EXECUTIVE SUMMARY

ANNUAL REPORT 2008

Outcome Line

SBA-1

Improved Beans for the Developing World

CIAT
Centro Internacional de Agricultura Tropical
International Center for Tropical Agriculture

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1. PRODUCT LINE LOGFRAME

IMPROVED BEANS FOR THE DEVELOPING WORLD: PRODUCT LINE SBA1

Rationale & Changes

Rationale

The common bean (*Phaseolus vulgaris* L.) is the world's most important grain legume for direct human consumption. Its total production exceeds 12 million MT, of which 7 million MT are produced in tropical Latin America and Africa. Beans are the "poor man's meat" and are particularly important in the diet of the underprivileged. Beans, like other legumes, supply proteins, carbohydrates, vitamins and minerals, and complement cereals, roots and tubers that compose the bulk of diets in most developing countries.

Common bean is also one of the most diverse crops in terms of its cultivation methods and its uses. It serves as mature grain, as immature seed, and as a vegetable (both leaves and pods), and after harvest the stover is used as animal fodder. It is cultivated from sea level up to 3000 masl in monoculture, in association, or in rotations. The possibility of obtaining a harvest in as little as two months offers quick income, quick food supply, and also permits rotating with other crops or inter-planting among fruit trees or coffee before the primary crop produces income. At the other extreme are the aggressive climbing beans that subsistence farmers maintain in the garden for food security and continual harvest over a six month period.

Apart from subsistence cultivation, beans have become increasingly commercial over the past thirty years in national, regional and international markets. In Central America beans are the #1 income generator among the traditional field crops. In Africa, farmers tap into regional bean markets in Nairobi, Kinshasa and Johannesburg. With the onset of globalization, the past decade has seen a growing international market that is now reported to reach 2.4 million MT. This heightens issues of equity for the small bean producers that have little other stable source of income, but some also see this as an opportunity. For example, bean represents 6% of external income for Ethiopia, and small farmers in Bolivia produce the large white and red mottled classes for export. Snap beans are a high value, labor intensive crop of small farmers in Kenya and the Andes.

Besides the common bean, another four cultivated species are conserved in the CIAT gene bank, as well as wild relatives. This collection is the largest of the genus in the entire world, representing more than 35,000 accessions that have been declared as part of the designated collection before FAO. These other cultivated species fill niches that are unsuitable for the common bean, for example, *P. acutifolius* that thrives in desert environments.

Our primary mission is to contribute to household and global food security by assuring an adequate supply of beans as a culturally acceptable and traditional staple; and to improve the income of small bean producers of Latin America and Africa, by making bean production more profitable. We also seek to improve human nutrition, both by augmenting the supply of beans, and by improvement of their nutritional value.

Our products are designed to respond in particular to the needs of small, resource-poor bean farmers in Latin America and Africa. Thus, we seek to create solutions to biotic and abiotic production limitations that require minimal inputs, and in the case of improved germplasm, with good market potential. **Our research strategy** focuses on the exploitation of the vast genetic resources of bean that exist as a complex array of major and minor gene pools, races and sister species. CIAT's gene bank with 41,000 accessions of common bean and related species is our most unique resource, and has been the source of genes for

disease and insect resistance, abiotic stress tolerance, nutritional quality and yield potential. Most traits are still selected by conventional means in field sites (in some cases backed up by greenhouse evaluations) where most important diseases, edaphic constraints and drought can be manipulated for purposes of selection. However, Marker Assisted Selection (MAS) is employed selectively but strategically, in most cases for disease resistance genes. CIAT pioneered participatory selection with farmers and this practice is being extended and systematized. While most products are seed based, others involve agronomic practices or are knowledge based. Our research is strategic combined with both basic and applied elements, as called for by the particular challenge.

Changes

There have been no essential changes in relation to the MTP of 2007. However, in 2008 an agricultural economist, Dr. Enid Katungi came on board under the Tropical Legumes-II project, with base in Kampala, Uganda.

CG System Priorities

CIAT's bean product line is housed principally under CG System Priority Area 2: Producing more and better food at lower cost through genetic improvements. Efforts are dedicated to improving yields through control of diseases and pests, tolerance to abiotic stresses (drought, aluminum toxicity and low soil fertility in particular), and expanding the adaptation range of climbing beans. The bean product line also places heavy emphasis on improvement of nutritional quality, especially through increase in iron and zinc content in the grain. There is potential to contribute to Priority Area 3A: Increasing income from fruits and vegetables, through the improvement of snap beans for both Africa and Latin America. The bean team collaborates with marketing specialists to create varieties with better market potential, including international export markets (Priority Area 5B). Finally, strengthening national institutions (Priority Area 5A) continues to be an important product, both in Africa where novel institutional arrangements and relations have been productive to achieve wide impact, and in Latin America where staff reductions have weakened national programs. On both continents national programs seek support to incorporate modern selection techniques.

Impact Pathways

Product 1 (Beans with improved micronutrient concentration that have a positive impact on human health) is targeted to small farmers and poor rural and urban consumers in Africa and Latin America. Targeting is developed in collaboration with nutritionists and with experts in GIS, to address human populations with nutritional deficiencies in iron and zinc. This product involves both small seeded germplasm that is often targeted to warmer climates or more difficult environments in Central America, Mexico, Venezuela, East Africa and Brazil. Large seeded germplasm is usually cultivated in more temperate climates in the Andean zone, the East African highlands and southern Africa, although in the African highlands small and large seeded types overlap, sometimes differentiated by soil fertility gradients within the farm, prevailing biotic constraints and household preferences. Improved germplasm is shared or developed jointly with NARS partners, who supply basic seed to a range of organizations interested in production of seed (local seed companies, NGO's, CBO's, women's groups) who in turn distribute to farmers. NGOs and health workers play a special role in delivery. Benefits accrue to farmers/consumers through stable food supply of more nutritious beans for home consumption, and potentially to poor urban consumers. Assumptions for the successful delivery of these products include institutional and financial stability of partners, political stability, and institutional support. The role of CIAT is that of a primary research provider (of improved germplasm), at times a secondary research provider (backing up national bean improvement programs with technical expertise and training), and catalyser (to promote downstream alliances in the uptake chain). This product is complementary to those of CIMMYT and CIP.

Beneficiaries of ***Product 2*** (Beans that are more productive under low input agriculture of poor farmers) are in some cases researchers (both inside and outside of CIAT), and in some cases are bean producers. For example, molecular markers for resistance genes benefit researchers directly, and farmers indirectly as subsequent beneficiaries. Uptake pathway for such methodologies is direct communication through workshops and courses, and indirectly through publications, leading to benefits of more efficient and effective bean research. This assumes that partners are in a position to implement such technologies. On the other hand, crop management practices are of direct benefit to farmers as users, potentially across all bean ecosystems. Uptake chains for agronomic practices are similar to those for seed based technologies; results are communicated to NARS and other partners (NGO's, CBO's etc) who have successfully diffused practices to farmers, to the benefit of farmers who enjoy more stable productivity. Improved germplasm is diffused through many of the same channels as beans with improved nutritional value, with the exception that partners may have less specific interests, and may be more production oriented. The role of CIAT is that of primary source of research for development.

Product 3 (Beans that respond to market opportunities) benefit small farmers in both Latin America and Africa. Farmers in Ethiopia have already benefited from tapping into export markets for canning beans, and other countries are positioning themselves to follow suite. In Central America exporters are seeking to fill a niche created by the Latin population in the USA. This is a demand-driven activity, and in large part has generated its own impact pathway. Exporters and international grain buyers have established market chains that give them access to export quality beans. CIAT's role has been that of supplying germplasm in some cases, and in others to facilitate communication, and to give support in seed systems to avail quality seed to farmers of very specific varieties.

Product 4, (Strengthened institutions that enhance product quality and delivery) seeks to benefit partners at multiple levels through facilitated interaction, including farmers who are at the end of the organizational chain. NGOs, government extension agencies, farmer organizations, local seed companies, and non-conventional seed actors such as women groups, people living with HIV/AIDS and tobacco companies all participate and benefit. The product will generate impact on target beneficiaries through their participation in development of innovations, knowledge and technologies in strategic alliances with multidisciplinary research teams and NGOs. Scaling out of innovations and best practices to areas with similar environments will be done through strategic alliances of research and development actors. The latter will use their network and other communications mechanism to adapt knowledge and results relevant to them. Scaling up regionally and internationally will be done through international NGOs, advocacy, and communication. The outcome is enhanced communication and complementarity of actors with resulting cost efficiencies, and in the case of technology diffusion, increased and diversified adoption. Another dimension of this product is support to NARS in development of projects, benefiting national program researchers and with the outcome of their integration into the product line research mode. This assumes a degree of consistency in partner personnel, while CIAT's role is that of facilitator.

International Public Goods

The IPG of the bean product line include:

- Improved germplasm with biotic and abiotic stress tolerance, and/or enhanced nutritional value, drawing upon the genetic resources of CIAT's extensive gene bank, and 30 years of experience in bean improvement. CIAT's geographical position and access to varied altitudes and research sites facilitates study and selection of germplasm.
- Improved practices for the management of pests and diseases, including monitoring of pathogen populations with modern molecular tools developed at CIAT.
- Knowledge and tools that contribute to the development and implementation of the above IPG's. For example, molecular markers for useful traits, developed with CIAT's in-house resources of genetic maps and markers. Knowledge of the structure of genetic resources housed in the gene bank, and ways to exploit them. Screening methods to identify biotic and abiotic stress resistant

genotypes. Participatory breeding methods with varying degrees of involvement of farmers, traders and other key actors.

- Methods for networking, both formal among official sector researchers, and less formal among a broader range of partners, with special emphasis on research partnerships and on effective and sustainable seed systems reaching a large number of households.

Partners

Most important partners and the respective person-years of professionals dedicated to bean research within the (several) products are:

Product 1: NARS in Latin America, including those of Mexico (6), Guatemala (2.5), Honduras (2, including EAP-Zamorano), El Salvador (2), Cuba (2), Brazil (4) participate in the AgroSalud project to improve nutritional quality and productivity of bean. NARS in South America, including those of Colombia (5 between university staff, an NGO and the NARI), Bolivia (4 between university staff and a foundation) collaborate in the improvement of disease resistance of Andean bean with better nutritional quality, also under the AgroSalud project. NARS in East, Central and Southern Africa, including those of Kenya (5), Rwanda (6), Uganda (5), Malawi (1), Zimbabwe (1) are partners in the improvement of nutritional qualities in large seeded Andean beans. Linkage funds finance a project with one Canadian university, and with a partner in USDA.

Product 2: Nicaragua (4.5) and Honduras (2) are partners in breeding for drought tolerance. NARS in East, Central and Southern Africa including those of Ethiopia (3), Kenya (2), Tanzania (3), Rwanda (4), Malawi (1), Zimbabwe (1) and DRCongo (4), participate in the improvement of productivity under low soil fertility and/or drought. The University of Hannover, Germany participates in a project to define physiological mechanisms of aluminum tolerance and drought resistance (2), which also includes Malawi (2) and Rwanda (4). Catholic University of Leuven (3) is a partner to improve nitrogen fixation technology. NARS in South America, including those of Colombia (5 between university staff, an NGO and the NARI), Bolivia (4 between university staff and a foundation) collaborate in the improvement of disease resistance of Andean bean. NARS in East, Central and Southern Africa, including those of Kenya (5), Rwanda (6), and Uganda (5) Tanzania (4) are partners in the development of disease resistance, medium altitude climbing beans (MAC), and productivity in large seeded Andean beans. NARS in Honduras (Zamorano) (1), Colombia (2), Uganda (3), Rwanda (4), and South Africa (2) share in the use of markers for MAS, especially for resistance. South Africa (3) participates in pathogen characterization, evaluation and validation of resistance sources. Agriculture and Agri-Food Canada (AAFC) is a partner in diagnosis and characterization of soil borne pathogens (especially *Pythium* species) using molecular techniques, and development of molecular based diagnostic assays for soil borne pathogens.

Product 3: Partners in Latin America with specific attention to breeding market quality include NARS in Honduras and Nicaragua. NARS in Africa with active participation in canning beans include those of Ethiopia and Uganda. Partners in the development of snap beans include a university in Colombia, and one in Kenya.

Product 4: NARS as above –plus a wide range of NGOS, CBOS, farmers' groups, women's groups, – totaling over 300 direct-link partnerships, to make users aware of technologies and to get these technologies widely disseminated.

The ECABREN and SABRN bean networks coordinate nine NARS in East Africa and ten NARS in southern Africa, respectively. These networks participate in Products 1, 2, 3 and 4 with input from African NARS cited above, plus NARS in Burundi (3), Sudan (2), Zambia (1), Zimbabwe (1), Mozambique (3), Lesotho (3) and Swaziland (3).

HarvestPlus Challenge Program: IFPRI, CIMMYT, and CIP are immediate collaborators in the CP and the AgroSalud (Latin American) nutritional improvement project, working in the same agro-ecological zones, while ICRISAT, IITA, IRRI, and ICARDA are indirect collaborators under HarvestPlus. ECABREN and SABRN networks in Africa also participate in HarvestPlus.

Generation Challenge Program: Partners include EMBRAPA-Brazil (2), INTA-Cuba (1), Pairumani (an NGO) in Bolivia (2), National University in Colombia (2).

Sub-Saharan Africa Challenge Program: ICIPE, AHI and NARS in Rwanda, Uganda and D.R. Congo are immediate partners.

Product line Funding

Budgeting 2006-2010

Year	2006 (actual)	2007 (estimated)	2008 (proposal)	2009 (plan)	2010 (plan)
US Dollars (millions)	6.276	6.785	6.528	6.589	6.651

IMPROVED BEANS FOR THE DEVELOPING WORLD: PRODUCT LINE SBA1 (2008-2010)

Targets	Products	Intended User	Outcome	Impact
PRODUCT 1	Beans with improved micronutrient concentration that have a positive impact on human health	NARS, farmers & consumers in Central America, the Caribbean, Brazil, East and Southern Africa	Adoption of improved varieties by farmers	Better nutritional status, especially of rural consumers
Product Targets 2008	• ~30 small seeded F3-derived F5 bush bean families developed with tropical adaptation, 60% more minerals, abiotic stress tolerance, and 2 biotic resistances for Central America (HarvestPlus)	• NARS, NGO's CBO's, health workers, and farmers in target countries	• Farmers incorporate high mineral and disease resistance lines into diverse production systems	• Reduced levels of iron and zinc deficiency in bean consumers
Product Targets 2009	• 50 improved lines with varietal potential and 90 ppm iron (ie, 80% more iron) • 15 new large seeded climbing beans with high mineral trait (HarvestPlus) • Marker assisted selection for one nutritional trait (iron) tested	• NARS, NGO's CBO's, health workers, and farmers in target countries	• Adoption of micronutrient rich beans	• Reduced levels of iron and zinc deficiency in bean consumers
Product Targets 2010	• Four fast track micronutrient dense bean varieties disseminated and promoted in two countries in eastern and southern Africa • Two large seeded lines with 50% more iron enter formal varietal release process in eastern Africa	• NARS, NGO's CBO's, health workers and consumers	• Adoption of micronutrient rich beans	• Reduced levels of iron and zinc deficiency in bean consumers

Targets	Products	Intended User	Outcome	Impact
PRODUCT 2	Beans that are more productive in smallholder systems of poor farmers	Breeders and pathologists in CIAT and NARS; farmers in E and S Africa, Andean zone, Caribbean	Adoption of improved varieties by farmers; Best bet IDPM practices and genetic combinations for stable resistance deployed.	More stable production, food availability and income
Product Targets 2008	• 5 molecular markers for detection, diagnosis and diversity studies of ALS and anthracnose pathogens made available • At least 10 lines in major market classes combining resistance to Pythium root rots, BCMV and angular leaf spot • An IPM system for whiteflies on snap beans refined and promoted in 2 major bean producing areas of the Andean zone	• NARS, NGO's and farmers' groups • CIAT and NARS breeders • NARIs researchers in LAC, Africa, IARCs	• Disease and pest characterization tools adopted by researchers • Adoption of disease resistant lines in marginal environments • Increased utilization of integrated management approaches.	• Improved food security, & income. • More stable disease resistance in advanced lines leads to stable yield
Product Targets 2009	• An IDM system for bean root rots implemented and promoted in 2 major bean producing countries in Africa • At least 40 lines combining drought resistance with resistance to BCMNV, root rots, and/or ALS available for testing in Africa • 2 molecular markers linked to ALS and Pythium root rot implemented in MAS	• NARS breeders, NGO's, CBOs, and farmer groups • NARS pathologists,	• Resistant lines incorporated into improved systems • Drought resistant lines with disease resistance used in drought prone areas in Africa • Breeders improve efficiency of genetic improvement	• Reduced yield losses from ALS, root rots and drought
Product Targets 2010	• Resistance genes for anthracnose or ALS introgressed into 5 BCMNV resistant climbing beans • At least 10 genotypes combining drought resistance with aluminium resistance available for testing in Africa	• NARS breeders, NGO's, CBOs, and farmer groups • NARS soil scientists and agronomists	• Farmers benefit from yield stability of high yield climbers • Farmers benefit from stable yields in marginal areas	• Improved food security, & income.

Targets	Products	Intended User	Outcome	Impact
PRODUCT 3	Beans that respond to market opportunities	NARS in Africa and Latin America	Adoption of commercial varieties by farmers, enhancing access to markets	Higher income, especially for the poor and women farmers
Product Targets 2008	• 10 lines of snap beans with confirmed resistance to Gemini virus in Colombia • 1 variety released in Nicaragua for export market	• NARS, NGOs, CBOs, farmer groups, seed producers	• Farmers reduce pesticide use, assuring production and profitability	• Less pesticide intoxication in rural communities and urban consumers • Increased production and incomes.
Product Targets 2009	• At least 3 snap bean lines with resistance to rust and quality characteristics preferred in regional and export markets for Africa. • 4 bean genotypes with very high commercial or export quality made available to farmers in 4 countries in Latin America and Africa	• NARS, NGOs, CBOs, farmer groups, seed producers	• Adoption of snap bean and reduced chemical use. • Farmers in marginal environments assure market access	• Increased production and incomes.
Product Targets 2010	• 5 canning bean lines with acceptable quality characteristics in yield trials in two countries in eastern Africa	• NARS, NGOs, CBOs, farmer groups, seed producers	• Farmers improve yields and quality of product with improved varieties	• Increased production and incomes.

Targets	Products	Intended User	Outcome	Impact
PRODUCT 4	Strengthened institutions that enhance bean product development and delivery	NARS in Africa and Latin America	Improved institutional performance by NARS, NGOs and other partners, reflected in more effective technology development and dissemination	More stable production, improved food availability, income and nutrition, especially for the poor and women farmers
Product Targets 2008	• One comprehensive methodology developed for assessing seed security and targeting responses in acute and chronic stress situations. • Lessons from 3 case studies (approaches for partnership; capacity building; alternative seed delivery systems) of strategies for product development and delivery in PABRA analyzed. • Protocols developed and adapted to facilitate application of MAS for disease resistance in 3 African countries • Breeding programs for higher iron levels established in Honduras, Nicaragua, Bolivia, Venezuela, Kenya and Malawi	• NARS, NGOs, CBOs, farmer groups, seed certification agencies, seed producers • UN, humanitarian and post-stress recovery organizations • PABRA	○ Frameworks and methodologies for seed systems, PM&E, and MAS are in use by PABRA partners	
Product Targets 2009	• A guide for mainstreaming and sustaining wider impact, developed and recommendations availed for 5 countries in East, Central and 4 countries in Southern Africa • Three delivery channels strategies tested for reaching the poor and in marginal areas with new variety innovations and information • At least 1 methodological frameworks/strategies for testing and evaluating multi-stakeholder networks and platforms (between private-public) for facilitating decentralized targeting for pro poor impact.	○ NARS, NGOs, Decentralized Local Governments, CBOs, farmer groups, seed certification agencies, seed producers ,agro-processors, local financial institutions • UN, humanitarian and post-stress recovery organizations	• Increased partner involvement in accessing technologies to a greater number of end users • Increased capacities of partner organizations / institutions to develop and promote integrated and decentralized strategies for reaching pro-poor farmers	

Targets	Products	Intended User	Outcome	Impact
	• Capacity to evaluate root systems in soil tubes established in Honduras and Nicaragua			
Product Targets 2010	• Elements of Pro-poor seed delivery and production systems confirmed and such pro-poor seed enterprises established in 2 PABRA network countries. • One strategy for wider utilization of non varietal bean technologies (IPM; soil management) developed and widely shared in 4 countries in Africa	• NARS, NGOs, CBOs, farmer groups, seed certification agencies, seed producers		
PRODUCT 5	More than 35,000 accessions are conserved, documented and available for distribution	Breeders, geneticists, and other bean scientists; national gene banks	Bean genetic resources are used directly or employed in breeding programs	More stable production, improved food availability, income and nutrition
Product Targets 2008	• 1500 accessions conserved in long term storage and in back-up in CIMMYT • 1000 samples of bean seed distributed	• Bean scientists; other gene banks	○ Novel genes incorporated into breeding programs	
Product Targets 2009	• Another 1500 accessions conserved in long term storage and in back-up in CIMMYT • Another 1000 samples of bean seed distributed • A plan formulated to establish a database of evaluation data	• Bean scientists; other gene banks	○ Novel genes incorporated into breeding programs	
Product Targets 2010	• Another 1500 accessions conserved in long term storage and in back-up in CIMMYT • Another 1000 samples of bean seed distributed	• Bean scientists; other gene banks	○ Novel genes incorporated into breeding programs	

2. IMPROVED BEANS FOR THE DEVELOPING WORLD – 2008 OUTPUT TARGETS

TARGETS 2008	Fully Achieved	75% Achieved	>50% Achieved	<50% Achieved	Cancelled	Deferred	EXPLANATION
PRODUCT 1 • ~30 small seeded F3-derived F5 bush bean families developed with tropical adaptation, 60% more minerals, abiotic stress tolerance, and 2 biotic resistances for Central America (HarvestPlus)	X						To be documented in 2008 Annual Report
PRODUCT 2 • 5 molecular markers for detection, diagnosis and diversity studies of ALS and anthracnose pathogens made available		X					Seven locus-specific microsatellite markers for ALS pathogen, which quickly distinguish between Andean and Mesoamerican pathogen groups were identified. Work on anthracnose was not pursued after the responsible pathologist left CIAT
• At least 10 lines in major market classes combining resistance to Pythium root rots, BCMV and angular leaf spot		X					Lines combining Pythium root rots and ALS and those with BCMVN in early generation.
• An IPM system for whiteflies on snap beans refined and promoted in 2 major bean producing areas of the Andean zone	X						Partially in 2007 report with additional documentation in 2008 Annual Report

TARGETS 2008	Fully Achieved	75% Achieved	>50% Achieved	<50% Achieved	Cancelled	Deferred	EXPLANATION
PRODUCT 3 • 10 lines of snap beans with confirmed resistance to Gemini virus in Colombia						X	Weather conditions in Colombia did not permit the build up of the white fly vector to be able to evaluate lines in the field
• 1 variety released in Nicaragua for export market		X					A new line with commercial grain type is already in commercial production for export but is not officially released.
PRODUCT 4 • One comprehensive methodology developed for assessing seed security and targeting responses in acute and chronic stress situations.	X						To be documented in 2008 Annual Report
• Lessons from 3 case studies (approaches for partnership; capacity building; alternative seed delivery systems) of strategies for product development and delivery in PABRA analyzed.	X						To be documented in 2008 Annual Report
• Protocols developed and adapted to facilitate application of MAS for disease resistance in 3 African countries		X					Protocols developed but adaptation in three countries delayed because of a delay in the start of Kirkhosue Trust supported projects (in 4 countries) which was to provide infrastructure and also support capacity development in collaboration with CIAT. This project start in 2009
• Breeding programs for higher iron levels established in Honduras, Nicaragua, Bolivia, Venezuela, Kenya and Malawi	X						To be documented in 2008 Annual Report

3. RESEARCH HIGHLIGHTS IN 2008

We will highlight 3 areas of our current research portfolio:

3.1. Drought resistance and yield potential in Andean beans

Contributors: S. Beebe, M. Blair, I. Rao, M. Grajales, C. Cajiao, F. Monserrate

Breeding for drought resistance in the small seeded Mesoamerican beans has been successful, but the large seeded Andean beans have received less attention. In 2007 and 2008 advanced breeding lines with commercial Andean grain types were tested under drought, and in 2008 the same lines were evaluated in Palmira with irrigation, and at a mid-altitude site (1400 masl) in Darién under rainfed but favorable conditions. Several lines expressed an advantage of about 50% in the drought trials over check cultivars in three grain classes (large red; cream striped; and large white) while progress in the red mottled class was more modest. Furthermore, in the irrigated plots and in the mid-altitude site, where the Andean beans normally adapt especially well, some drought tolerant lines yielded as much as a ton more than the checks. This finding is comparable to that with Mesoamerican beans, whereby drought-selected lines expressed improved yield potential, a finding that has been attributed to better remobilization of biomass from vegetative parts to grain. The current results suggest a similar trend in Andean beans. Yield improvement has been especially difficult in Andean beans, and these results may indicate a means to overcome this long term bottleneck.

3.2 Baseline study on the role and importance of common bean in drought prone areas of East Africa

Contributors: E. Katungi, L. Sperling, A. Farrow

The bean program is undertaking massive diffusion of drought resistant varieties in drought prone areas of east Africa. A socio-economic baseline survey was conducted in semi-arid areas of Kenya (Eastern province) and Ethiopia (Oromia and Southern region) to contextualize this effort and to orient the breeding for drought resistance. A total 360 farming households in 18 villages, and 120 traders along the value chain were interviewed in the two countries. In Kenya farmers integrate a diversity of crops, cropping systems and farming management practices with local ecosystems and livelihoods to cope with drought. They dry-plant their crops, make terraces to harvest water, intercrop intensively, keep livestock, invest in social capital, work outside their farms for food or wage and undertake petty trade and handcraft but still experience an average of 5 months of inadequate food supply per year. Drought is ranked the most important constraint to livelihood improvement, causing about 70% yield loss in common beans when it occurs. Nevertheless, common bean is ranked the second most important food crop after maize, with about 70% of households growing from 3 to 10 varieties simultaneously, primarily for home consumption. Household characteristics, as well as consumption and production attributes are the driving factors that underlie variety choice and extent of planting. The breeding effort should target both categories of attributes.

3.3 Application of MAS in support of the Ethiopian national bean improvement program

Contributors: M. Blair, H. Buendía, S. Beebe, T. Assefa, C. Cardona, J.M. Bueno

The arcelin seed protein is the most effective resistance factor for the storage pest of common bean, *Zabrotes subfasciatus* (Boheman). Crosses were made between arcelin-containing RAZ lines and a series

of Andean and Mesoamerican beans with drought tolerance useful for Eastern and Southern Africa (Ethiopia, Kenya, Malawi, Tanzania and Zimbabwe). For Ethiopia, crosses were generated to incorporate arcelin into a drought tolerant background and then transfer that resistance/tolerance to the small white, Ethiopian variety 'Awash Melka'. Double crosses were generated with Andean types including the Malawian release CIM9314-34, the Kenyan releases KAT B1 and KAT B9 and other African cultivars such as Canadian Wonder, CAL96 and CAL143. Marker assisted selection (MAS) is applied for the arcelin gene to facilitate the pyramiding of bruchid resistance with other biotic and abiotic stress resistances. MAS was carried out using microprep DNA. For Andeans, a total of 251 F_1 plants segregated for the arcelin locus, and of these, 236 amplified with the arcelin marker. For improvement of Awash Melka, a total of 498 F_1 plants segregated for the arcelin locus in seven different pedigrees. This latter work represents support to an Ethiopian Ph.D. candidate. This represents the first application of MAS for insect resistance in common bean.

4. PROJECT OUTCOME:

Managing Bean Root Rot - A constraint Associated with Intensification in Land Use

Outcome statement: National program breeders and pathologists initiate breeding programs and select resistant lines based on information of pathogen distribution defined by CIAT pathologists.

This outcome results from an output target in CIAT's 2004-2007 MTP: "Pathogen distribution maps developed for ALS, anthracnose, Pythium and Fusarium." Results meeting this target were reported in the 2005 Annual Report (pp. 182-185). It is also associated with the target, "Improved germplasm available to NARS, regional networks, and farmers, combining better yield with disease resistance", by availing root rot resistant lines to partners in Africa (MTP 2004, 2005).

Context: Intensified land use in the highlands of Eastern and Central Africa has been associated with the increased incidence of bean root rots, a devastating disease caused by a complex of soilborne pathogens, mainly Pythium species. In 2001, over 75% of farmers reported calamitous declines in bean production associated with root rots in a survey in western Kenya districts of Kakamega and Vihiga. These districts and those of southwestern Uganda and many parts of Rwanda are typical of regions affected by root rot: farm sizes are small (average 1-2.6 ha), population densities high (404 persons /km^2 in Kakamega and 938 in Vihiga), and crop rotation near nil.

CIAT identified major Pythium species prevalent in Kenya, Rwanda and Uganda on the basis of cultural and molecular techniques. Species distribution and prevalence were mapped, including at key root rot "hot spots". This basic information was then used by breeders in East Africa to guide germplasm evaluations and varietal improvement programs. The regional breeder backstopping NARS breeding programs in East and Central Africa Bean Research Network (ECABREN) evaluated a range of germplasm representing different market classes using artificial inoculation of representative Pythium species and at a key "hot spot" in Western Kenya. A number of resistant germplasm such as AND 1055, NR 12793-8-1, NR 12631-7-1, RAB 475, DFA 52 and NM 12803-11 were identified (RF & CIAT Reports). Similarly NARS breeders from Kenya, Uganda, Rwanda, and southern Democratic Republic of Congo used the knowledge to evaluate nurseries and segregating populations for resistance to prevalent Pythium species (Musoni, et al. – *in press*; Otsyula, PhD thesis; Kimani et al, 2005; ECABREN Report; CIAT Annual reports) at respective "hot spots" (Vihiga, western Kenya; Kabale, southwest Uganda; Runyinya, Rwanda. Representative isolates (maintained at Kawanda, Uganda) were used to artificially screen germplasm from the three countries. A breeder from KARI, Kakamega, Kenya used the identified species to study the nature of resistance and mechanism of inheritance in selected sources of resistance (Otsyula, 2005 – Rockefeller meeting, PhD 2009 thesis). In addition he and his counterparts in Rwanda (ISAR) and Uganda (NARO) used the "hotspots" above and artificial inoculation of identified Pythium species to select resistant progenies from populations developed to improve root rot resistance in local bush (e.g. GLP-2, CAL 132, Urugezi) and climbing beans.

Following extensive artificial inoculations with key Pythium species (*P.ultimum var ultimum, P. salpingophorum, P. spinosum , P. torulosum, P. pachycaule*) and evaluations under natural conditions at "hotspots" by CIAT and NARS partners in Uganda, Rwanda and Kenya, resistant germplasm was used to constitute a root rot nursery. About 80 entries were made available to several NARS partners in Africa (Kenya, Uganda, Rwanda, DRC, Ethiopia, Malawi, South Africa, and Cameroon) (CIAT Annual Reports). These partners in turn involved farmers to evaluate the materials. As a result in Uganda, two genotypes originally from Rwanda (RWR 2075 and RWR 1946) were highly appreciated by farmers and traders in evaluations over a 2 year period. The farmers gave them local names; RWR 1946 with a large dark red seed type was named "Murwanisa" meaning 'resistant to harsh conditions' and RWR 2075 'Muzahura', meaning 'restorer' (Namayanja et al. Euphytica). These genotypes have been released in Uganda as NABE 13 (RWR 1946) and NABE 14 (RWR 2075), and have entered national performance trials in Kenya as well. In Kenya SCAM-CM80/15 has also been released.

5. LIST OF 2008 PUBLICATIONS

(includes in press, in review and accepted) - see complete list

5.1 Book chapters and books (all in English)

- Book chapters published: 6
- Book chapters in press: 4

5.2 Refereed and non-refereed journal articles

- Papers published in English: 25
- Papers in press in English: 1
- Papers in review in English: 2
- Papers accepted in English: 1
- Papers published in Spanish: 1
- Papers in review in Spanish: 2

5.3 Workshop and conference papers

- Papers in English: 28
- Papers in Spanish: 1

5.4 Proceedings, posters, abstracts, others

- Proceedings: in English 13
- Posters: in English 10
  in Spanish 4
- Others: in English 4
- Media Campaign Wires
  Online
  Broadcast
  Print

5.5 Editorial Contributions

- Scientific Committee of Agronomia Colombiana Journal
- Reviewed articles for:
  Crop Science
  Agroforestry Systems
  Acta Agronomica

5.1 BOOK CHAPTERS AND BOOKS

Arora-Jonsson, Seema, Ballard, Heidi L., Buruchara, Robin, Casolo, Jennifer, Classen, Lauren, DeHose, Judy; Emretsson, Margareta; Fortmann, Louise; Halvarsson, Anne Lundgren; Halvarsson, Ewa; Humphries, Sally; Long, Jonathan; Murphree, Marshall W; Nemarundwe, Nontokozo; Olssen, Anne; Rhee, Steve; Ryen, Anna; Wilmsen, Carl; Wollenberg, Eva. 2008. Conclusions *In* Louise Fortmann (ed). Participatory Research in Conservation and Rural Livelihoods: Doing Science Together. Blackwell Publishing Ltd.

Beebe, S.E., I.M. Rao, M.W. Blair and J.A. Acosta-Gallegos. 2008. Drought resistance phenotyping of common bean. Generation Challenge Program Special Issue on Phenotyping (in press).

Buruchara., R.A. 2008. How Participatory Research Convinced a Skeptic. *In* Louise Fortmann (ed). Participatory Research in Conservation and Rural Livelihoods: Doing Science Together. Blackwell Publishing Ltd.

Fortmann, L., H. Ballard, and L. Sperling. 2008. Change around the Edges: Gender Analysis, Feminist Methods and Sciences of Terrestrial Environments. In L. Schiebinger (ed). Gendered Innovations, Stanford University Press.

Gepts, P., Aragao, F., Barros, E., Blair, M.W., Brondani, R, Broughton, W., Hernández, G., Kami, J., Lariguet, P., McClean, P., Melotto, M., Miklas, P., Pedrosa-Harand, A., Porch, T., Sánchez, F. 2008. Genomics of *Phaseolus* beans, a major source of dietary protein and micronutrients in the tropics. In P.H. Moore and R. Ming (eds) Genomics of Tropical Crops, Springer Publ., Chp 5. pp. 113-143.

Jansa, J., A.Bationo, E. Frossard, I.M. Rao. 2008. Options for improving plant nutrition to increase common bean productivity in Africa. In: A. Bationo (ed) Fighting Poverty in Sub-Saharan Africa: The Multiple Roles of Legumes in Integrated Soil Fertility Management, Springer-Verlag, New York (in press).

Kimani, P.M., Lunze Lubanga, Gideon Rachier and Vicky Ruganzu. 2009. Breeding common bean for tolerance to low fertility acid soils in East and Central Africa. In: *Bationo, A. et al* (eds). *Innovations for the Green Revolution in Africa*. Springer Verlag, Dordrecht, The Netherlands (accepted and in press).

Mauyo, L. W. J. R. Okalebo, R. A. Kirkby, R. Buruchara, M. Ugen, and H. K. Maritim, 2007. Spatial pricing efficiency and regional market integration of cross-border beans (*Phaseolus vulgaris*) marketing in East Africa: The case of Western Kenya and Eastern Uganda. *In* p 1027-1033. Bationo et.al. (eds) Advances in Integrated Soil Fertility Management in Sub-Saharan Africa

Nandwa, S.M., A. Bationo, S.N. Obanyi, I.M. Rao, N. Sanginga and B. Vanlauwe. 2008. Inter and intra-specific variation of legumes and mechanisms to access and adapt to less available soil phosphorus and rock phosphate. In: A. Bationo (ed) Fighting Poverty in Sub-Saharan Africa: The Multiple Roles of Legumes in Integrated Soil Fertility Management, Springer-Verlag, New York (in press).

Teshale Assefa, H. Assefa and P.M. Kimani. 2007. Development of improved haricot bean germplasm for mid- and low altitude sub-humid ecologies of Ethiopia, pages 87-94. In: Food and Forage Legume of Ethiopia: Progress and Prospects. ICARDA, Allepo, Syria.

5.2 Refereed and Non-Refereed Journal articles

Refereed Journals

Akhter, A., M.S.H. Khan, E. Hiroaki, K. Tawaraya, I.M. Rao, P. Wenzl, S. Ishikawa and T. Wagatsuma. 2008. The greater contribution of low-nutrient tolerance to the combined tolerance under high-aluminum and low-nutrient stresses for sorghum and maize in a solution culture simulating the nutrient status of tropical acid soils. Soil Science and Plant Nutrition (in press).

Astudillo C., Blair, M.W. 2008. Evaluación del contenido de hierro y zinc en semilla y su respuesta al nivel de fósforo en variedades de fríjol colombianas. Agronomía Colombiana 26: 471-476.

Beebe, S., I. M. Rao, C. Cajiao, and M. Grajales. 2008. Selection for drought resistance in common bean also improves yield in phosphorus limited and favorable environments. Crop Science 48: 582-592.

Blair, M.W., Morales, F.J. 2008. Geminivirus resistance breeding in common bean. CAB Reviews: Perspectives in Agriculture, Veterinary Science, Nutrition and Natural Resources 3: 1-14.

Blair, M.W., Buendía, H.F., Giraldo, M.C., Metais, .I, Peltier, D. 2008. Characterization of AT-rich microsatellites in common bean (*Phaseolus vulgaris* L.) Theor Appl Genet 118: 91-103.

Blair, M.W., Porch, T., Cichy, K., Galeano, C.H., Lariguet, P., Pankurst, C., Broughton, W. 2008. Induced mutants in common bean (*Phaseolus vulgaris*), and their potential use in nutrition quality breeding and gene discovery. Israel Journal of Plant Sciences 55: 191 – 200.

Checa, O.E., Blair, M.W. 2008. Mapping QTL for climbing ability and component traits in common bean (*Phaseolus vulgaris* L.) Molecular Breeding 22: 201-215.

Dwivedi, S.L., Upadhyaya, H.D., Stalker, H.T., Blair, M.W., Bertioli, D., Nielen, S., Ortiz, R. 2008. Enhancing crop gene pools of cereals and legumes with beneficial traits using wild relatives. Plant Breeding Reviews 30: 179-230.

Garzón, L.N., Ligaretto, G., Blair, M.W. 2008. Molecular marker assisted backcrossing of anthracnose resistance into Andean climbing beans (*Phaseolus vulgaris* L.) Crop Science 48:562-570.

López-Marín, H.D., I.M. Rao and M.W. Blair. 2008. Quantitative trait loci for aluminum toxicity resistance in common bean (*Phaseolus vulgais* L.). Theoretical and Applied Genetics (in review).

Mauyo, L. W., J. R. Okalebo, R. A. Kirkby, R. Buruchara, M. Ugen and R.O. Musebe. 2007. Legal and institutional constraints to Kenya-Uganda cross-border bean marketing. African Journal of Agricultural Research Vol. 2 (11), pp. 578-582

Mauyo, L.W., J. R. Okalebo, R. A. Kirkby, R. Buruchara, M. Ugen, C.T. Mengist, V.E. Anjichi and R.O. Musebe. 2007. Technical efficiency and regional market integration of cross-border bean marketing in western Kenya and eastern Uganda. African Journal of Business Management pp. 077-084

McGuire, S. and Sperling, L. 2008. Leveraging farmers' strategies for coping with stress: seed aid in Ethiopia. Global Environmental Change, Vol 18 (4): 679-688.

Montoya, C.A., Leterme, P., Beebe, S., Souffrant, W.B., Mollé, D., and Lalle`s, J.P. 2008. Phaseolin type and heat treatment influence the biochemistry of protein digestion in the rat intestine. British Journal of Nutrition, 99, 531–539.

Montoya, C.A., Leterme, P., Victoria, N.F., Toro, O., Souffrant, W.B., Beebe, S., and Lallès, J.P. 2008. Susceptibility of Phaseolin to in Vitro Proteolysis Is Highly Variable across Common Bean Varieties (*Phaseolus vulgaris)*. J. Agric. Food Chem., 56, 2183–2191.

Mwang'ombe, A.W., Wagara, N. Kimenju, J.W., Buruchara, R.A. 2007. Occurrence and Severity of Angular Leaf Spot of Common Bean in Kenya as Influenced by Geographical Location, Altitude and Agroecological Zones. Plant Pathology Journal. 6: 235-241

Odeny, D.A., S. M. Githiri and P.M. Kimani. 2009. Inheritance of resistance to fusarium wilt in pigeonpea, cajanus cajan (L.) Millsp. J. Animal and Plant Sciences 2: 89-95.

Polanía, J., I.M. Rao, S. Beebe, and R. García. 2008. Desarrollo y distribución de raices bajo estrés por sequía en frijol común usando tubos con suelo en condiciones de invernadero. Agronomía Colombiana (in review).

Rangel, A.F., I M. Rao and W.J. Horst. 2008. Cellular distribution and binding state of aluminum in root apices of common bean (*Phaseolus vulgaris* L.) genotypes differing in aluminum resistance. Physiologia Plantarum (published online on 5 November 2008).

Rao, I.M., P. Wenzl, A. Arango, J. Miles, T. Watanabe, T. Shinano, M. Osaki, T. Wagatsuma, G. Manrique, S. Beebe, J. Tohme, M. Ishitani, A. Rangel and W. Horst. 2008. Advances in developing screening methods and improving aluminum resistance in common bean and Brachiaria. Braz. J. Agric. Res. (in review).

Remans, R., S. Beebe, M.W. Blair, G. Manrique, I.M. Rao, A. Croonenborghs, R.T. Gutierrez, M. El-Howeity, J. Michiels and J. Vanderleyden. 2008. Detection of quantitative trait loci for root responsiveness to auxin producing plant growth promoting bacteria in common bean (*Phaseolus vulgaris* L.). Plant and Soil 302:149-161.

Rivera, M., E. Amézquita, I. Rao and J. C. Menjivar. 2008. Análisis de la variabilidad especial y temporal del contenido de humedad en el suelo de diferentes sistemas de uso de suelo. Acta Agronómica (in review).

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Schlueter, J.A., Goicoechea, J.L., Collura, K., Gill, N., Lin, J-Y., Yu, Y., Vallejos, E., Muñoz, M., Blair, M.W., Tohme, J, Tomkins, J., McClean, P., Wing, R., Jackson, S.A. 2008. BAC-end sequence analysis and a draft physical map of the common bean (*Phaseolus vulgaris* L.) genome. Tropical Plant Biology 1: 40-48.

Sperling, L., H.D. Cooper, and T. Remington. 2008. Moving toward more effective seed aid Journal of Development Studies, Vol 44(4):586-612.

Wagara, I.N. A. W. Mwangombe, J. W. Kimenju, and R. A. Buruchara, 2007. Variation in aggressiveness of *Phaeoisariopsis griseola* and angular leaf spot development in common bean J. Trop. Microbiol. Biotechnol. 3:3-13

Zhang, X., Blair M.W., Wang, S. 2008. Genetic diversity of Chinese Common bean (*Phaseolus vulgaris* L.) landraces assessed with simple sequence repeat (SSR) markers. Theor Appl Genet 117:629–640.

NON-REFEREED JOURNALS

Blair, M.W., Buendía, H.F., Díaz, L.M., Díaz, J.M., Giraldo, M.C., Tovar, E., Duque, M.C., Beebe, S.E., Debouck, D.G. 2008. Utilization of microsatellite markers in diversity assessments for common bean. Annual Report of the Bean Improvement Cooperative 51: 12-13.

Blair, M.W., Caldas, G.V., Muñoz, C., Bett, K.E. 2008. Evaluation of condensed tannins in tepary bean genotypes. Annual Report of the Bean Improvement Cooperative 51: 130-131.

Blair, M.W., Iriarte, G., Beebe, S.E. 2008. Utilization of wild accessions to improve common bean (*Phaseolus vulgaris*) varieties for yield and other agronomic characteristics. Grain Legumes 50: 8-9.

Blair, M.W., Namayanja, A., Kimani, P., Checa, O., Cajiao, C., Kornegay, K. 2008. Development and testing of mid-elevation, commercial-type, Andean climbing beans. Annual Report of the Bean Improvement Cooperative 51: 124-125.

Porch, T.G., Blair, M.W., Lariguet, P., Broughton, W. 2008. Mutagenesis of common bean genotype BAT 93 for the generation of a mutant population for TILLING. Annual Report of the Bean Improvement Cooperative 51: 16-17.

5.3 WORKSHOP AND CONFERENCE PAPERS

Blair, M.W. 2008. Advances in Common Bean Genomics. Presented at IV International Congress on Legume Genetics and Genomics, in Vallarta, Mexico, 7-12 Dec.

Blair, M.W., A. Asfaw, G. Makunde. 2008. Advances for the common bean TL1 project. Presented at Tropical Legumes I meeting, 2 July.

Blair, M.W. Bean Genomics/ Genetics at CIAT. 2008. Presented at INIA- Quilamapu, Chile, 23 Jan.

Blair, M.W. 2008. Breeding medium – large seeded Andean beans for high minerals. Presented at Harvest Plus bean meetings in Bukavu, DR Congo, 8 Oct., and Butare, Rwanda, 12 Oct.

Blair, M.W. 2008. Genômica do Feijoeiro no CIAT. IX Congresso Nacional de Pesquisa de Feijão, in Campinas, Brazil, 21 Oct.

Blair, M.W. 2008. Improving common bean productivity for drought prone environments in sub-Saharan Africa. GCP Annual Research Meeting in Bangkok, Thailand, 15-20 Sept.

Blair, M.W., and Beebe, S. 2008. Marcadores Moleculares para el Mejoramiento de Frijol Común. Primer Congreso Internacional y Feria de Frijol in Celaya, Guanajuato, México, 22 May.

Blair, M.W. 2008. Microsatellite diversity of cultivated common bean (*Phaseolus vulgaris* L.). - CIAT internal seminar, 23 April.

Blair, M.W. 2008. Population structure in cultivated common bean (*Phaseolus vulgaris* L.). IV International Conference on Legume Genomics and Genetics in Vallarta, Mex., 6 Dec.

Blair, M.W. 2008. Potential of the Common Bean reference collection (diversity structure and drought tolerance performance assessment). ADOC meeting – ICRISAT, Hyedrabad, AP, India, 10-12 Sept.

Blair, M.W. 2008. Race structure and relationships among "ecotypes" in cultivated common bean (*Phaseolus vulgaris* L.). Plant and Animal Genome, San Diego, California, 11-16 Jan.

Buruchara, R. A. 2008. Contributing towards reducing hunger and poverty in Africa: CIAT's approach, experience and opportunities. Presentation at JIRCAs, Tokyo, Japan, May 2008

Buruchara, R. A. 2008. ISFM-based crop production systems for major impact zones in sub-Saharan Africa. Presentation at the Round Table |Meeting on Agricultural Research for African Development May, 2008, University of Tokyo.

Kimani, P.M., S. Beebe, M. Blair, R. Chirwa and I. Rao. 2008. Improving productivity of common bean and incomes for the poor in marginal environments of sub-Saharan Africa: Overview of TL I and II projects. Drought phenotyping workshop, 4-17 May 2008 Lilongwe, Malawi.

Kimani, P. M., G. Mbugua and P. Okwiri. 2008. Breeding beans for drought resistance in East and Central Africa region. Drought phenotyping workshop, 4-17 May 2008 Lilongwe, Malawi.

Kimani, P.M. 2008. Characterisation in drought testing sites in East and Central Africa. Drought phenotyping workshop, 4-17 May 2008, Lilongwe, Malawi.

Kimani, P.M. 2008. Future breeding for drought resistance in eastern Africa. Drought phenotyping workshop, 4-17 May 2008, Lilongwe, Malawi.

Kimani, P.M., R. Chirwa, A. Namayanja, C. Ruradama, S. Gebeyehu, N. Mbikayi and Lodi Lama. 2008. Breeding better bean varieties for African farmers: Achievements and Future directions. PABRA Stakeholders Workshop, 21-25 January 2008, Kampala, Uganda

Kimani, P.M., S. Beebe and M. Blair. 2008. Breeding Micronutrient Dense Bean Varieties in East and Central Africa. HarvestPlus Regional Review and Planning Workshop, 6-9 October 2008, Bukavu, DR Congo.

Kimani, P.M., S. Beebe, Nkonko Mbikayi and M. Blair. 2008. Screening bean germplasm for micronutrients. HarvestPlus Regional Review and Planning Workshop, 6-9 October 2008, Bukavu, DR Congo.

Kimani, P.M. 2008. Genotype x environment interactions for micronutrient density and variety release. HarvestPlus Regional Review and Planning Workshop, 6-9 October 2008, Bukavu, DR Congo.

Kimani, P.M. 2008. Breeding micronutrient dense beans in ECABREN: Objectives, activities and Milestones. HarvestPlus Regional Review and Planning Workshop, 6-9 October 2008, Bukavu, DR Congo.

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Kimani, P.M. and R. Chirwa. 2008. Future Breeding for Drought Resistance, Better Nutrition and Health in PABRA. Pan African Bean Research Alliance Annual workshop, 20-24 October 2008, Lilongwe, Malawi

Kimani, P.M. 2008. New Research Directions in PABRA: Implications for WECABREN. IRAD-WECABREN Collaborative Bean Research Program Workshop, 16-21 November 2008, Bafoussam, Cameroon.

Kimani, P.M. 2008. Agronomic management for maximising micronutrient density in beans. HarvestPlus Regional Review and Planning Workshop, 6-9 October 2008, Bukavu, DR Congo.

Kimani, P.M. 2008. Improving food security and quality for low input farmers in the East African Highlands: Lessons Learnt. Nutribean Review and Planning Workshop, 24-27 August 2008, Nyeri, Kenya.

Rubyogo, J.C., and L. Sperling, 2008. Developing seed systems in Africa . In Robert Chambers, Ian Scoones and John Thompson eds. Farmer First Revisited : Farmer Participatory Research and Development Twenty Years on. Workshop held Institute of Development Studies, University of Sussex, Brighton, UK. 12-14 December, Sussex: IDS

Sperling , L , S. Nagoda and A. Tveteraas. 2008. Moving from emergency seed aid to seed security - linking relief with development. Workshop organized by the Drylands Coordination Group Norway and Caritas Norway, in collaboration with Norad and The Norwegian Ministry of Foreign Affairs. Oslo, Norway, DCG Proceedings No. 24, 14 May.

5.4 Proceedings, Posters, Abstracts and Others

Proceedings

Chirwa, R. M., M. Pyndji and R. Buruchara. 2008. CIAT-PABRA Management and Organization – An assessment of strengths, weaknesses, opportunities and threats. A paper presented at a PABRA Stakeholders Workshop, Kampala, Uganda , 15-20 January

Chirwa, R. M, R. Buruchara. 2008. CIAT's Pan Africa Bean Research Alliance (PABRA) – An Overview. A paper presented at a Grain Legumes CRSP inception Workshop, Barcelona, Spain, 29 Feb. - 4 March

Chirwa, R. M., J. M. Bokosi and E. Mazuma. 2008. Use of Marker Assisted Selection in Developing Bean Varieties for multiple disease resistance in Malawi. A paper presented at a Meeting organized by Kirkhouse Trust in Kampala, Uganda 6-7 March

Chirwa, R. M. 2008. The Status of Southern Africa Bean Research Network – Progress Towards Achieving Targets in the Current Phase. A paper presented at the PABRA Steering Committee Meeting, Lusaka, Zambia, 17-19 March .

Chirwa, R. M., D. Fourie and G. Makunde. 2008. Bean breeding for drought resistance in SABRN. A paper presented at the TL-II training workshop held at MIM, Lilongwe, Malawi, 5-16 May

Chirwa, R. M. 2008. Future bean breeding for drought resistance in SABRN. A paper presented at the TL-II training workshop held at MIM, Lilongwe, Malawi, 5-16 May

Chirwa, R. M., E. Mazuma and J. C. Rubyogo. 2008. Getting back to basics: creating impact -oriented bean seed delivery systems for the poor (and others) in Malawi. A paper presented at the PVS training Workshop for NARS partners, Mponela, Malawi, 26-27 May

Chirwa, R. M., H. Tefera and M. Siambi. 2008. Current Status of the Legume Industry: Bean, Soybean, Groundnut & Goal of the Legume Platform. Presented at the 1st RIU-Legume Platform Meeting Held at NASFAM Conference Room, Lilongwe, Malawi, 5th June

Gomonda, R.W.J, I.M.G Phiri, R. Chirwa and C. Mwale. 2008. Improving Soil Fertility: Key Programmes, Strategies and Challenges in Malawi. Presented at the Soil Health Program launch workshop, held at Windsor Golf Hotel, Nairobi Kenya 16-18 June

Chirwa, R. M., J. C. Rubyogo, L. Sperling, E. Mazuma, M. Amane and C. Madata. 2008. Getting back to basics: creating impact -oriented bean seed delivery systems for the poor (and others) in Malawi, Mozambique and Tanzania - A progress report. A paper presented at the McKnight's Legumes CCRP community of practice workshop held at Hotel VIP, Maputo, Mozambique, 6-9 Oct.

Chirwa, R. M. 2008. The status of bean research activities in the SABRN. A paper presented at the SABRN/ECABREN joint SC meeting held at Lilongwe Hotel, Lilongwe, 22-24 Oct.

Chirwa, R.M, C. Mwale, A. R. Saka, and Ian Kumwenda. 2008. Alliance for a Green Revolution in Africa - Soil Health Program Business Planning Process. A Country Report for Malawi. October

Horst, W.J., A.F. Rangel, D. Eticha, M. Ishitani and I.M. Rao. 2008. Aluminum toxicity and resistance in *Phaseolus vulgaris* – physiology drives molecular biology. Proceedings of the 7th International Symposium on Plant-Soil Interactions at Low pH, Guangzhou, China, 17-21 May.

POSTERS

Asfaw, A., M.W. Blair. 2008. Population Genetic Structure of Common Bean (*Phaseolus vulgaris* L.) Landraces from Ethiopia and Kenya. Plant Animal Genome, San Diego, California, 11-17 Jan.

Becerra, V., M. Paredes, C. Rojo, M.W. Blair, J. Tay. 2008. Morphological, agronomical and genetic characterization of a core collection of common bean (*Phaseolus vulgaris* L.): Race Chile. IV International Conference on Legume Genomics and Genetics, Chillán, Chile, 21-26 Jan.

Blair, M.W., H.F. Buendía, L. Díaz, J.M. Díaz, M.C. Giraldo, E. Tovar, M.C. Duque, S.E. Beebe, D. Debouck. 2008. Microsatellite marker diversity in common bean (*Phaseolus vulgaris* L.). Plant Animal Genome, San Diego, California, 11-17 Jan.

Checa, O.E., M.W. Blair. 2008. Mapping QTL for climbing ability and component traits in common bean (*phaseolus vulgaris* L.) – CIAT posters.

Diaz, A., G.V. Caldas, M.W. Blair, 2008, Cuantificación de taninos condensados e identificación de QTLs asociados a su contenido en una población de frijol comun (*P. vulgaris*). Congreso Panamericano de Semillas, Cartagena, Colombia, 14-18 Oct.

Kimani, P.M., John Nderitu and Levi Akundabweni. 2008. Towards Vision 2030: New Bean Varieties for improved productivity, food and nutrition security and wealth creation. 9-12 November 2008, Strategy for Revitalising Agriculture, Second National Workshop, Safari Park Hotel, Nairobi (Award winning poster presentation). Presented to H.E the President, H.E. Vice-President and Hon Minister for Agriculture.

Kimani, P.M., A. Mwang'ombe and J. W. Kimenju. 2008. New Varieties from University of Nairobi Bean Program. 9-12 November 2008, Strategy for Revitalising Agriculture, Second National Workshop, Safari Park Hotel, Nairobi (Award Winning poster presentation). Presented to H.E the President, H.E. Vice-President and Hon Minister for Agriculture.

Lozano, M.A., G.V. Caldas, M.W. Blair. 2008. Cuantificación de fitatos por espectroscopía visible en 16 genotipos de una población de fríjol común (*P. vulgaris* l.) sembrada en suelos con alto y bajo fósforo. Congreso Panamericano de Semillas, Cartagena, Colombia, 14-18 Oct.

Makumba, W., R. Chirwa, J.C. Rubyogo, R. S. Weldesemayat and M. Jonasse. 2008. Improving smallholders food security, nutrition and income through increased production and marketing of climbing beans in Malawi and Mozambique – presented in Mozambique

Ortiz, D., H. Pachón, M.W. Blair, D. Gutiérrez, C. Araujo, J. Restrepo. 2008. Evaluación del valor nutricional de micronutrientes en una receta típica (fríjol sancochado) preparada con fríjoles nutricionalmente mejorados. Congreso Panamericano de Semillas, Cartagena, Colombia, 14-18 Oct.

Ortiz, D., H. Pachón, M.W. Blair, D. Gutiérrez , C. Araujo, J. Restrepo. 2008. Evaluación de la calidad proteica de recetas preparadas con cultivos de maíz mejorado nutricionalmente. Congreso Panamericano de Semillas, Cartagena, Colombia, 14-18 Oct.

Papp, P., T. Gollenar, L. Holly, M.L. Warburton, M.W. Blair, G.B. Kiss. 2008. Evaluation of allelic diversity in maize and common bean germplasm, GCP annual meeting, Thailand, 15-20 Sept.

Rubyogo J.C., F. Tembo., R. Chirwa. E. Mazuma, M. Amane. and C. Madata. 2008. Collaborative research program for creating impact oriented bean seed delivery systems for the poor in Malawi, Mozambique and Tanzania – presented in Mozambique

Yang, Z.B., D. Eticha, I.M. Rao and W. Horst. 2008. The interaction between aluminum toxicity and drought stress in common bean (*Phaseolus vulgaris* L.). Poster paper presented at the Annual Meeting of the German Society of Plant Nutrition in Limbergerhof/Speyer, Germany, 23-24 Sept.

OTHERS

International Newsletters

Sperling, L. and S. McGuire, 2008 Seed aid in Ethiopia. Anthropology News 49(7):52

Guides and Handbooks

Buruchara, R. A., C. Mukankusi and K. Ampofo. Pests and Diseases of Common Bean and their Management in Africa. Handbook for Small Scale Seed Producers (*in Press*)

Sperling, Louise, 2008. When Disaster Strikes: A Guide to Assessing Seed System Security. Cali, Colombia: International Center for Tropical Agriculture

Brochures

PABRA Outlook: Issue 3.

Media Campaign May/June 2008: Seed Aid, with, CIAT Communications unit, CG Communication Unit and Burness Communications.

Based on Seed AID work of L. Sperling, Tom Remington and other partners

Wires

Asian News International (India)
Reuters (Nature....) (which linked to Science)

Broadcast

BBC Network Africa
South African Broadcasting Corporation (SABC) Channel Africa

Print

Hindustan Times (India)
New Vision (Uganda)
Bistandaktuelt (Norway)

Online

Africa Science News Service
Agricultural Biodiversity Blog
Andhranews.net (India)
DailyIndia.com
KTIC Rural Radio Online
Malaysia Sun Online
Nature News
NewKerala.com (India)
Star Online (Malaysia)
Thaindian.com (India)
TopNews.in (India)
Webindia123.com

5.5 EDITORIAL CONTRIBUTION

I.M. Rao served on the scientific committee of the editorial board of the journal, Agronomia Colombiana, and a reviewer to the journals: Crop Science, Agroforestry Systems and Acta Agronomica.

6. LIST OF SPECIAL PROJECTS

6.1 AT HEADQUARTERS

6.1.1 New proposals approved in 2008

Title	Donor	Funding period	Total amount	Amount to Partners (US $)	Available in 2008 (US$)
Biofortificación del Frijol Común (*Phaseolus Vulgaris* L.) en Panamá con Micronutrientes"	SENACYT – Panama	2008-2011	12,000	-	7,000
Improved beans for Africa and Latin America	DFID, UK	2008	120,690	-	120,690
Characterization of bean diversity in Central Europe	GCP	2008-2009	9,000	-	9,000
Dry bean improvement and marker assisted selection for diseases and abiotic stresses in Central America and the Caribbean"	GCP	2008-2009	40,120	-	40,120
Capacity Building Needs regarding the Tropical Legume I (TLI) Project	BMGF grant to GCP	2008-2009		5,904	5,904
Obtención y evaluación de *Phaseolus vulgaris* y Zea mays tolerantes a la sequía	CYTED, Spain	2008-2009	$1,000,000	-	29,906
Development of a handling system of *Bemisia tabaci* in paprika and pepper in the Cauca Valley Gracias	MADR	2008-2011	58,288		16.560
Improvement of Chitti bean in Iran. SPII, Iran	Iranian government	2008	18,423	-	18,423

6.1.2 List of ongoing special projects in 2008

Title	Donor	Funding period	Total amount	Amount to Partners (US $)	Available in 2008 (US$)
Reducing pesticide use and pesticide resistance in rice and beans in the Andean zone	FONTAGRO	2006-2009	224.000	64.276	125.152
Fighting Drought and Aluminium Toxicity: Integrating Genomics, Phenotypic Screening and	BMZ	2006-2009	€ 1,100,000	US153,907	US303,233

Title	Donor	Funding period	Total amount	Amount to Partners (US $)	Available in 2008 (US$)
Participatory Research with Women and Small-Scale Farmers to Development Stress-Resistant Common Bean and Brachiaria for the Tropics					
Biofortified Crops for Improved Human Nutrition – Harvest Plus Challenge Program (Yearly contracts)	Gates Foundation World Bank DANIDA, Denmark	2003-2008	305,000	50,000	255,000
Combating hidden hunger in Latin America: Biofortified crops with improved vitamin A, essential minerals and quality protein (AgroSalud)	CIDA	2004-2010	20,000,000	123,855	254,894
Integrated management of whiteflies in the tropics	DFID	2005 - 2008	259.788	7.849	22.864
Increasing Food Security and Rural Incomes in Eastern, Central and Southern Africa through Genetic Improvement of Bush and Climbing Beans (Headquarters component)	RF	2005-2008	US 254,000	-	10,750
Nutritional Improvement of the important pulse legume, the common bean, through the reduction of seed tannin content, for the benefits of people' diet in Africa and Latin America	CIDA/Univ. of Saskatchewan	2007-2010	CAD 225,000	US 32,102	US 34,503
TL1: Improving tropical legume productivity for marginal environments in sub-Saharan Africa (Headquarters component)	BMGF grant to GCP	2007-2010	1,867,328	115,000	473,944
TL2: Enhancing grain legumes productivity, production and income of poor farmers in drought-prone areas of sub-Saharan Africa and South Asia (HQ component)	BMGF grant to CGIAR	2007-2010	3,454.802	1,104.056	197,701
Variedades de fríjol tolerantes al estrés abiótico de la baja fertilidad y la sequía, y a la sostenibilidad productiva y alimentaria de Centroamérica	Red-SICTA, SDC	2007- 2008	246,100	-	45,450

6.2 In Africa

6.2.1 New proposals approved in 2008

Title	Donor	Funding period	Total Amount US	Amount to partners US$	Available in 2008 US$
Supporting Nutrition and health, Food security, Environmental Stresses and Market Challenges that contribute to improve livelihood and create income resource poor small holder families in Sub –Saharan Africa	SDC	2009-2011	3.2 million	2,221,384	978,616

6.2.2 List of ongoing special projects in 2008

Title	Donor	Funding period	Total amount	Amount to Partners (US $)	Available in 2008 (US$)
TL1: Improving tropical legume productivity for marginal environments in sub-Saharan Africa (African component)	BGMF	2007-2010	115,000		115,000
TL2: Enhancing grain legumes' productivity, production and the incomes of poor farmers in drought-prone areas of sub-Saharan Africa and South Asia: Seed Systems (African component)	BGMF	2007-2010	2,866.084 1, 368,000 million seed systems	601,250	502,866
Getting back to basics: creating impact-oriented bean seed delivery systems for the poor in Malawi, Mozambique and Tanzania	McKnight Foundation	2007-2010	US$ 400,000	300,000	100,000
Improved Smallholder food Security, Nutrition and Income through Increased Production and Marketing of Climbing Beans.	McKnight Foundation	2007-2010	US$ 400,000	300,000	100,000
Fighting Drought and Aluminium Toxicity: Integrating Genomics, Phenotypic Screening and Participatory Research with Women and Small-Scale Farmers to Development Stress-Resistant Common Bean and Brachiaria for the Tropics	BMZ	2006-2009			US 63,185
Increasing Food Security and Rural Incomes in Eastern, Central and Southern Africa through Genetic Improvement of Bush and Climbing Beans (African component)	RF	2005-2008	US 254,000	-	76,739

Title	Donor	Funding period	Total amount	Amount to Partners (US $)	Available in 2008 (US$)
Supporting improved nutrition, food security and community empowerment for poverty alleviation – PABRA	SDC	2007-2008	US 944,616		944,616
Supporting improved nutrition, food security and community empowerment for poverty alleviation – PABRA III	CIDA	2003-2008	US5,298.787		2,231,057

6.2.3 Regional research subprojects under SABRN

Activity Set 1.1	Value $	Country
1.1.1 Test biofortified - Fast lines	200	Angola
	200	D R Congo
	200	Lesotho
	200	Mozambique
	200	Malawi
	200	Tanzania
	200	Swaziland
	200	Zambia
	200	Zimbabwe
1.1.2. . Test biofortified - large seeded lines	200	Angola
	200	D R Congo
	200	Lesotho
	200	Mozambique
	200	Malawi
	200	Swaziland
	200	Tanzania
	200	Zambia
	200	Zimbabwe
1.1.3. Conduct seed multiplication of NUA 45 and AYENEW	400	Angola
	400	D R Congo
	400	Lesotho
	400	Mozambique
	400	Malawi
	400	Swaziland
	400	Tanzania
	400	Zambia
	400	Zimbabwe
1.1.4. Conduct PVS to bring awareness of biofortified varieties/lines	700	Angola
	700	D R Congo
	700	Lesotho
	700	Mozambique
	700	Malawi
	700	Swaziland
	700	Tanzania
	700	Zambia
	700	Zimbabwe

1.1.5. Distribute to other non PVS participating farmers for wide assessing of acceptance	300	Angola
	300	D R Congo
	300	Lesotho
	300	Mozambique
	300	Malawi
	300	Tanzania
	300	Swaziland
	300	Zambia
	300	Zimbabwe
1.1.6 Analyses bean samples for Fe and Zn	3000	Zambia
	3000	South Africa
1.1.7 Generate segregating lines combining disease resistance and Fe and Zn content	2000	Tanzania
	3000	Zambia
	2000	Zimbabwe
	3000	South Africa
1.1.8 Characterize local germplasm for Fe and Zn	1000	Angola
	600	D R Congo
	600	Lesotho
	600	Mozambique
	1000	Tanzania
	1000	Zambia
	1000	Zimbabwe
	1000	South Africa
TOTAL	**39,200**	
Activity Set 1.2: Exploit Genetic diversity of bean to address marginal environments		
1.2.1 Preliminary yield test of BILFA nursery	600	Angola
	600	D R Congo
	600	Lesotho
	600	Mozambique
	600	Malawi
	600	Mozambique
	600	Swaziland
	600	Tanzania
	600	Zambia
	600	Zimbabwe
1.2.2 Preliminary yield test of SABREN lines	600	Angola
	600	D R Congo
	600	Lesotho
	600	Mozambique
	600	Malawi
	600	Swaziland
	600	Tanzania
	600	Zambia
	600	Zimbabwe
1.2.3 Preliminary yield test of SARBYT	600	Angola
	600	D R Congo
	600	Lesotho
	600	Mozambique
	600	Malawi
	600	Swaziland
	600	Tanzania
	600	Zambia
	600	Zimbabwe

1.2.4 Test drought nursery large seeded	300	Angola
	300	D R Congo
	300	Lesotho
	300	Mozambique
	300	Swaziland
	300	Tanzania
	300	Zambia
1.2.5 Test climbing beans adapted to medium altitude	600	Angola
	600	D R Congo
	600	Swaziland
	600	Tanzania
	600	Zambia
	600	Zimbabwe
1.2.6. Test heavy climbers	500	Angola
	500	D R Congo
	500	Tanzania
	500	Zambia
1.2.7. Test ALS resistant lines	500	Angola
	200	D R Congo
	200	Lesotho
	200	Mozambique
	200	Malawi
	200	Swaziland
	200	Tanzania
	200	Zambia
	200	Zimbabwe
1.2.8. Conduct PVS to bring awareness of varieties tolerant to marginal environments	700	Angola
	700	D R Congo
	700	Lesotho
	700	Mozambique
	700	Malawi
	700	Swaziland
	700	Tanzania
	700	Zambia
	700	Zimbabwe
Activity Set 1.3		
Activity Set 1.4: Develop new bean varieties that address market demands		
1.4.1 Test sugar bean	500	Angola
	500	D R Congo
	500	Lesotho
	500	Mozambique
	500	Malawi
	500	Swaziland
	500	Tanzania
	500	Zambia
	500	Zimbabwe

1.4.2. Test Calima lines	500	Angola
	500	D R Congo
	500	Mozambique
	500	Malawi
	500	Tanzania
	500	Zambia
	500	Zimbabwe
1.4.3 Test small whites	500	Angola
	500	D R Congo
	500	Lesotho
	500	Mozambique
	500	Malawi
	500	Swaziland
	500	Tanzania
	500	Zambia
	500	Zimbabwe
1.4.4 Test Khaki lines	500	Angola
	500	D R Congo
	500	Mozambique
	500	Malawi
	500	Tanzania
	500	Zambia
	500	Zimbabwe
1.4.5 . Conduct PVS of promising materials with end users especially women, traders, processors and exporters and thereby assess their acceptability	800	Angola
	800	D R Congo
	500	Lesotho
	800	Swaziland
	800	Zambia
	800	Zimbabwe
Activity Set 2.1: Make available more options for managing soil productivity and bean pests (e.g. evaluate and document new ISFM options such as green manures, and IDPM options for managing intractable pests and diseases especially bean stem maggot and root rots.		
2.1.1 Develop promotional material for promising technologies(traditional storage methods for bean pest control, control of field pests, soil fertility amendments etc)	1000	Angola
	1000	D R Congo
	500	Lesotho
	1000	Mozambique
	1500	Swaziland
	1500	Tanzania
	1500	Zambia
	1500	Zimbabwe
2.1.2 Finalize economic analyses for the pending technologies to be released	1000	D R Congo
	1000	Mozambique
	1000	Malawi
	500	Swaziland
	1000	Tanzania
	1000	Zambia
	1000	Zimbabwe
Activity Set 3.1: Scale up proven technologies through strategic alliances with specialist NGOs in at least 10 countries (with innovative approaches; learning by farmer research groups/field schools; provision of promotional leaflets; guidelines for adaptation and scaling up		
3.1.1 Develop promotional material for wide dissemination of the new released bean varieties	1500	Angola
	1500	D R Congo
	1500	Lesotho
	1500	Mozambique
	1500	Malawi

	1500	Swaziland
	1500	Tanzania
	1500	Zambia
	1500	Zimbabwe
3.1.2 Organize training and backstop community seed producers to bulk seeds of the new released bean varieties	1500	Angola
	1500	D R Congo
	1500	Lesotho
	1500	Mozambique
	1500	Malawi
	1500	Swaziland
	1500	Tanzania
	1500	Zambia
	1500	Zimbabwe
3.1.3 Facilitate translation of promotional material	500	Angola
	500	D R Congo
	500	Lesotho
	500	Mozambique
	500	Malawi
	500	Swaziland
	500	Tanzania
	500	Zambia
	500	Zimbabwe
Activity Set 4.1: Facilitate and improve the capacities of communities to experiment with bean-related and/or other agricultural technologies		
4.1.1 Update the list of service providers working with beans and their role	200	Angola
	200	D R Congo
	200	Lesotho
	200	Mozambique
	200	Malawi
	200	Swaziland
	200	South Africa
	200	Tanzania
	200	Zambia
	200	Zimbabwe
4.1.3 With each partner access the number of men and women reached by rural service providers	500	Angola
	500	D R Congo
	500	Lesotho
	500	Mozambique
	500	Malawi
	500	Swaziland
	500	South Africa
	500	Tanzania
	500	Zambia
	500	Zimbabwe
Activity Set 6: Increasing the knowledge and skills of Scientists & staff from NARs, NGOs and Rural Service providers		
6.1 Finalize economic analyses for the pending technologies to be released	1000	D R Congo
	1000	Mozambique
	1000	Malawi
	1000	Swaziland
	1000	Tanzania
	1000	Zambia
	1000	Zimbabwe
Activity Set 8.1: Support performance monitoring against result based management for PABRA		
8.1.1(a) Organize internal meeting sessions between scientists that contribute to		Angola

topics covered by M&E data/tools–these are bean breeding, INM/ISFM for bean management practices, bean related IPDM & social economists & Extension. The budget covers internal meetings	500	D R Congo
	500	Lesotho
	500	Mozambique
	500	Malawi
	500	Swaziland
	500	Tanzania
	500	Zambia
	500	Zimbabwe
	500	
Activity set 8.3		
8.3.1(b) Organizing follow ups with stakeholders and together develop success stories (NARI, NGOs etc)	2000	Angola
	2000	D R Congo
	500	Lesotho
	2000	Mozambique
	2000	Malawi
	500	Swaziland
	2000	Tanzania
	2000	Zambia
	2000	Zimbabwe
8.3.1 Management of the bean stakeholders forum - may include communications costs, organization costs for the bean stakeholders	1000	Angola
	1000	D R Congo
	500	Lesotho
	1000	Mozambique
	1000	Malawi
	500	Swaziland
	1000	Tanzania
	1000	Zambia
	1000	Zimbabwe
TOTAL	**140,000**	

6.3 LIST OF PROJECTS SUBMITTED, PROPOSALS, AND CONCEPT NOTES PREPARED

6.3.1 AT HEADQUARTERS

Title	Donor	Comments	Funding period	Total amount US
Extracting the best from a desert species: Mining tepary bean for drought tolerance	GCP	Concept note not selected for full proposal development	2008-2011	$889,350
Basal root architecture and drought tolerance in common bean	GCP	Concept note and full proposal approved	2008-2011	$ 345,000
An integrated experimental and modeling approach to optimize soil water use under limited water	GCP	Concept note not selected for full proposal development	2008-2011	$905,060

Title	Donor	Comments	Funding period	Total amount US
A cross-legume phenotyping effort to identify common traits for superior adaptation to drought	GCP	Concept note under review	2009-2011	$459,020
Improving tolerance to drought stress in crops	WUN	Seed grant under review	2009	$48,000

6.3.2 In Africa

Title	Donor	Comments	Funding period	Total amount US
Impact and development of Conservation Agriculture techniques in developing countries	European commission	Collaborators are: University of Applied Sciences Eberswalde, Germany; International Food Policy Research Institute (IFPRI), USA International, University of Ghana and Makerere University Participating CIAT technical team include: Enid Katungi and Roger Kirby	3 years	220,000 (CIAT's budget only)
Supporting Nutrition and health, Food security, Environmental Stresses and Market Challenges that contribute to improve livelihood and create income resource poor small holder families in Sub –Saharan Africa..	CIDA		2009-2013	7.8 million
Enhancing productivity, nutrition and incomes through improved marketable climbing bean and biofortified bean varieties	Government of Kenya	In review	2009-2011	$110,000
Improving Food and Nutrition Security, and Incomes of Smallholder Farmers in East and Central Africa through increased access to Markets and Technology Innovation	Belgium Development Cooperation (BADC)	Unsuccessful	2008-2011	$3,148,632

Title	Donor	Comments	Funding period	Total amount US
Climbing out from poverty: Realizing the benefits from high yield potential of Climbing beans for smallholder farmers in Africa	JIRCA	Presented to donor in Jan 2008		
Use of marker Assisted Selection in Developing Multiple Disease Resistant Bean Varieties in Malawi -	Kirk House Trust	Under review by donor (second round)	2009-12	150,000

7. STAFF LIST (INCLUDING % TIME ASSIGNMENT)

7.1 STAFF AT HEADQUARTERS

Stephen Beebe, PhD, Breeder, Geneticist, Project Manager (**70% SBA-1**, 30% SBA-6)
Matthew Blair, PhD, Germplasm Characterization Specialist, Bean Breeder (70% SBA-6, **30% SBA-1**)
Francisco Morales, PhD, Virologist (**30% SBA-1**, 50% PE-1)
Idupulapati Rao, PhD, Plant Nutritionist, Physiologist (**50% SBA-1**, 50% SBA-3)

7.2 STAFF IN AFRICA

Robin Buruchara, Ph.D., Plant Pathologist/CIAT Africa Coordinator (stationed in Kampala, Uganda - **90% SBA-1**, 10% PA-2)
Rowland Chirwa, PhD, Plant Breeder/SABRN Coordinator (stationed in Lilongwe, Malawi - **100% SBA-1**)
Enid Katungi, PhD, Agricultural economist (stationed in Kampala, Uganda - **100% SBA-1**)
Paul Kimani, PhD, Plant Breeder for ECABREN (University of Nairobi/CIAT, stationed in Nairobi, Kenya - **75% SBA-1**)
Rachel Muthoni, BSc, MPA, Monitoring and Evaluation Specialist, (stationed in Kampala, Uganda - **100% SBA-1**)
Jemimah Njuki, PhD, ERI Specialist, (stationed in Zimbabwe – **44% SBA-1**, 56% TSBF-1)
Martha Nyag'aya,, MSc, Nutrition (stationed in Kampala, Uganda – **90% SBA-1,** 10% TSBF-1)
Mukishi Pyndji, PhD, Plant Pathologist, ECABREN Coordinator (stationed in Arusha, Tanzania - **100% SBA-1**)
Jean Claude Rubyogo, MSc, Seed System Specialist (stationed in Malawi – **100% SBA-1**)
Louise Sperling, PhD, Social Scientist, (stationed in Rome, Italy - **80% SBA-1,** 20% SBA-6)

8. SUMMARY 2008 BUDGET PREPARED BY FINANCES: ACTUAL EXPENDITURES 2008

Outcome Line SBA-1: Beans

SOURCE	Bean Program			Total US$	(%)
	HQ + LAC	Africa	Biotech		
Unrestricted Core	622,284		120,901	743,185	7%
Restricted Core Japan			35,500	35,500	0%
Sub-total Core	**622,284**	**-**	**156,401**	**778,685**	**8%**
Restricted					
Special Projects	1,045,811	3,067,539	2,874,851	6,988,201	70%
Generation Challenge Program	35,450		254,592	290,042	3%
Harvest Plus	312,089		429,099	741,188	7%
Sub Total Restricted	**1,393,349**	**3,067,539**	**3,558,543**	**8,019,431**	**81%**
Direct Expenditures	**2,015,634**	**3,067,539**	**3,714,943**	**8,798,116**	**89%**
Non Research Cost	259,492	394,914	478,261	1,132,667	11%
Total Expenditures	**2,275,126**	**3,462,453**	**4,193,204**	**9,930,783**	**100%**