.

b) Dissemination of Seed of Improved Cowpea Varieties in West Africa

Adoption of improved cowpea varieties in West African countries is constrained by inadequate supplies of Breeder and Foundation Seed, which in turn limits the amount of Certified Seed that can be produced. Insufficient resources limit growing, harvesting and storing Breeder Seed increases, in turn limiting Foundation Seed and Certified Seed for farmers. Increased seed supply of improved varieties developed by the CRSP and African NARS in Senegal and Burkina Faso can have important impact on production. Currently only about 5% of the cowpea area in sub-Saharan Africa is planted to improved varieties and their potential goes largely unrealized. Recently, effective models for production and dissemination of improved cowpea seed have evolved in Burkina Faso and Senegal, based on collectives (e.g. women farmer organizations) and for-profit seed cooperatives (NGO-established, but now largely self-sustaining). However, their scope has been limited by insufficient quantities of Breeder and Foundation Seed. This project will support increased production of Breeder Seed and strengthen the production and marketing of Foundation Seed producers. Strengthening seed production and delivery at the early breeder-involved stages will promote availability of high quality cowpea planting seed of the best possible varieties. Introducing and promoting seed production into neighboring Mali and Niger will extend the benefit of the improved varieties on a regional basis.

A collaborative project, involving the Institut Senegalais de Recherches Agricole (ISRA, Senegal), Institut de l'Environnement et des Recherches Agricole (INERA, Burkina Faso) and the University of California- Riverside, will increase the amounts of Breeder and Foundation Seed available to Certified Seed producers in Senegal and Burkina Faso. In addition, new Certified Seed producers will be identified and trained so as to ensure delivery of the improved cowpea varieties to resource poor farmers in the region. Efforts will also be made to expand the program by leveraging funds and cooperation from NGOs. In Senegal and Burkina Faso, national extension services (e.g., ANCAR, DRA) will be utilized to reach farmer organizations throughout the cowpea production regions. Activities will also focus on strengthening the small private seed producers, some of whom are already marketing cowpea seed, by making them aware of new varieties. Several progressive farmers will be selected per village, and provided guidance and quality Foundation Seed for multiplication. They will become the source of improved seed for the entire village. From these efforts, local entrepreneurs may arise to form local seed companies. Strong linkages will be developed with PASS (Program for Africa's Seed Systems), WASNET (West African Seed Network), and AGRA to derive synergy in promoting local seed enterprises.

In Burkina Faso, Breeder Seed of seven improved cowpea varieties (e.g., IT98K-205-8, Melakh, KVVX421-2J, KVVX414-22-2, KVVX442-3-25, KVVX775-33-2, Gorom Local) will be produced in the off-season at Bazega and Bagre under irrigation. Foundation Seed will be produced on each of the three INERA stations (Saria, Pobe, and Kamboinse) to ensure adequate supply for Certified Seed producers. This activity will generate about 18 MT of Foundation Seed and address the estimated 5% shortage of Foundation Seed, kick-starting an expansion of the self-sustaining seed production system. Training of farmers as Certified Seed producers will be done at Tougan (Sourou province), Donsin (Ougritenga Province) and Pissala (Sanmatenga Province). A total of approximately 120 seed producers, women and men, will be provided Foundation Seed and trained in production of Certified Seed from planting to harvesting, storage, and marketing.

In Senegal, the availability of Foundation Seed is a bottleneck for adequate supply of seed to farmers. Additional Foundation Seed will be produced of three varieties (Melakh, Yacine, ISRA-2065) to supply new Certified Seed to growers. The project team will work with the National Extension Service (ANCAR) and 80 farmer organizations at 4 locations (Thilmakha, Merina, Mekhe, Sangalkam), where farmers (at least 80) will be trained in seed production, harvest and post-harvest handling. ISRA will focus in particular on Mekhe, a federation with 70 member farmer organizations, with the capacity to supply communities with cowpea seed sold through their storage facilities and in local markets. Seed will be packaged in 4 Kg bags from a government processing unit in Diourbel near Bambey. At least 100 ha of Melack and Yacine will be grown initially for certified seed, with the goal of scaling up in future years.

A selected sub-set of the improved varieties will be field-tested in similar agro-ecological production areas in Mali and Niger. HC PIs Drs. Cisse and Drabo have experience of variety performance in these regions. Both existing and new performance data will be used to select one variety each from Senegal and Burkina Faso for a pilot effort to develop Foundation and Certified seed locally in Mali and Niger, working with the NARS programs in each country (Drs. M. Toure and Moutari, respectively). The goal will be to determine preferred high performing varieties and feed these into the seed systems pipeline being developed by the GCP/ICRISAT Tropical Legumes 2 program in southwest and northern Mali and southern Niger.

2) Implementation of a Comprehensive Bio-Control Program for the Management of Economically Important Insect Pests on Cowpea in West Africa

The primary limitation for cowpea production in West Africa is attack by insect pests both in the field and in storage. The major economically important insect pests of cowpea in the field in West Africa include: (i) the legume pod-borer, *Maruca vitrata* Fabricius; (ii-iii) the coreid pod-sucking bugs, *Clavigralla tomentosicollis* Stal and *Anoplocnemis curvipes* (F.); (iv) the groundnut aphid, *Aphis craccivora* Koch; and, (v-vi) thrips, *Megalurothrips sjostedti* Trybom and *Sericothrips occipitalis* Hood. The cowpea bruchid (*Callosobruchus maculatus*) is the major storage insect pest contributing to major grain losses, however, low-technology control strategies are currently being employed in West Africa (hermetic sealing in plastic bags).

Transgenic cowpea is currently being touted as a solution to control of the legume pod borer (*Maruca vitrata*). Recently developed cowpea lines into which the *Bt* gene has been introgressed, however, have some significant limitations that will slow or could potentially derail their release in West Africa for control of *Maruca*. First, expression levels of the *Bt* in

the flowering parts of the plant are not sufficient for the development of a solid insecticide resistance management (IRM) plan. Second, West Africa is the center of origin of cowpea, thus, it is possible for the *Bt* trait to escape into wild cowpea populations. Third, even if *Bt* expression levels can be elevated in the next-generation of the cowpea lines (with new vectors that increase expression levels), an IRM plan for cowpea in West Africa remains to be developed and the outcomes of this plan are still unclear.

Unfortunately, the legume pod-borer is only one of numerous insect pests that can completely destroy a cowpea crop. Since there are no other currently identified candidate resistance trans-genes for the other insect pests, with the possible exception of thrips, a prudent strategy is to pursue other approaches for management of insect pests.

Even if *Bt* cowpea is ultimately deployed in West Africa for the control of the legume pod-borer, it will control only one of the many economically important insect pests of cowpea in the field. There are no other candidate resistance genes, for transforming cowpea and in controlling any of the other insect pests of cowpea. Even if candidate genes can be found, at least one or multiple decades of research would be required be introgressed into commercially acceptable varieties of cowpea and deployed for commercial production in West Africa.

At the current moment farmers in West Africa often resort to using pesticide sprays to minimize pest populations. These pesticides are often misused or over-used (or both), with detrimental health effects to (i) those that spray the pesticides, (ii) those that work in the fields after the pesticides are sprayed (often women and children), (iii) traders, retailers, **market women** and (iv) in some cases also to consumers that purchase cowpeas that have been sprayed immediately prior to harvest. *Increasingly, these pesticides are coming from China, where the companies “skip steps” in the manufacturing processes, in order to reduce costs, which has resulted in pesticides that are less than 85% pure and contain numerous uncharacterized by-products.* Adding to this problem is the fact that some of these pesticides simply are not effective in controlling insect populations, due to poor quality controls manufacturing (as recently seen at the Crop Research Institute in Kumasi by Dr. Tamò).

One extremely cost-effective and sustainable option for the control of pest insects in Africa has been the use of biological control agents (*e.g.*, parasitic wasps, viruses, predators, etc.). For the control of the millet head miner, *Heliocheilus albipunctella* (de Joannis) (Lepidoptera: Noctuidae) it has been estimated that the release of parasitoids by IRAN, INERA, IER and IITA consortium of scientists has achieved a highly cost effective control method for this important pest (\$0.004 U.S.D. cent per hectare or 225 hectares per dollar in the short term). Moreover, as the parasitoid becomes established in the field, there are few additional needs for inputs over the subsequent years and decades, thereby making this an attractive low cost control strategy over the long-term for resource poor farmers.

With the advent of biotechnology-based “solutions”, some have considered the use of bio-control strategies as passé or “it has all been done before”, mainly referring to the unprecedented success achieved by IITA and national partners in the continent-wide control of the cassava mealybug. Nothing could be further from the truth. In fact, with the advent of genomics we are entering a fascinating new stage of the use of bio-control approaches. Scientists are now in a position to use genomics as a tool to make better decisions as to when

and where to deploy these bio-control agents. An emerging field termed “Integrated Pest Management omics” (IPM-omics), is being spearheaded by the members of the Dry Grain Pulses CRSP project entitled, “Biological Foundations of Pest Management in Cowpea in West Africa.” Briefly, molecular markers are used to characterize pest populations, including the location and migrations of endemic pest populations as well as those of introduced beneficial biologicals. Determination of the positioning and movements of pest populations is critical for the scheduling of the rearing of biologicals and their successful deployment to effectively control pests in cowpeas. Essentially the use of “omics” tools, coupled with currently developed IPM strategies, allow good decision making as to where and when to release the bio-control agents and how to achieve the greatest return on the investment in terms of pest control.

Bio-control strategies involve a “pipeline of discovery to deployment” just like traditional pesticides and transgenic plants. The difference lies in the fact that the success rate of candidate bio-control agents has been much better than that for candidate transgenes and pesticides. Although candidate bio-control agents are in the pipeline, with some being ready for large-scale release, such a pipeline needs resources for large-scale releases and short-term high-level impact.

A team of NARS and entomologists with extensive experience in all aspects of the “bio-control agent pipeline” are in place in Niger, Mali and Burkina Faso. Moreover, this team has a portfolio of bio-control agents “in hand” that can be scaled up for release across West Africa for the control of pest populations of cowpeas. These include:

Table 1. Bio-control agents available for the development of a pan-West African bio-control program for economically important insect pests of cowpea

Insect Pests of Cowpea	Bio-control Agents
Flower thrips	Hymenopteran parasitoid <i>Ceranisus femoratus</i> Predatory mite <i>Amblyseius swirski</i>
Legume pod borer	Hymenopteran parasitoids <i>Apanteles taragamae</i> and <i>Nemorilla maculosa</i>
Pod-sucking bugs	Nuclear polyhedrosis virus (NPV) Hymenopteran egg parasitoids <i>Gryon fulviventre</i> Entomopathogenic fungus <i>Beauveria bassiana</i>
Aphids	Hymenopteran parasitoids <i>Lysiphlebus testaceipes</i> and <i>Aphidius colemani</i> Entomopathogenic fungus <i>Neozygites fresenii</i>

As there is a dire need to achieve food security in West Africa, one important step towards this goal will be to dramatically reduce, in a cost effective manner, insect pressure on cowpea crops. This can be achieved through a large-scale effort to release multiple biological control agents to impact all the major species of insects that attack cowpea in the field.

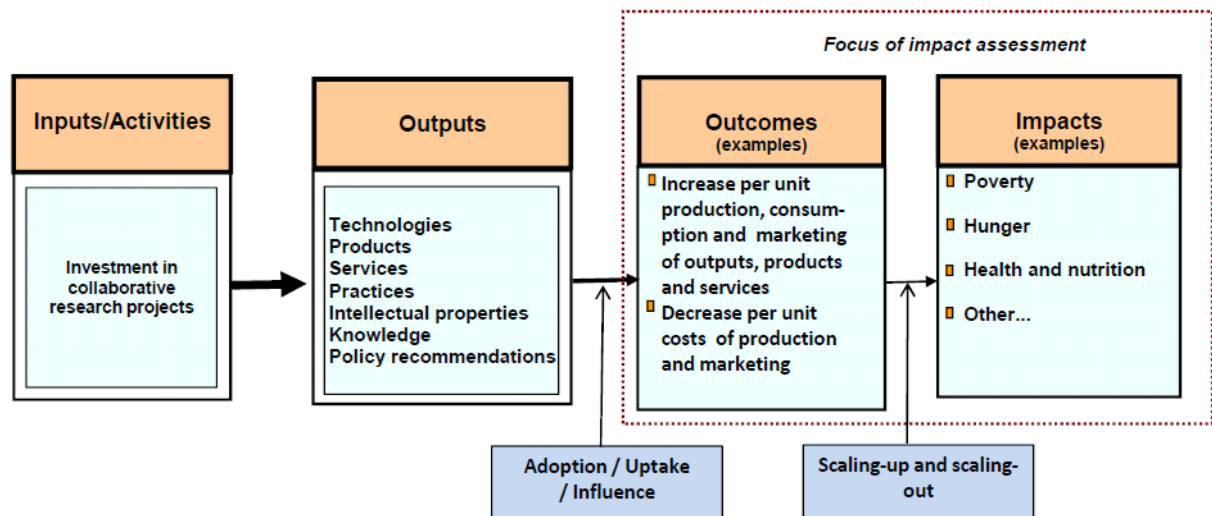
The comprehensive cowpea bio-control program being proposed for West Africa will expedite the cowpea “bio-control agent pipeline” discovery and release process. Bio-control

agents will be released *en mass*, in strategic areas, while efforts continue to move forward other promising bio-control agents. Institutions providing leadership to this effort, University of Illinois at Urbana Champaign and IITA-Benin, will work with West African NARS' scientists at the Institut de l'Environnement et des Recherches Agricole (INERA, Burkina Faso) and l'Institut National de la Recherche Agronomique du Niger, INRAN, Niger) to achieve these following specific aims:

- Build capacity at host country institutions for the rearing and mass release of bio-control agent that are currently ready for release;
- Rear and release beneficial biologicals at critical times and locations utilizing organismal and molecular techniques for effective insect pest management on cowpeas (IPM-omics);
- Bring new bio-control agents into the pipeline for development and deployment;
- Document the establishment and movement of these biological control agents in the environment and the reduction of pest populations;

3. Strategy for Impact Assessment by the Dry Grain Pulses CRSP

Figure 1 illustrates a simplified and generalized impact pathway (or a results chain) of how investments by the Pulse CRSP are conceptualized to affect developmental outcomes and impacts and introduces the concept of 'impact assessment,' which is defined as 'the systematic analysis of the significant or lasting changes—positive or negative, intended or not – in people's lives brought about by a given action or series of actions in relation to a counterfactual.'



Arrows in the impact chain indicate the direction of influence and its thickness indicates level/degree of influence on an effect

Definitions:

Inputs: The financial, human, and material resources used for the research intervention.

Outputs: Include changes resulting from the research which are relevant to the achievement of outcomes; manifested in technologies, products, capital goods, services, practices, knowledge, policies and information.

Outcome: The likely or achieved short-term and medium-term effects of an intervention's outputs at the beneficiary level (farmers, individuals, consumers).

Impacts: Positive and negative, primary and secondary long-term effects produced by a development intervention, directly or indirectly,

The research inputs from the past, ongoing and proposed activities are conceptualized to generate outputs in the form of technologies and practices, goods and services, intellectual properties and policies that are relevant to bringing about changes in the use of farm- and community-level resources and assets (i.e., land, labor, capital, entrepreneurship) to increase per unit production or marketing of outputs, products and services, or decreased risks and per unit costs at the farm household level (referred in Figure 1 as project outcomes). The realization of projected outcomes requires adoption/uptake of research outputs at the end-user level (farmers, processors, consumers). Impacts on developmental goals (such as poverty, environmental sustainability, food security, health, etc.) are realized when the outcomes are sufficiently scaled up and scaled out to a large number of beneficiaries.

Impact assessments are widely recognized to perform two functions--**accountability** and **learning**. Greater accountability (and strategic validation) is seen as a prerequisite for continued support for development assistance. Better learning is crucial for improving the effectiveness of development projects and ensuring that the lessons from experience – both positive and negative – are heeded. Accountability and strategic learning has long been core concerns for ex-post impact assessments. However, the strategy for impact assessment proposed by the Pulse CRSP is based on the view that strategic learning must occur throughout the project cycle—in the planning stages (ex ante assessments of impact potential); in the implementation stages (M&E to check what consequences a project is currently having; and after completion (ex-post IA to examine what effects the project has had). In the remaining three years of the current grant, Pulse CRSP MO proposes to focus on all three aspects of impact assessments and evaluations. The ex-ante assessments of impact potential will be integrated in the research projects under the theme “Improving the Performance and Sustainability of Pulse Value-Chains” (see 1.c under section C). Strategy for monitoring of project outputs and program evaluation is discussed in section D. In this section we describe the proposed activities for ex post impact assessments.

Ex-post Impact Assessment

The nature of the results chain (or impact pathway depicted in Figure 1) of a ‘research’ intervention is generally more complex due to long and unpredictable lags between when the research is conducted to when the outputs, outcomes and impacts are realized. Given the long lags between research inputs and outcomes and impacts, the focus of the proposed ex-post impact assessment activities will be on outputs from research supported by the Bean/Cowpea CRSP. However, where feasible, impacts of investments by the Dry Grain Pulses CRSP in continuing past research activities will be included in the impact assessment portfolio.

For FY 10-12, the MO is proposing to conduct three to four ex-post impact assessments that enables the Dry Grain Pulses CRSP to “tell a story” of effective contributions of CRSP’s research efforts to developmental impacts and institutional capacity building. Some likely candidates for ex post impact assessment include:

- Benefits of genetic improvement of cowpea in Senegal and West Africa. Over the past 20 years, due to collaborative efforts of CRSP researchers, several varieties of cowpeas with resistance to biotic and abiotic stresses have been released in Senegal and other countries in West Africa. A study is proposed to document the adoption of these varieties and to document the economic costs and benefits attributed to CRSP-NARS investments in these improved varietal technologies.

- Documentation (synthesis and update) of the social, economic and environmental impacts of the cowpea grain storage technologies in West Africa. The recent dissemination efforts by the Bill and Melinda Gates Foundation offers an opportunity to update and synthesize the impact story of the CRSP developed triple bagging and other storage technologies in West Africa.
- Synthesis and update study on the impact of CRSP's bean improvement efforts in the LAC region. The past Bean/Cowpea CRSP, and the current Dry Grain Pulses CRSP have played an important role in supporting the bean improvement research efforts in the Latin America region (esp., Central America, the Caribbean region and Ecuador). Several studies conducted in the past have documented the adoption and economic impacts of the outputs generated by the bean improvement research in this region. The proposal is to update the adoption and economic impact estimates of CRSP varietal technologies in the past 3-5 years.
- Global contribution of CRSP to genetic improvement of common bean (including the U.S., LAC and SSA). The Bean/Cowpea CRSP supported bean breeding programs in the U.S. and in host countries have contributed to the genetic improvement of common beans in the form of direct varietal releases as well as indirect contributions to the gene pool present in the pedigree of released varieties. This second type of contribution of CRSP-supported research in molecular breeding and other advanced techniques can be seen today throughout the bean producing regions of the world, including the U.S. A potential study proposed will take a stock of all the genetic contributions of the research supported by the bean/cowpea and the Dry Grain Pulses CRSP and estimate an economic value of such contribution in terms of value addition to genetic materials grown by bean farmers around the world.

The approach to be used in the proposed ex post impact assessment is the cost-benefit analysis framework, where benefits will be estimated as a function of the size of the effect of an improved technology/product/practice as a result of CRSP research and the scale of adoption/use/uptake of a given CRSP output. The impact estimation approach will involve making theory-based assumptions about the underlying relationships between model parameters, and then estimating total benefits which are compared with total costs (including partner costs) to derive rates of return (ROR) on research investments. The emphasis in ex post impact assessment will be not as much on precision of impact estimates as it will be on the range of plausible impacts. Sensitivity analysis based on different scenario and assumptions about key model parameters will be also part of impact analysis.

Meta-Benefit Cost Analysis of Bean/Cowpea and Dry Grain Pulses CRSPs

The Management Office also proposes a meta-cost-benefit analysis of the documented impacts of the Bean/Cowpea and Dry Grain Pulses CRSPs in the final year as described below.

Meta-benefit-cost-analysis can be defined as an aggregate benefit-cost analysis to identify generalized patterns from case observations (Maredia and Raitzer, 2006). Just as the traditional meta-analysis approach, this method attempts to assemble as broad a pool of cases as possible from which to draw inferences and derive generalizable results. However, unlike the more common approach to meta-analysis, which typically uses statistical analysis techniques (e.g., regression) of pooled data, the meta-B-C-analysis is a simple aggregation of benefits and costs derived from case studies (i.e., published or completed ex post impact assessments of CRSP research) and applying the general framework of benefit-cost analysis to estimate the rates of return across a portfolio. Such an approach is warranted due to the fact that each of the impact studies measures a separate but partial aspect of the response of a dependent variable (economic benefits) to a shared exogenous variable (total investment). The proposed meta-B-C-study will help 'tell the impact story' of the bean/cowpea and the Dry Grain Pulses CRSP in a comprehensive manner and will help identify areas of research that

have had greatest impact and those that have had modest impacts or turned out to be ‘dry holes.’ This will be an analysis of the global program and should provide valuable information for the Final Technical Report of the Dry Grain Pulses CRSP and to USAID as it decides on a five-year extension of the program through 2017.

4. Development of Communication Tools for the Dry Grain Pulses CRSP

The Management Office will be preparing a wide array of communication instruments during FY 2010 - 12 to inform diverse audiences of the mission, project activities and outputs of the Dry Grain Pulses CRSP research, training and extension activities. These communication instruments will be prepared appropriately for such target audiences as:

- Non-scientific groups interested in the Pulse CRSP’s global mission, technical strategy, and potential contributions to development outcomes (reducing food insecurity and poverty): E.g., Congressional representatives, NGOs, lay groups, etc.
- Organizations interested in information on projects and outputs of the Pulse CRSP that will benefit pulse value chains and lead to development impacts: E.g., USAID country missions, private sector stakeholder groups, pulse industry groups, donor organizations, NGOs engaged in agricultural development, etc.
- Scientific and professional groups interested in the research advances and technological achievements as related to the technical focal areas of the Pulse CRSP: E.g., international communities of pulse scientists, Office of Agriculture/EGAT/USAID, partner research institutions in Host Countries and the U.S., International Agriculture Research Institutions, etc.

Specific communication instruments being planned or which are in preparation include:

- a. Brochure (foldout) for lay audiences (including Congressional Representatives)
- b. Brochure with project information for stakeholder groups, USAID missions, etc.
- c. Highlights of Technical Achievements of Phase I, II and III Projects for scientific audiences and partners
- d. Research Briefs (one or two page maximum) in both printed and electronic formats of specific research advances and technological achievements
- e. Material in electronic format which can be downloaded from the web page of the Dry Grain Pulses CRSP (www.pulsecrsp.msu.edu/). In addition to the above identified instruments, the Management Office plans to regularly posting “Spotlight” articles and possibly interviews with CRSP PIs on topics of general interest.

In order to ensure that communication instruments are written and prepared utilizing language, photos and graphics that are appropriate for target audiences, the Management Office will contract as needed writers, graphics designers, and publishing/printing organizations to assist with document preparation and printing.

Mywish Maredia, who will be serving in the capacity of Impact Assessment Consultant in the Management Office and providing leadership to ex-post impact assessment, will be called upon to contribute material/documentation as well as to assist in the writing of articles the will “tell stories of technical achievement and developmental impact” that resulted from earlier funded projects of the Bean/Cowpea CRSP. Although certain Phase I projects of the Dry Grain Pulses CRSP are building upon foundations of research completed under the Bean/Cowpea CRSP, the majority of the research, extension and training activities supported under the current award involve new technical objectives, new Host

Country PIs and institutional partners, and in many cases new target Host Countries. As a consequence, the Management Office contends that the “story” of the Dry Grain Pulses CRSP will involve an “evolving script” that can only be told over coming years and decades as technical progress is achieved and outputs are promoted, shared and disseminated, and achieve their intended outcome.

5. CRSP Knowledge Management and Communication Project

CRSPs generate important technologies and information that is not currently consolidated and used to improve the outreach of these effective programs to stakeholders in Congress, the international development community, and USAID regional Bureaus and Missions.

This project is to assemble for analysis and synthesis common sets of data from all or multiple CRSPs, and to make that information available to the stakeholders in the USAID/University partnership. The objective is to give greater public visibility to the global activities of the EGAT funded Collaborative Research Support Programs and to enable USAID to more efficiently collect critical data for reporting purposes and to promote the CRSPs within the federal government.

The CRSP programs being funded in FY 2010 will financially contribute support for the contracting of an office preferably in Washington DC to provide the following services:

To develop and implement a knowledge management system to:

- Consolidate information relating to important results of the CRSPs
- Communicate these results to stakeholders in the CRSP community
- Minimize the burden of reporting by CRSPs and USAID

A PI/service provider for the project will be identified through a public, restricted solicitation to undertake implementation of the database, synthesis and report preparation in response to the requirements of the CRSP Council. Each CRSP will contribute data common to CRSPs to a centralized database. These data will be programmed to allow common requests for data by USAID and other stakeholders to be assembled with standardized web queries. The data will be available in standard output formats thus saving the individual CRSPs the burden of preparation of individual reports responding to the information/knowledge request, and eliminating the problems of standardization across the multiple CRSPs when a variation of the query is necessary. CRSPs will be responsible for meeting the costs of assembling/providing their data contributions for the project. Individual CRSPs will, also, be able to access and utilize this database for their own report purposes.

The Dry Grain Pulses CRSP will provide support in FY 2010 for the contracting of an entity to administer the CRSP Knowledge Management and Communication project. Financial support in subsequent years for this project will be provided by EGAT, USAID.

6. Management Office

With expanded programming resulting from the increase in the Dry Grain Pulses CRSP’s award ceiling and anticipated increases in USAID obligations for the remaining three years of the program (FYs 2010 through 2012), the following changes in Management Office staffing and activities are being proposed.

a. Staffing of the Management Office

Deputy Program Director (0.5 FTE)

Michigan State University will conduct a search for a new Deputy Program Director (0.5 FTE) with a tentative start date of October 1, 2009. The new Deputy Director will replace Dr. Mywish Maredia who will be assuming the position of “Impact Assessment Consultant” for the Dry Grain Pulses CRSP. A Search Committee is being established, comprised of MSU tenured professors with extensive knowledge of the program scope and administrative functions of the Management Office of the Dry Grain Pulses CRSP. The responsibilities associated with this position are similar to those presented in current contract.

Position Description of Deputy Director: Serve operationally as the secondary administrative officer in line with USAID guidelines and MSU regulations and procedures. Responsibilities include: Backstopping the Director; Participate in all MO staff functions; Assist in organizing staff responsibilities and activities; Oversee the MO in the Director's absence; Assist in the administration of subawards; Assist the Director in M&E of projects, especially of socio-economic research, including project site visits; Organize and coordinate activities to monitor overall technical achievement and developmental impact; Perform administrative support functions for the CRSP training and capacity building efforts including the maintenance of a trainee database; Synthesize information and prepare Annual Global Program Implementation Plans and Technical Reports; Accompany the Director as needed to governance committee and CRSP Council meetings; and Prepare materials for newsletters and briefs highlighting major results and achievements.

The Associate Director should have a Ph.D. in an agricultural science related field (preferably complementary to that of the Director- e.g. agriculture economics), and knowledge and experience in international development, with administrative experience and mastery of a foreign language desirable. If a suitable person can be identified, this position may start as early as October 1, 2009.

In accord with the Substantial Involvement clause in the Dry Grain Pulses CRSP award, the Deputy Director is considered as “Key Personnel.” Thus, the appointment of a new Deputy Director will be subject to the approval of the USAID/Washington Cognizant Technical Officer and the Agreement Officer for the Dry Grain Pulses CRSP.

Impact Assessment Consultant (0.25 FTE)

Dr. Mywish Maredia will be contracted (0.25 FTE) as an Impact Assessment Consultant in the Management Office to provide leadership to the Dry Grain Pulses CRSP for the planning and implementation of impact assessment activities, including monitoring and evaluation. Dr. Maredia will have specific responsibility for oversight of ex-post impact assessment activities involving other MSU faculty and graduate students and the preparation of the appropriate reports and communication pieces.

Clerical Staff (0.75 FTE)

The existing clerical staff position will be increased from 0.5 to 0.75 FTE due to the projected increase in contract and financial management responsibilities within the Management Office.

b. Global Program Meetings

Periodic global CRSP program meetings provide an effective venue and opportunity for U.S. and Host Country scientists, development professionals and partners to network, to coordinate CRSP research, extension and training activities, to discuss emerging issues facing agriculture, and to plan for possible future research and development activities that will benefit a particular sector of agriculture (e.g., those who produce, process and market cowpea and common beans). From the Management Office's perspective, global program meetings are extremely important for ensuring program focus and coherence, achieving multi-disciplinary collaboration among scientists, monitoring of technical progress, the sharing of USAID performance expectations, and for future strategic planning.

The Management Office proposes that a portion of the new funds be used to support Global Program meetings of the Dry Grain Pulses CRSP during the third and fifth years of the current award, FY 10 and FY12, respectively. The upcoming meeting would likely be held in late April 2010 in Ecuador or the U.S., depending on cost and ease of obtaining visas for participants. This second meeting (FY 10) is considered essential to provide an opportunity for the new cohort of PIs involved in Phase III, Impact Assessment and Technology Dissemination projects (supported with the new CRSP funds), to meet and coordinate activities with Phase I project PIs (some of whom will be continuing as Phase II project PIs).

Funds are also being budgeted to financially support an expanded global program meeting in FY 2012. This meeting had been approved as part of the original Technical Application but funds had not been set aside for PI travel and per diem. A primary objective of this meeting would be present and highlight scientific and technology-dissemination achievements of the Dry Grain Pulses CRSP in a forum attended by other scientists, development professions, USAID and other donors, and certainly stakeholders of pulse value chains. Nairobi, Kenya, is currently the venue under primary consideration for this third meeting tentatively planned for October or November 2011.

Tentative Agendas for these two Global Pulse CRSP Meetings might include:

FY 2010 Global Dry Grain Pulses CRSP Meeting

- Presentation of new Phase III, Technology Dissemination and Impact Assessment projects
- FY 2011 Workplan development by PIs of Phase II and Phase III projects
- Coordination of activities between Phase II and III projects to enhance research effectiveness and maximize technology promotion and dissemination
- Organizing data collection for program monitoring and impact assessment
- Strategic planning of responses to the Global Food and Nutritional Crisis
- Preparations for External Evaluation of Pulse CRSP program in FY 11

FY 2012 Global Dry Grain Pulses CRSP Meeting

- Presentation of Achievements of Phase II and III and Technology Dissemination Projects
- Discussion of emerging global issues and influence on pulse production systems and value chains (i.e., climate change, environmental degradation, food and nutritional insecurity, changes in food distribution systems, market trends, etc.)

- Findings of informative ex-ante impact assessments and implications for future pulse research and human resource development in developing countries.
- Strategic planning for possible extension of Dry Grain Pulses CRSP

D. MONITORING AND EVALUATION PLAN FOR THE DRY GRAIN PULSES CRSP

The Management Office will continue to follow the initial “Monitoring and Assessment Plan” as outlined in the approved Technical Application (Attachment B- Program Description, page 35) for the Dry Grain Pulses CRSP (September 28, 2007).

“Monitoring and Assessment Plan: The use of performance indicators, annual progress reports and institutional site visits will constitute the primary mechanisms for monitoring and assessment of projects. Annual reports will provide a basis for assessment of scientific quality, technical progress toward benchmarks, effectiveness in the use of funds, collaboration with both CRSP and other programs, leveraging of additional resources, and effectiveness in the dissemination of outputs to end-users to achieve intended outcomes. Of particular importance will be evaluative feed back to PIs from the MO at the end of the first year of the projects. This information will enable PIs to better understand program expectations and provide opportunity for interventions and mid-course adjustments to ensure success in achievement of development objectives. The TMAC will be the principal advisory group responsible for regular monitoring and assessment of technical progress and for advising the MO on technical and budgetary matters. The Program Director and Deputy Director are committed to maintaining active interactions with U.S. and HC PIs. Through visits to participant HC and U.S. institutions, they will gain insights into the conduct of projects, and be able to address performance issues.”

A. Research to Impact Pathways

The Management Office of the Dry Grain Pulses CRSPs views “Monitoring and Evaluation” of subcontracted research, extension and training projects as NOT an end in itself, but rather as a means or strategy for “mapping impact pathways” and increasing the likelihood of strong project performance. Toward that end, the following “revision” of Section d. (Attachment B- Program Description, page 23), is proposed for the period October 1, 2009 through September 28, 2012.

d. Strategy for Mapping Impact Pathways by Developing Benchmark and Performance Indicators for Outputs and Outcomes:

All projects supported by the Dry Grain Pulses CRSP will include a plan for transforming project activities into: (1) output targets; (2) outcomes consistent with the Pulse CRSP’s global program vision and goals, and (3) impacts aligned with USAID strategic objectives for food security and poverty reduction.

The principal instruments to be utilized by the Dry Grain Pulses CRSP for planning and performance evaluation and of all sub-contracted projects include the following:

Instruments:

- Annual Project Workplans
- Semi-annual Benchmark Indicators of Technical Progress
- Annual Performance Indicators for Foreign Assistance Framework (FAF)
- Annual Technical Progress Reports

- Site Visits by MO staff and TMAC Members
- Final Technical Reports of Phase I, II and III Projects

The Management Office regularly collects specific information from all sub-contracted projects so as to systematize the “research-to-impact” pathway and to facilitate the monitoring and evaluation of technical progress toward achievement of identified outputs, outcomes and long-term impacts.

Annual Project Workplans-

PIs are required to prepare Annual Project Workplans prior to start of each fiscal year. The purpose of Workplans is (1) to develop an implementation plan for a specific time period against which the progress will be judged, and (2) to give direction and a road map for what needs to occur in order to achieve project goals and objectives. The “impact pathway framework” is used as the basis for the Workplans to ensure that proposed approaches, activities, collaborative relationships and networks directly contribute to target outputs, outcomes and long-term developmental impacts. It is important that outputs move beyond the “shelf” and are widely disseminated and adopted by stakeholders of pulse value-chains, especially resource poor farmers. Prior to their approval by the Management Office and inclusion in Amendments to Sub-Contracts with Lead U.S. universities, Annual Project Workplans and Budgets are evaluated by the Technical Management Advisory Committee and the Management Office.

Semi-annual Benchmark Indicators of Technical Progress-

Semi-annual “Benchmark Indicators” are established by Principal Investigators for each six-month period of a project (see attached Semi-Annual Indicators of Progress Form; Addendum A) and approved by the MO prior to the start of each fiscal year. The purpose of Benchmark Indicators is to provide an accountability mechanism for assessing technical progress of Pulse CRSP projects toward predefined project objectives. Since satisfactory completion of benchmark indicators is required for installment payments to Host Country institutions (Report forms are “deliverables” in Fixed Price Contracts), Lead U.S. Principal Investigators must review the success of all partner collaborating institutions in completing the target Benchmark Indicators of Progress and authorize a future payment. Failure to make acceptable technical progress during successive reporting periods will likely result in a “non-performance” assessment and in the discontinuation of a sub-subcontracted activity by the Lead U.S. university on a Pulse CRSP project. PIs are provided opportunity to explain failures to achieve benchmark indicators and changes in project activities in the Annual Technical Progress Reports, which are also evaluated by the Technical Management Advisory Committee.

Annual Performance Indicators for Foreign Assistance Framework (FAF)-

Target output and outcome “Performance Indicators” are established by Principal Investigators for each year of a sub-contracted project in the Dry Grain Pulses CRSP and submitted to the Management Office for approval. The purpose of Performance Indicators is (1) to monitor effectiveness and productivity of projects in achieving output targets, (2) to ensure that project outputs are contributing to global program objectives of the Dry Grain Pulses CRSP, and (3) to collect the necessary data that will enable the Management Office to accurately report CRSP contributions to the Foreign Assistance Framework for Development by the Office of Agriculture, EGAT, USAID-Washington each year. The Pulse CRSP uses a Performance Indicators Form (see Addendum B) which requests both quantitative “target” and “actual” performance data for the following categories.

- Degree Training: Number of individuals who have received degree training
- Short-term Training: Number of individuals who have received short term training
- Technologies and Policies
- Beneficiaries
- Developmental Outcomes

Lead PIs of sub-contracted projects are required to submit quantitative data on “actual” performance in each of these categories by October 1 for the previous fiscal year. These data are reviewed annually by the Technical Management Advisory Committee and the Management Office as a regular part of performance monitoring and evaluation of Phase I, II and III projects.

Annual Technical Progress Reports-

Annual Technical Progress Reports are prepared at the end of each fiscal by both U.S. and Host Country Principal Investigators collaborating in subcontracted projects and submitted to the MO. The purpose for requiring Annual Technical Progress Reports for all sub-contracted projects is (1) to monitor technical progress toward defined project objectives and outputs, and (2) to assess the likelihood that the knowledge and technologies being generated through the projects are being promoted and disseminated in accord with long-term developmental outcome goals. The Technical Management Advisory Committee is the principal body responsible for reviewing technical progress of projects. Project performance is assessed based on technical quality, productivity in terms of achieving research, extension and training output commitments, effectiveness of collaborations with Host Country scientists, contributions to Host Country institutional capacity building, and networking with appropriate public and private sector institutions for technology transfer. Ultimately, all projects are accountable for completion of research, extension and training activities as committed to in the Annual Workplans.

Site Visits by MO Staff and TMAC Members-

The Management Office will conduct up to one visit per project to a Host Country site during each Phase (e.g., Phase I, II and III). As funding permits, the Director and/or Deputy Director will invite a member of the Technical Management Advisory Committee to accompany them on these visits. The purpose of site visits is to gain first-hand insights into the implementation of sub-contracted projects, functionality of collaborative relationships between U.S. and Host Country PIs, status of technical progress, and a better understanding of challenges and constraints in achieving outcome goals. The information learned from the trip reports will be shared with the Technical Management Advisory Committee and will be considered when projects are evaluated for possible extension (e.g., evaluation of Phase I projects in FY 10 for consideration of two-year extensions).

Final Technical Reports of Phase I, II and III Projects-

Final Technical Reports of Phase I, II and III projects submitted to the Management Office of the Pulse CRSP should focus on successes in attaining project objectives (outputs), and follow-up measures by collaborating Host Country institutions and their partners (i.e., NGOs, public governmental programs, etc.) that will lead to developmental outcomes. This information is vital for the Dry Grain Pulses CRSP to systematically document the performance of the global program during the five-year award period (2007-2012). Final Technical Reports also provide an opportunity for the Management Office to evaluate its own program priorities and implementation strategies, learning lessons from the successes and failures of projects, and to make programmatic changes that will contribute hopefully to a more impactful Dry Grain Pulses CRSP in the future.

B. Monitoring and Evaluation of Phase I projects

The Dry Grain Pulses CRSP is implementing a two phase technical program with two award cycles (Phase I- 2.5 year projects; Phase II- 2 year projects) for the initial five-year authorization of the Pulse CRSP (2007-12). A third phase, Phase III (3 year projects, October 1, 2009 – September 28, 2012) is being added as a result of the increase in the award ceiling and anticipated future obligations from USAID. The justification for adopting a two-phase system was to provide opportunity for midstream performance assessment and thus technical and budgetary adjustment of projects. It also enables the funding of shorter duration projects and the opportunity to respond to emerging issues.

1. Evaluation of Phase I Projects and Implementation of Phase II Projects

Phase I projects may be considered by the MO for a two-year extension (becoming Phase II projects, October 1, 2010 – September 28, 2012) in response to receipt of a formal request from the Lead U.S. university. Approval of extension requests will be contingent upon acceptable technical performance as evidenced by achievement of benchmarks/target outputs and outcomes, a compelling justification and acceptable approach for future research, extension and training activities that will lead to priority outputs and developmental outcomes, and the availability of obligated funds from USAID.

The Technical Management Advisory Committee will assume primary responsibility for the assessment of technical performance by Phase I projects under consideration for an extension. Evaluations will be based upon review of project documentation including Semi-Annual Benchmark Indicators of Progress (up through April 1, 2010), Performance Indicators, and the Annual Technical Progress Reports (for the periods 4/1/08 – 9/30/08, 10/1/08 – 9/30/09). In certain situations, a site visit by an MO, CTO and/or member of the Technical Management Advisory Committee will be conducted to gain additional insights into collaborative relationships, quality of technical work, and project productivity.

For those projects approved for a two-year extension, the Management Office will request the preparation of Phase II project workplans for FY 2011 and 12. PIs of Phase II projects will be required to respond to Management Office guidance regarding future activities when preparing the workplans resulting from the assessments by the Technical Management Advisory Committee and the Management Offices desire to achieve global program objectives.

For Phase I projects which were not extended, due either to the lack of a formal request from the Lead U.S. university to continue the project or an unacceptable performance assessment by the TMAC, the MO will follow the appropriate protocol for establishing new Phase II projects that will address priority technical focal areas relating to pulses as identified in the Technical Program Approach of the Dry Grain Pulses CRSP.

C. External Program Assessment by USAID for Five-Year Extension of Dry Grain Pulses CRSP.

In accord with the terms of the Dry Grain Pulses CRSP contract (*CRSP Assessments*, page 8), the Management Entity (Michigan State University) will cooperate with EGAT/USAID in the conduct of an “External Evaluation” and an “Administrative Management Review.” These two evaluations provide input into the renewal extension for a possible second five-year award. As requested by USAID and contractors, the Management Office will provide documentation that gives evidence of the quality and progress of the research, the achievement of outreach and developmental outcome benchmarks, and the degree to which the research activities achieve integration and relevance to development programming of the Agency. For the Administrative Management Review, the ME is willing to provide documentation giving evidence of its effectiveness in administering and managing the Dry Grain Pulses CRSP. The expectation is that these two evaluations of the global program will be conducted during year four (FY 2011) at the expense of USAID. The Dry Grain Pulses CRSP will not be responsible for funding these external evaluations.

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ADDENDUM A:

SEMI-ANNUAL BENCHMARK INDICATORS OF TECHNICAL PROGRESS
 Dry Grain Pulses CRSP
 Addendum to Annual Research, Training and Outreach Workplans

(Fiscal Year of Annual Workplan)

SEMI-ANNUAL INDICATORS OF PROGRESS BY INSTITUTIONS FOR SIX-MONTH REPORT PERIODS

Project Title:

	Provide abbreviated name of institutions in columns below														
Identify Benchmarks by Objective	10/1/	4/1/	10/1/	10/1/	4/1/	10/1/	10/1/	4/1/	10/1/	10/1/	4/1/	10/1/	10/1/	4/1/	10/1/

(Tick mark the time period for achieving identified benchmarks by institution)

Objective 1:

Objective 2:

Objective 3:

Objective 4:

Objective 5:

Name of the PI responsible for reporting on benchmarks

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Signature/Initials:

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Date:

ADDENDUM B:

PERFORMANCE INDICATORS FOR FOREIGN ASSISTANCE FRAMEWORK (FAF)

Dry Grain Pulses CRSP
Research, Training and Outreach Workplans

(Fiscal Year of annual workplan)

Project Title:
Lead U.S. PI and University:
Host Country(s):

Output Indicators	20 Target	20 Actual	20 Target	20 Actual
	(Apr 1, 20)	(-Sept 30, 20)	(Oct 1, 20)	(-Sept 30, 20)

Degree Training: Number of individuals who have received degree training				
Number of women				
Number of men				

Short-term Training: Number of individuals who have received short-term training				
Number of women				
Number of men				

Technologies and Policies				
Number of technologies and management practices under research				
Number of technologies and management practices under field testing				
Number of technologies and management practices made available for transfer				
Number of policy studies undertaken				

Beneficiaries:				
Number of rural households benefiting directly				
Number of agricultural firms/enterprises benefiting				
Number of producer and/or community-based organizations receiving technical assistance				
Number of women organizations receiving technical assistance				
Number of HC partner organizations/institutions benefiting				

Developmental outcomes:				
Number of additional hectares under improved technologies or management practices				