EXECUTIVE SUMMARY

ANNUAL REPORT 2008

Outcome Line

SBA-1

Improved Beans for the Developing World

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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 2007-2011

Year	2007 (actual)	2008 (actual)	2009 (proposal)	2010 (plan)	2011 (plan)
US Dollars (millions)	8.008	9.931	7.597	7.702	7.812

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	o 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.	o 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	o 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	o 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	o 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 submitted) - 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.

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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).

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5.2 REFEREED AND NON-REFEREED JOURNAL ARTICLES

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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.

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5.3 WORKSHOP AND CONFERENCE PAPERS

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

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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**.**

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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

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5.4 PROCEEDINGS, POSTERS, ABSTRACTS AND OTHERS

PROCEEDINGS

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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.

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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

Regional research subprojects under SABRN

Activity	Value	Country
1.1.1 Complete germplasm collection, characterization and mineral analysis for all accessions	1000	DRC
	3000	Zambia
1.1.2 Conduct multi-location evaluations and national performance trials	650	Angola
	500	DRC
	1500	Malawi
	600	Mozambique
	800	Swaziland
	1500	Zambia
	1000	Zimbabwe
1.1.3 Analyze candidate varieties for minerals and protein in some countries in SABRN	1000	Angola
	1000	Malawi
	400	Mozambique
1.1.4 Develop descriptors for candidate varieties	500	Malawi
	300	Mozambique
	500	Zambia
	500	Zimbabwe
1.1.5 Conduct DUS in applicable and present for release: 3 countries in SABRN	500	DRC
	1000	Malawi
	800	Mozambique
	500	Zimbabwe
1.1.6 produce breeder seed in countries that have released varieties	900	Angola
	1000	Malawi
	400	Mozambique
	1000	Swaziland
	800	Zambia
	800	Zimbabwe

Activity	Value	Country
1.2.1 On-farm evaluations using PVS	2250	Angola
	2800	DRC
	1500	Malawi
	2600	Mozambique
	3500	South Africa
	1500	Swaziland
	3000	Zambia
	1000	Zimbabwe
1.2.2 Develop descriptors for the new bean varieties	700	Zambia
	700	Zimbabwe
1.2.3 Produce breeders' seed for the new and old bean varieties	3000	DRC
	500	Zimbabwe
1.2.4 Rejuvinate BILFA, Drought and disease nurseries	1700	Angola
	3000	DRC
	1000	Malawi
	1700	Mozambique
	1500	Zimbabwe
1.2.8 Combine resistance and select for pyramid (ALS, CBB) in ZA and BSM (MW and ZW)	1500	Malawi
	7500	Zambia
1.2.10 Selection and testing of climbing beans adapted to mid-altitude (1200 -500 masl)	1500	Angola
	850	Mozambique
	2000	Zambia
	2000	Zimbabwe
1.3.1 Identify export market potential including enhancing competitiveness of beans in SABRN	500	Malawi
	500	Zimbabwe
1.3.2 Conduct a bean cross-border trade study across South TZ, South DRC and Zambia	3000	DRC
	1500	Zambia
1.4.2 Continue with backcrossing programme to improve commercial cultivars - Southern Africa	1000	Malawi
	4000	South Africa
1.4.3 Strengthen capacity for application of MAS - Bunda	4000	Malawi
1.4.6 Produce adequate seed for all breeding materials	1500	Malawi
	1500	Zambia
	1000	Zimbabwe
1.4.7 Production of foundation seed with partners	2000	DRC
	3700	Mozambique
	2000	Zambia
	1000	Zimbabwe

Activity	Value	Country
2.1.1 Validate effectiveness and farmers' acceptance and gender perceptions of promising ISFM and IPDM options with farmers	1850	Angola
	1000	Malawi
	500	Mozambique
	1000	Zambia
	1000	Zimbabwe
2.1.2 Disseminate and promote accepted options with partners for technologies in 10 all countries	1500	Malawi
	500	Mozambique
	1500	Swaziland
	2000	Zimbabwe
2.1.3 Perform cost-benefit tradeoffs analyses and adoption potential of these technologies	1000	Malawi
	1000	Zimbabwe
3.1.1 Organize, train and technically backstop community seed producers to bulk seeds	2000	DRC
	2500	Mozambique
	1000	Zimbabwe
3.1.2 Update number, type location and activities of service providers	250	Angola
	1000	DRC
	1000	Mozambique
	1000	Zimbabwe
3.2.3 Facilitate production of promotional and information publications (including publications for SABRN website), transilations in each network	950	Angola
	1000	DRC
	1000	Malawi
	1000	Mozambique
	1000	Swaziland
	1000	Zambia
	1000	Zimbabwe
5.5.2 Conduct participatory formulation and evaluation of a basket of diets for improved nutrition - using biofort products	2000	DRC
	2000	Malawi
	1500	Swaziland
	1000	Zambia
	1000	Zimbabwe

Activity	Value	Country
6.1.4. Conduct training workshops on nutrition assessment and linking nutrition support with agricultural extension	800 1000	Swaziland Zimbabwe
8.1.1 Inventory by year products (varietal and non-varietal), promotional materials	1750 3500	Angola Mozambique
TOTAL	**140050**	

HarvestPlus funded activities

Activity	Value	Country
1. Germplasm collection	4000 4000 3000	Malawi Tanzania Zimbabwe
2. Evaluation of fast trucks lines in various countries	2000 2000 2000 2000 2000 2000 2000	Angola Lesotho Malawi DRC Tanzania Zambia Zimbabwe
3. Breeding for high Fe combining with other biotic and abiotic stresses	2000 2000 2000 2000	Malawi South Africa Tanzania Zimbabwe
4. Supplies and small equipment: reagents, computer, printer	5000	SABRN
TOTAL	**40000**	

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
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)

Title	Donor	Comments	Funding period	Total amount 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..	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
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%**