SUMMARY ANNUAL REPORT 2003

PROJECT IP - 1

Bean Improvement for the Tropics

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Project IP-1: Bean Improvement for the Tropics

Project Description

Objective: To increase bean productivity through development, enhanced access and utilization of improved cultivars and management practices in partnership with NARS, regional networks and farmers.

Outputs:

1. Higher and stable bean production with less dependency on inputs such us pesticides, fertilizers, and water.
2. Integration of traditional and advanced (e.g., marker-assisted selection) crop-improvement techniques and farmer participatory research approaches to facilitate rapid adoption of improved bean cultivars.
3. Strengthening of NARS, regional networks, and farmers in basic food production and technology adoption.
4. Higher rates of bean technology adoption achieved through NARS, regional networks, and farmers.

Gains: Improved varieties grown in 40% of Latin America and 10% of Africa (in network countries) by year 2005. Bean productivity stabilized, and bean availability secured for poor rural and urban consumers in restricted areas. Pesticide use cut by 20% in selected areas, thus reducing hazards to environment and health. Farmers growing the new cultivars will see a 10%-50% increase in their income from marketing beans. Public and private researchers have access to beans with multiple-stress resistance and greater nutritional value. Research capacity strengthened through regional networks.

Milestones:

2003 Marker-assisted selection developed for various biotic constraints. Lines with resistance to two or more pathogens developed: angular leaf spot, root rots, drought, bean common mosaic virus, and bean golden mosaic virus. Specialty types developed in Andean beans.

2004 Lines resistant to bean common mosaic virus, black root, stem maggot, root rots, CBB, anthracnose and angular leaf spot made available to partners in Africa. Advanced lines with improved drought tolerance validated with partners. Lines with tolerance to low N and pH developed. Characterization and distribution of *Pythium* root rot pathogen in Eastern Africa established.

2005 Nutritional quality traits incorporated into high-yielding and stress-tolerant cultivars. Lines tolerant to N, P, and pH complex available to partners in Africa. Method to quantify *Pythium* and Fusarium root rot pathogens in soil validated. Improved varieties to reach about 3 million people in Africa.

Users: Small-scale farmers in tropical America and Africa (mainly women) will obtain higher and more stable yields. Poor consumers, especially women and children, will benefit from low-cost protein and micronutrients. The environment and community at large will benefit from reduced pesticide and fertilizer use. Food legume researchers will access an enhanced knowledge base and germplasm.

Collaborators: *Regional networks*: PABRA, ASARECA, SACCAR, Afnet, ECABREN, and SABRN (Africa); SIGTTA (Central America). *Developing improved germplasm:* NARS and farmers for FPR and PPB. *Improving soil, pest, and disease management:* ICRAF, CIMMYT, IITA, CIP, TSBFI, and national partners in the systemwide IPM program and African Highland Initiative (AHI). *Training in breeding and IPM:* Bean/Cowpea CRSP and ICIPE. *Diffusing new technology:* NGOs, churches, relief and governmental agencies, and entrepreneurs. *International institutions:* CATIE and EAP-Zamorano (Central America), universities and other institutions in Australia, Belgium, Canada, France, Netherlands, Spain, Switzerland, UK, and USA. *Resistance breeding and gene tagging* Bean/Cowpea CRSP and USDA.

CGIAR system linkages: Enhancement & Breeding (75%); Crop Production Systems (10%); Protecting the Environment (5%); Networks (5%); Training (4%); Information (1%).

CIAT project linkages: Germplasm (SB-1); IPM (PE-1); Nutrient & Water-Use Efficiency (PE-2); Climate Change (PE-6); Sustainable Hillside Systems (PE-3); Participatory Research (SN-3); Impact Assessment (BP-1)

Log Frame Work Plan for IP-1, 2003-2005
Area: Competitive Agriculture
Manager: Stephen E. Beebe

Narrative Summary	Measurable Indicators	Means of Verification	Important Assumptions
Goal To obtain a lasting increase in food availability and income for the poor through improved bean productivity.	Increased bean production, better income distribution and nutrition with improved cultivars and management practices.	National production statistics.	Adoption continues at rates at least comparable with those in the past.
Purpose To increase bean productivity through improved cultivars and management practices in partnership with NARS, regional networks, and farmers.	Improved cultivars and/or management practices are used by NARS, regional networks, and farmers in 40% of Latin America and 10% of Africa (in network countries) by year 2005. Farmers growing new varieties see a 10% increase in income from marketing of beans. Regional networks fully devolved to local management, with CIAT participating as a research partner.	Reports of NARS and regional networks. Adoption survey reports. Publications. CIAT reports. End-of-project and evaluation reports.	Core of bean researchers and operation budgets are maintained. Continued donor support to regional networks. Access to resources from challenge programs. Regional bodies and national governments continue to give priority to bean production.
Output 1 Improved, small-seeded, bean germplasm resistant to major biotic and abiotic stress factors and combined with greater nutritional and market value.	Improved parents, populations, and/or lines available to NARS, regional networks, and farmers, with emphasis on drought tolerance combined with disease resistance and higher iron concentration.	Reports from NARS and regional networks. Annual reports. Publications.	Continued donor support to PROFRIJOL, the African networks, and CIAT. Continued input of breeders, molecular geneticist, and plant nutritionist.
Output 2 Improved, large-seeded, bean germplasm resistant to major biotic and abiotic stress factors and combined with greater nutritional and market value.	Improved parents, populations, and/or lines available to NARS, regional networks and farmers, combining better yield with disease resistance and higher iron concentration.	Reports from NARS and regional networks. Annual reports. Publications.	Continued donor support to PROFRIZA, PROFRIJOL, the African networks, and CIAT. Continued input of breeder and molecular geneticist.
Output 3 Strategies developed for managing diseases and pests in bean-based cropping systems	IPM strategies developed. Gene combinations to control insects and pathogens determined.	Reports from NARS and regional networks. Annual reports. Publications.	Continued input of Pathologist, Entomologist, and Virologist. Continued donor support to whitefly IPM project.
Output 4 Strengthened institutional, organizational and collaborative capacity of NARS and sub-regional networks in Africa and Latin America.	Regional and national specialists take more responsibility in backstopping NARIs and NGOs, NARIs partners apply new techniques for breeding, IDPM and INM. Increased products (research extension, proposals etc) derived from cross-country and network collaboration developed and used. Climbing bean adopted in 10 countries in Africa. Improved crop management practices disseminated in 5 countries by 2005. Improved bean varieties disseminated to reach about 3 million people.	Reports from NARS, regional networks and PABRA. Annual Reports, PABRA reports National statistics.	Continued donor support. NARES scientists remain stable in heir position and able and willing to participate and collaborate. Partners open to incorporating and committing resources to innovative approaches.

SUMMARY ANNUAL REPORT 2003

IP-1 PROJECT

Title: Bean Improvement for the Tropics

Investigators:

At Headquarters:

Stephen Beebe, PhD, Breeder, Geneticist, Project Manager (70% IP-1, 30% SB-2)
Matthew Blair, PhD, Germplasm Characterization Specialist, Bean Breeder (70% SB-2, 30% IP-1)
César Cardona, PhD, Entomologist, (37.5% IP-1, 37.5% IP-5)
George Mahuku, PhD, Plant Pathologist (100% IP-1)
Francisco Morales, PhD, Virologist (30% IP-1, 20% Special Projects, 50% IPGRI)
Idupulapati Rao, PhD, Plant Nutritionist, Physiologist (30% IP-1, 30% IP-5, 40% PE-2)

In Africa:

Robin Buruchara, PhD, Plant Pathologist/PABRA Coordinator (stationed in Kampala, Uganda - 70% IP-1, 30% PE-1)
Rowland Chirwa, PhD, Plant Breeder/SABRN Coordinator (stationed in Lilongwe, Malawi - 100% IP-1)
Paul Kimani, PhD, Plant Breeder for ECABREN (University of Nairobi/CIAT, stationed in Nairobi, Kenya - 75% IP-1)
Elilaineny Minja, PhD, IPM Specialist (stationed in Arusha, Tanzania - 10% IP-1, 90% PE-1)
Mukishi Pyndji, PhD, Plant Pathologist, ECABREN Coordinator (stationed in Arusha, Tanzania - 100% IP-1)
Jean Claude Rubyogo, BSc., Seed System Specialist (stationed in Nairobi – 100% IP-1)

Cooperators:

Within CIAT:

Personnel in Projects SB-1, SB-2, PE-1, PE-2, PE-3, PE-4, BP-1, SN-1, SN-3, and Communications Unit.

Outside CIAT:

National Programs: Argentina, Bolivia, Brazil, Cameroon, Colombia, Costa Rica, Cuba, Democratic Republic of Congo, Dominican Republic, Ecuador, El Salvador, Ethiopia, Guatemala, Haiti, Honduras, India, Iran, Kenya, Madagascar, Malawi, Mexico, Mozambique, Nicaragua, Panama, Paraguay, Peru, Rwanda, South Africa, Sudan, Swaziland, Tanzania, Uganda, United States, Zambia, and Zimbabwe. Scientists at

University of Ghent, Catholic University of Leuven in Belgium; University of Guelph in Canada; Royal Veterinary and Agricultural University, in Denmark; INRA in France; Escuela Agrícola Panamericana (Zamorano) in Honduras; University of Norway, Aas, in Norway; Alemaya University in Ethiopia; ICIPE and University of Nairobi in Kenya; Rockefeller Foundation in Uganda; University of Puerto Rico, Mayaguez, Puerto Rico; University of Hannover and University of Freiburg, Germany; ARC-Grain Crops Institute in South Africa; ETH University at Zurich, Switzerland; University of Adelaide, Australia; University of Minnesota, Michigan State University, Pennsylvania State University, Clemson University, Cornell University and University of Montana in the U.S., and IACR-Rothamsted in UK.

Budget:

At Headquarters:

Source	Amount (US$)	Proportion (%)
Unrestricted core	180,302[a]	25
Restricted core	304,051	43
Carry over from 2002	74,189[b]	10
Sub-total	**558,542**	**78**
Special projects	153,065	22
Totals	**711,607**	**100.0**

[a] Unrestricted core is reduced by an estimated $ 155,000 for Full Cost Recovery
[b] Carryover includes only the third part of what is estimated to be executed in 2003.

In Africa:

Source	Amount (US$)	Proportion (%)
Unrestricted core		0
Restricted core		0
Carry over from 2002		0
Sub-total		0
Special projects	2,539,559	100%
Totals	**2,539,559**	**100%**

Research Highlights in 2003

We will highlight six areas of our current research portfolio:

1. Development and physiological analysis of lines for low fertility tolerance in small seeded Mesoamerican types

Low fertility is a persistent, primary yield limitation of beans in small farmer agriculture. A few unusually tolerant materials such as A 774 and VAX 1 were recognized previously. Physiological analysis suggests that both display abundant shallow roots that exploit intensively the nutrients in the upper soil horizon where organic matter (litter) accumulates and degrades. Subsequently a second mechanism was recognized that was associated with greater capacity to fill grain under stressful environments. This is an important physiological trait that reflects the capacity to transport photosynthate under conditions of stress when transport is normally inhibited. This trait complements the abundant shallow roots of VAX 1 and A774, and offers the possibility to combine mechanisms for higher levels of stress tolerance. In yield trials of lines bred for tolerance to low P, VAX 1 significantly out-yielded the commercial check, and at least one line (progeny of VAX 1 and RAB 655, the latter with good grain filling) in turn out-yielded VAX 1. Superior lines express as much as 80% yield advantage over commercial varieties in the small red seeded class. This demonstrates graphically our strategy for breeding for low P stress. A good root system is the foundation of tolerance, since this contributes not only to P nutrition but to the acquisition of all other essential nutrients. Once a vigorous root system is selected, improved grain filling can increase tolerance even more. Neither a genetic strategy nor soil fertility management alone can hope to resolve the problem of low soil fertility on farm, but these two strategies together can impact significantly in raising on-farm yield levels. Advances in yield at low fertility levels, combined with results in drought tolerance, bode well for tolerance to abiotic stress.

2. Management of Pythium root rots in intensive bean systems in Africa

An intensive effort has been undertaken to solve the problem of Pythium root rots in Africa. As population pressure increases and cultivation becomes more intensive, soil fertility drops and inoculum accumulates. This combination of factors results in serious epiphytotics of Pythium root rots. An integrated approach is being implemented including: studies on pathogen diversity; genetic studies on inheritance of resistance; breeding; agronomic practices and soil fertility in an IDM-ISFM context; and farmer schools to promote awareness of the problem and adoption of solutions. A dilution plating method was developed to quantify total inoculum of Pythium spp in the soil, but this method still requires species classification by colony identification. Twelve species of Pythium were identified and of these, four species caused severe root rot on susceptible bean cultivar CAL 96: *P. ultimum* var *ultimum*, *P. spinosum*, *P. graminicola*, and *P. paroecandrum*. Inheritance to Pythium root rot in MLB-49-89A, AND 1062 and RWR 719 was shown to be conditioned by single dominant genes. Past success with these resistant varieties led to levels of adoption as high as 80% in one area of western Kenya. Further screening of advanced lines revealed more resistant materials. Only four climbing beans presented intermediate resistance, but 8 and 10 red mottled types were resistant and intermediate

respectively. Eighteen crosses for multiple traits were initiated to combine the Pythium resistance of MLB-49-89A and RWR 719 with other traits and in a range of grain types. Progeny of another 26 crosses are advancing. Farmyard manure and Calliandra green manure both reduced symptoms of Pythium root rots.

3. More markers are deployed in MAS: ALS, bruchids, and recessive BCMV resistance

Selection of *bgm-1* gene for BGYMV resistance is now routine in both breeding programs at CIAT headquarters, and selection of a QTL marked by the W12 SCAR is now widely used in the Mesoamerican section. Results in the field in Haiti this year suggest that this strategy has served to recover a useful level or resistance, and even in Colombia, Andean types selected for the *bgm-1* gene expressed resistance to a new white fly transmitted begomovirus. Beyond simple tagging of genes, MAS requires the development of robust markers adapted to "quick-and-dirty" DNA extraction protocols. This past year has seen more ample adoption of markers for a wider range of resistance genes. Two new SCARs for ALS resistance genes, from G10474 and G10909, have been developed and tested in CIAT. A RAPD for an ALS resistance gene in Mex 54 is also in use in Uganda. A SCAR developed at the University of California-Davis was employed to select Andean beans with the *bc-3* gene. For the first time this year a microsatellite was used in MAS, to detect the presence of arcelin genes for resistance to Zabrotes, the Mexican bean weevil. This system replaces the use of a protein detection method that is costly and time-consuming. Thus, markers are finding application in specific situations in response to demands of the work. Development of markers for other traits is advancing, especially for *Apion* and *Thrips palmi*, and other ALS resistance genes. To promote the use of markers among national program partners, two training workshops were held, one at CIAT headquarters for ten Latin American colleagues, and one in Uganda for fifteen African scientists. In the latter course, one of the SCAR markers developed at CIAT for ALS was used for demonstration purposes, responding to the number one fungal disease problem in Africa. Two breeders and the pathologist traveled to Uganda to support regional staff in this effort.

4. Refinement of genetic characterization of angular leaf spot and anthracnose pathogens

As a continuation of work in past years, molecular analysis on two important pathogens was extended. A large number of isolates of *Phaeoisariopsis griseola* (Pg) and *Colletotrichum lindemuthiuanum* (Cl) were evaluated with random amplified microsatellite primers (RAMS) and/or AFLP. Whereas last year we reported on the analysis of a sample of South American isolates of Pg from Brazil and Bolivia, this year a broad sample of 808 isolates from Africa, Latin America and Caribbean were characterized using 5 RAMS primers. Two broad groups were distinguished as is widely reported: Mesoamerican and Andean. However, internal structure associated with geographical origin was evident. Mesoamerican types resolved into three sub-groups: those from Middle American, Brazil-Bolivia, and Africa. Andean types divided into sub-groups from South America and Africa. A statistical test demonstrated that even within these groups there was highly significant diversity. An analysis of *Colletotrichum lindemuthiuanum* revealed two gene pools, an Andean and a Mesoamerican, as well as geographically-based diversity within each large group. Mexico and Costa Rica formed

independent sub-groups, and there was also separation of isolates along a latitudinal gradient in the Andes.

5. Impact of bean varieties on family well-being in Uganda

Past adoption and impact studies in Uganda had indicated that adoption of improved varieties led to impacts that farmers themselves identified: higher incomes, availability of investment capital, better health, and educational opportunities for farmers'children. Data collection for the Uganda impact assessment study has continued and has been completed in 5 out of 6 target sites. Preliminary analysis from one site in eastern region (Mbale) indicates 48% adoption of the dominant new variety K132. Impact results from that site indicate several positive features. Adopters consume about 50% more beans than non-adopter households. Adopting households on average consume 1 Kg of beans a day, while non-adopters consume about 0.7 Kg of beans per day. New varieties constitute 46% of total rural household bean consumption. Average consumption of new varieties is less than old varieties because new varieties are mostly sold. Average household income from beans has doubled compared to base income (1995) before adopting new varieties. The new varieties contribute 50% of total household bean income. There is more participation of women in decisions regarding bean income, due in part to an increase in bean acreage, a portion of which is under new varieties managed by women.

6. Harvest Plus: The Biofortication Challenge Program Bean workshop

After a Harvest Plus kick-off workshop in CIAT headquarters in June, each of the six first phase crops held a crop-specific workshop to develop a workplan for the next two years. The bean meeting was held in Naivasha in western Kenya, with the participation of 45 professionals working in agriculture, health, nutrition, home economics, seed, end user perspectives, and economics. Six countries in Africa (D.R. Congo, Kenya, Malawi, Rwanda, Tanzania, Uganda) and two in the Americas (Brazil and Honduras) were represented. The breeding work plan focused on: 1) the screening of local germplasm in Africa as a continuation of present activities; and, 2) the development of crosses between parents for high mineral content with those for standard economic production traits, especially disease resistance, earliness and low soil fertility. Rather than becoming a special project with a limited objective of increasing mineral concentration *per se*, the strategy is to incorporate the high mineral trait as soon as possible into the mainstream breeding program, as another trait to be selected together with more conventional traits. Issues raised by nutritionists focused on the role of anti-nutrients (phytates and polyphenolics); and the level of iron needed to have a detectable impact on human health parameters. Beyond simple breeding activities, the inclusion of nutritional goals in a breeding program implies a gamut of opportunities and challenges, and gives occasion to review our entire end user focus. We are called to work with new partners, such as those organizing and orienting women's groups, and those involved in home economics. While we are building on the PABRA structure in Africa to implement biofortification, in Latin America we will attempt to revive regional collaboration around this theme.

Problems encountered and their solutions:

- Operational funding is always a concern. The Project solved part of this problem by actively seeking special funding for several research activities. The future of the regional networks in Latin America (Profrijol and Profriza) is still to be determined but some continuity is expected. The Swiss donor is in the final stages of reviewing the future Central American network, and is evaluating their strategy in the Andean Zone.

- As we expressed in 2001 and 2002, we still need to fortify our database management. This past year more time of a systems specialist was assigned to SB-2, and we hope that this will benefit IP-1.

- At Headquarters, Socio-Economics and Agronomy continue to be weaknesses.

- In general, the short term project funding mode does not permit proper execution of routine service and maintenance functions, such as: maintaining viability of seed stocks; ample distribution of breeding nurseries; updating databases. The cost recovery mechanism must permit returning funds to the crop programs to support these functions.

Plans for next year:

- Consolidating collaboration between headquarters and African staff, especially with an eye to the SABRN network, and with ECABREN to work nutrition into the mainstream activities.

- Consolidate collaboration through Harvest Plus, hopefully to the extent of reviving Latin American regional networks.

- Further use of marker assisted selection in breeding: ALS, ANT, CBB, *Apion*, *Thrips palmi*, *Zabrotes subfasciatus.*

- Root rot management will be further extended with farmers.

- Beeding for higher yielding climbers adapted to lower elevations will continue.

- Incorporation of *bc-3* gene for black and red-seeded materials for Central America will be extended.

- BGMV resistance will continue to be an indispensable trait for improved lines in the Americas, to be combined with other traits, especially high iron and zinc.

- New avenues for diffusion of new varieties in Latin America will be explored, especially through associations of farmer organizations.

- Development and deployment of IPM systems for management of whiteflies and thrips affecting beans and snap beans will continue.

Performance indicators

1. TECHNOLOGIES, METHODS AND TOOLS

1.1 Released varieties during 2000-2003 in Latin America and Africa

A. Latin America

Country	Name	Year of release
ARGENTINA	A 281	2003
	TUC 241	2001
	TUC 310	2001
	TUC 510	2001
	GATEADO	2000
	AZABACHE	2000
BRAZIL	BRS MARFIM (A 774)	2002
	BRS TIMBO (FEB 163)	2002
	BR-IPAGRO 44 (Guapo Brilhante)	2002
	IPR JURITI	2000
COLOMBIA	Corpoica Radical Jiji	2002
	FRIJOL ORO SEVILLA	2000
	FRIJOL LAS 220	2000
	UNIPAL MILENIO	2000
EL SALVADOR	CENTA SAN ANDRES	2002
	CENTA 2000	2000
MEXICO	Bayo INIFAP	2002
	TLP 19	2002
	Alteño 2000	2001
	PINTO SALTILLO	2001
	NEGRO VIZCAYA	2000
	FLOR DE MAYO 2000	2000
NICARAGUA	INTA Estelí	2002
	INTA Nueva Guinea	2001
	INTA Cárdenas	2001
	INTA Rojo	

B. Africa

Country	Name	Year of release
ETIOPIA	OMO 95 (RWR 719)	2002-2003
	IBADO (AFR 722)	2002-2003
	A 197	2002
KENYA	SCAM 80 CM/15	2002
MALAWI	SUG 131	2002
	UBR (92)25	2002
RWANDA	SCAM 80 CM/15	2002
	RAB 487	2002
	CAB 19	2002
	CAB 2	2002
	G 2331	2002
SUDAN	Mutwakil (Berber Large)	2002-2003
	Iberya (ABA 61)	2002-2003
	RO/2/1	2002-2003
	Giza 3	2002-2003
	Sarag	2002-2003
	Basabeer	2002-2003
TANZANIA	WANJA (A 197)	2003

1.2 Genetic materials distributed as yield trials, observation nurseries, parental lines and materials for specialized studies

- Headquarters distributed 117 seed shipments
- Within the ECABREN regional project, 86 nurseries were distributed
- Within the SABRN network, 51 nurseries were distributed

1.3 Elite material with varietal potential developed

- Breeding lines with commercial grain type and tolerant to terminal drought in previous years also expressed tolerance to intermittent drought, exceeding the commercial checks by as much as 200% in yield.
- Evaluation of medium altitude climbing beans for resistance to Pythium root rot, angular leaf spot, common bacterial blight and other diseases identified lines resistant to one or more diseases and that have as much as 39% yield advantage over checks, with potential for direct use.
- Eighteen new navy (small white) bean lines with resistance to rust give significantly higher seed yield than five regionally important commercial cultivars.
- Thirteen new rust resistant pinto lines out–yield best commercial cultivars by up to 58% under high disease pressure in Eastern Africa.
- Nine red mottled lines with multiple disease resistance show yield advantage of up to 20% compared to the best of 10 regionally important red mottled commercial cultivars.
- Sixteen new red kidney lines showed yield advantage of more 500 kg ha-1 over the commercial cultivars in regional trials in Eastern Africa
- Advanced lines derived from red mottled and Empoasca resistant parent were yield tested this year and included new bruchid resistant red mottled, large red, light red kidney and white kidney Andean genotypes.
- New bean lines high in iron and/or zinc concentration were identified in Nariño, Colombia, and in Eastern Africa where they were evaluated for agronomic characteristics by more than 20 farmers.

1.4 Sources of traits identified for breeding programs

- New drought tolerant lines show up to 42% yield improvement over local commercial cultivars under both stress and non-stress conditions in Eastern Africa.
- Among the 95 advanced lines of the cross BAT 881 x G 21212, three were superior in their adaptation to drought stress conditions, exhibiting lower levels of seed ash (mineral) and seed P.
- Among the 94 advanced lines of the cross BAT 881 x G 21212, three were outstanding in their adaptation to acid soil stress conditions.
- Lines bred for tolerance to low soil fertility were identified that yielded 65-75% more than a good commercial check over three fertility stressed environments.

- Among 30 advanced lines and parents of the cross BAT 477 x DOR 364 that were evaluated, BT 21138-98-1-1-M-M-M-M-M was outstanding in utilizing phosphorus and nitrogen for grain production.
- Resistance to the bean weevil (*Acanthoscelides obtectus*) and to the leafhopper (*Empoasca kraemeri*) was identified in *Phaseolus vulgaris* x *P. acutifolius* hybrids
- Fourteen recombinant inbred lines (RILS) from the DOR 364 x G 19833 combine resistance to several *P. griseola* and *C. lindemuthianum* pathotypes, including the most virulent races.
- Sixteen advanced lines with small black and small red seed were resistant to the most virulent race (63-63) of *Phaeoisariopsis griseola*.
- Effectiveness of the ALS resistance sources G10909 and G10474 was confirmed against a distinct set of pathogen races in Darién, while the resistance of G10613 was broken by these races. From the international ALS nursery, 22 lines were identified for adaptation to the African environments in Malawi.
- New sources of BGYMV resistance have been identified in the Mesoamerican race of *P. vulgaris*.

1.5 Genetic mechanisms understood

- A QTL that is associated with better symbiotic nitrogen fixation under phosphorus-stressed conditions and contributes as much as 49 kg/ha yield, or the equivalent of 8% total yield in a low yield environment.
- The superior performance of SEA 15 under drought stress was associated with lower seed ash (mineral) content indicating efficient utilization of acquired nutrients for grain production.
- Studies on antibiosis, tolerance, and antixenosis as mechanisms of resistance to *Thrips palmi* were finished, and a major QTL for *Thrips* resistance was located on chromosome b06.
- At least three resistance genes condition resistance of G 19833 to four races of *C. lindemuthianum*. The resistance genes in G 19833 are distinct from those in the Andean genotypes Michigan dark red kidney, Kaboon and Perry Marrow, and might be a new Andean resistance locus.
- Both dominant and recessive genes with epistatic effects condition resistance to *Phaeoisariopsis griseola*, and the nature of the gene depends on the pathogen race used.
- Six new AFLP markers segregating with resistance genes in G 10474, G 10909, MAR 1 and Mexico 54 were identified, and two AFLP markers were successfully converted to STS markers and protocols for their use in MAS were developed. The RAPD marker, OPE04 was found useful in detection of a resistant gene in Mex 54 under different backgrounds and in all cases was shown to segregate with resistant dominant gene.
- Bulk segregant analysis and genetic mapping of insect resistance narrowed down the number of chromosomes that contain genes for Apion resistance and provided other potential molecular markers to use for marker assisted selection. Progress was made on developing a SCAR marker for resistance to *Apion godmani*.

- Inheritance to Pythium root rot in MLB-49-89A, AND 1062 and RWR 719 was shown to be conditioned by single dominant genes.

1.6 Methodologies

- A greenhouse screening procedure was implemented to evaluate low P adaptation, revealing that three traits on a "per plant" basis could serve to identify low P adapted genotypes: total number of basal roots, total root length, and total number of root tips.
- A screening procedure was implemented to evaluate genotypic variation in aluminum resistance, based on four traits: percent inhibition of root elongation, percent increase of average root diameter, total root length per plant and total number of root tips per plant.
- Widespread application of a second marker for resistance to BGYMV has been implemented in the breeding program.
- Marker assisted selection (MAS) for BCMV resistance was implemented in Andean bush and climbing beans this year, for the *bc*-3 gene and the *I* gene.
- A DNA-based molecular marker for resistance to the Mexican bean weevil, *Zabrotes subfasciatus*, was developed, and progress was made in the development of markers for resistance to the pod weevil (*Apion godmani*).
- Forty-four Andean, Afro-Andean and Mesoamerican races of *Phaeoisariopsis griseola* from all over Kenya, were used to evaluate resistance of lines belonging to major market classes grown in Africa.
- Generation means analysis of climbing x bush bean populations was conducted to determine trait correlations and heritabilities in climbing beans, which will facilitate future breeding of better climbing beans.
- Action thresholds for management of the whitefly *Trialeurodes vaporariorum* were validated and refined on snap beans and dry beans.
- The feasibility of producing snap beans with 70-75% less insecticides was demonstrated.
- A dilution plating method was developed to quantify total inoculum of Pythium spp in the soil.

1.7 Pathogens and pests characterized and monitored

- A new whitefly-transmitted virus that attacks common bean in Colombia has been detected, partially characterized at the molecular level, and sources of resistance have already been identified.
- Levels of resistance to insecticides were monitored in whitefly populations in Colombia and Ecuador, as well as the presence of Bemisia biotypes A and B.
- Co-infection of common bean by different races of *P. griseola* occurs under field conditions was demonstrated.
- The pathotype structure of *C. lindemuthianum* in the departments of Antioquia and Santander, Colombia has changed and new more virulent races have been characterized.

- Thirty Pythium isolates Uganda and Kenya were characterized by sequencing the ITS1 region of ribosomal DNA and were grouped into 12 species, 7 of which are new additions
- Distribution maps were developed for Pythium species characterized in Uganda.
- A bioassay method to quantify inoculum of *F. solani* f.sp *phaseoli* confirmed that FYM increased bean yield but also increased inoculum in the soil. *Calliandra* spp. green manure did not result in such high yields as farmyard manure but did not increase the soil population of the pathogen.
- Neither farmyard manure (FYM) nor Calliandra green manure (GM) had significant impact on *Pythium* populations.

2. PUBLICATIONS (see complete list in Annual Report)

2.1 Refereed Journals

- Papers published in English: 16
- Papers accepted in English: 4
- Papers published in Spanish: 7
- Papers submitted in English: 9

2.2 Books or Book Chapters

- Book chapters published: 9 (all in English)

2.3 Published Proceedings

- 6 Papers in English
- 6 Abstracts in Spanish

2.4 Scientific Meeting Presentations

- 30 Papers in English
- 7 Papers in Spanish

2.5 Editorial Contributions

- Reviewed papers for:
  Africa Crop Science Journal
  Agronomy Journal
  Euphytica
  European Journal of Plant Pathology

3. STRENGTHENING NARs

3.1 Training courses

- First International Course on Bean Breeding Assisted by Molecular Markers (CIAT HQ, October 21 - November 15, 2002)
- Two training courses of Participatory Plant Breeding —specifically linked to the Rockefeller-funded project: "Increasing food security and rural incomes in Eastern, Central and Southern Africa through genetic improvement of bush and climber beans". The first was held in Kakamega, Kenya 12-15 May 2003, (with 19 participants, from Kenya, Uganda and Rwanda) the second in Kampala Uganda, 15-16 September (9 participants from the same three countries, plus Tanzania).
- Marker Assisted Selection short course in Uganda, in February 2003 with participants from Malawi, Southern Highlands of Tanzania; Zambia, South Africa, Uganda, Kenya, Ethiopia, Rwanda.
- Several training workshops were organized and implemented for bean IPM farmer group representatives, district and village extension officers, rural service providers and community local leaders at project sites in Kenya, Tanzania and Malawi
- A three-day workshop in Mukono, Uganda organized by the Ugandan National Bean Programme (NARO) with the participation of 22 farmer representatives and 11 extension services.

3.2 Individualized Training

- CIAT-PABRA sponsored one scientist from Univ. of Malawi to participate in the PPB monitoring tour in Honduras
- Scientists from CORPOICA, Bogota, were trained for a week in "Técnicas para la conservación de microorganismos a larga plazo" in Bean Pathology
- A visiting researcher from La Violeta, Bolivia, attended training on germplasm evaluation and adaptation to abiotic stress factors
- Training on biological control of whiteflies was offered to one scientist from CORPOICA, Bogota to four from from Consorcio CHARCHI, Ecuador and to farmers from COAGROHUILA, Colombia
- A researcher from Cochabamba, Bolivia, received training on pests in beans
- Six individuals received training in the use of markers for diversity assessment, microsatellite mapping, marker assisted selection and gene tagging, at CIAT.

3.3 Ph.D., M. Sc., and Pregraduate thesis students

a) completed in 2003
   - One PhD candidate doing her work in CIAT finished her thesis work with ETH in Switzerland
   - Four African scientists finished their M. Sc. degree programs.
   - Two pre-graduate students finished their degree research at CIAT headquarters

b) continuing thesis students
    - Six PhD candidates in Africa and six in Latin America are continuing their studies.
    - Six African and four Latin American candidates to the M.Sc. degree are continuing their studies.
    - Six pre-graduate students continue to work toward their degrees at CIAT headquarters.

3.4 Workshops and Meetings

Bean team staff experienced an especially heavy load of meetings this year and participated in the following events:

- November, 2002 and January, 2003. Guatemala. Workshops on the future of the Central American networks.
- February. Planning workshop for a bioefficacy trial with the University of Nairobi. Kisumu, Kenya.
- February. Workshop on Impact Assessment and Monitoring & Evaluation.
- February. Training workshops for bean IPM farmers and village extension officers, Hai and Lushoto, Tanzania.
- March. Wider impact workshop, Kawanda, Uganda.
- March. Participatory breeding Workshop, Kawanda, Uganda.
- April. Annual meeting of Honduran CIALs (Local Agricultural Research Committees). Honduras.
- April. Annual meeting of PCCMCA. La Ceiba, Honduras.
- April. National Congress of Food Scientists – ACTA "Asociacion Colombiana de Ciencia y Tecnologia de Alimentos". Bogotá, Colombia..
- April: Situación del biotipo B de *B. tabaci* en el Valle del Cauca (Hotel Las Victorias Palmira, Colombia)
- May: Field day on "Alternativas de manejo de mosca blanca en frejol en el Valle de Chota Ecuador" (El Tambo, Ecuador)
- May. Forum on Agricultural Research in Africa. Dakar, Senegal.
- May. NEPAD Workshop, Berlin, Germany
- May. Training workshop on principles of crop production and IPM for adult education teachers. Kisii, Kenya
- May. PABRA Steering Committee Meeting, Kabale, Uganda.
- May. Effective and Sustainable Seed Relief: A Stakeholder Workshop, FAO: Rome.
- June. Curso Taller MIP en la producción Agraria Sostenible, INISAV (La Habana, Cuba).
- June-July. PRGA stakeholders workshop, Cali, Colombia
- July. XXX Congreso de la Sociedad Colombiana de Entomología, SOCOLEN. Universidad Autónoma de Occidente, Cali, Colombia.
- June. Training workshop for bean IPM farmers and extension officers, Lushoto, Tanzania
- June. Planning meeting of the Biofortification Challenge Program
- June. Good Seed Initiative Workshop, Morogoro, Tanzania.

- July. ECABREN problem analysis workshop, Naivasha, Kenya
- July. ECABREN stakeholders priority setting workshop, , Nairobi, Kenya
- July. "Congreso Nacional de Fitomejoramiento y Producción de Cultivos". Bogotá, Colombia.
- August. Situación del biotipo B de *B. tabaci* en Colombia y el Valle del Cauca. Hotel Cacique T, Cereté, Córdoba, Colombia
- July. Planning workshop for the Full Proposal on "Improving crop water productivity of grain legumes: Comparative physiological and genetic approaches to develop tools and methods for genetic enhancement" for Challenge Program on Water and Food held at ICRISAT, Patancheru, India.
- August. Genetic Resource Challenge Program technical meeting. Wageningen, Netherlands
- August. workshop on seed multiplication of OPV and self-pollinated crops for Zimbabwe and Botswana.
- September. Workshop on OPV seed multiplication for Malawi and Zambia.
- August – September 2003. Field training tour for Malawi farmer representatives in southern highlands, Mbeya, Tanzania
- September. Participatory breeding Planning Meeting, Kawanda, Uganda.
- September. ASARECA-Seed Trader Association : Seed Trade Policy Harmonization Regulations Workshop. Arusha, Tanzania
- September. The Second National Review Workshop on Food and Forage Legumes, Addis Ababa, Ethiopia.
- October. Biofortification Challenge Program-Bean Planning Meeting, Naivasha, Kenya.
- October. SABRN Steering Committee meeting. Potchefstroom, South Africa.
- October. African Crop Science Conference, Nairobi, Kenya.

3.5 Technical Assistance

- Breeders in Africa visited most countries in the target areas in order to review work and visit breeding nurseries, although travel in Latin America was reduced due to the cessation of projects in Central America and Haiti.
- Personnel in the Participatory IPM Development and Promotion in Eastern and Southern Africa assisted NARs in Kenya, Tanzania, and Malawi
- Likewise, personnel in the Whitefly IPM Project assisted NARs in El Salvador and Ecuador

4. RESOURCE MOBILIZATION

4.1 Proposals funded:

At Headquarters:

Project	Donor	Funding Country	Year of current funding
Genetic improvement of *Phaseolus vulgaris* using exotic bean germplasm and biotechnology	AGCD/BADC	Belgium	2000-2003
Characterization of South American genotypes of bean for optimal use of light under abiotic stress	European Commission	Belgium	2001-2003
Integration of bio-fertilization in bean cultivation by optimizing the use of the Rhizobium-bean symbiosis	K.U. Leuven	Belgium	2001-2005
Andean climbing bean improvement for the Andean Zone	IICA/BID/FONTAGRO	Colombia	2002-2004
Mejoramiento de la nutrición humana en comunidades pobres de América Latina utilizando maiz (QPM) y frijol común biofortificados con micronutrientes	IICA/BID/FONTAGRO	Colombia	2004
Genetic improvement of 'Cargamanto' beans in Antioquia Colombia	CORPOICA/ COLCIENCIAS	Colombia	2003
Estudio de la factibilidad de la selección asistida por marcadores para obtener cultivares de frijol con resistencia simultanea al virus del mosaico común y la antracnosis	CORPOICA/MAG	Colombia	2002-2003
Proposal for increasing bean and maize agrobiodiversity as an approach for improving production systems, food security and nutrition in Nariño, Colombia	ECOFONDO FIDAR	Colombia	2003-2005
Characterization of South American Genotypes of Bean for Optimal Use of Light under Abiotic Stress.	Univ. de Chile	Chile	2001-2003
Candidate Genes for Tolerance of Symbiotic Nitrogen Fixation (SNF) to Phosphorus Deficiency in Common Bean (Phaseolus vulgaris L. (INRA, CIAT, INIFAP Mexico)	Plate-forme de recherches avancées Agropolis – 2ème appel d'offre.	France	2001-2003
An integrated approach for genetic improvement of aluminum resistance of crops on low-fertility acid soils	GTZ	Germany	2001-2003-
Bean genomics for improved drought tolerance in Africa and Latin America	BMZ	Germany	2003-2006
Screening for resistance to tomato yellow leaf curl virus in common bean	The Volcani Center	Israel	
PROMPEX-CIAT Bean Project (Peru)	SDC	Switzerland	2002-2004
Technical assistance to PRONALAG team (Bolivia)	SDC	Switzerland	2002-2004
Regional collaborative bean network for Central America, Mexico, and the Caribbean – PROFRIJOL	SDC	Switzerland	2001-2003
Genetic plant resources as a core element to safeguard bean harvest	ETHZ	Switzerland	2000-2002
Resistance to *Thrips palmi* in beans	ETHZ-ZIL	Switzerland	2000-2003
Implementation of IPM practices to control whitefly-transmitted viruses affecting beans and horticultural crops in El Salvador and Mexico	DFID	UK	
Improved beans for Africa and Latin America	DFID	UK	2004
Tropical Whitefly IPM Project	DFID	UK	2001-2004
Increasing food security and rural incomes in eastern, central, and southern Africa through genetic improvement of bush and climbing beans	Rockefeller Foundation	USA	2001-2003

Project	Donor	Funding Country	Year of current funding
Nutritional Genomics	USAID	USA	2003
Strengthening Research & Development for Increased and Sustainable Agricultural Productivity, Improved Food Security and Nutrition, and Income of Rural and Urban Populations in East and Central Africa	USAID/REDSO/ESA	USA	2003-2006
Increasing food security and rural incomes in eastern, central, and southern Africa through genetic improvement of bush and climbing beans	Rockefeller Foundation	USA	2001-2003
Nutritional Genomics	USAID	USA	2003
Strengthening Research & Development for Increased and Sustainable Agricultural Productivity, Improved Food Security and Nutrition, and Income of Rural and Urban Populations in East and Central Africa	USAID/REDSO/ESA	USA	2003-2006
A coordinated effort to mark and map important genes in common bean: Universities of California, Cornell, Michigan State, North Dakota, and Puerto Rico	USAID	USA	2000-2003
Haiti hillside agricultural program	USAID/DAI	USA	2001-2003
Breeding staple crops for improved micronutrient value (for biofortification research)	USAID		2002-2004
Biofortified Crops for Improved Human Nutrition	World Bank DANIDA Gates Foundation	USA	2003-2008

In Africa:

Project	Donor	Funding Country	Duration of current funding
Pan-Africa Bean Research Alliance	CIDA	Canada	2000-2002
Pan-Africa Bean Research Alliance	SDC	Switzerland	1998-2001 2001-2004
Epidemiology of bean root rots	HRI (from DFID)	UK	2000-2003
Eastern and Central Africa Bean Research Network	USAID	USA	1998-2003
Genetic Improvement of Bush and Climbing Beans	Rockefeller Foundation	USA	2001-2003
Achieving wide impact with climbing bean and agroforestry interventions in the Eastern Africa Highlands (Tanzania Highlands): a win-win combination"	FARM-AFRICA (Maendeleo Agricultural Technology Fund		2004-2006
Seed Aid and Germplasm Restoration in Disaster Situations: Synthesis of Lessons Learned and Promotion of More Effective Practices	IDRC	Canada	
Assisting Disaster-Affected and Chronically-Stressed Communities in East and Central Africa: Focus on Small Farmer Seed Systems	USAID	USA	Ongoing

Research sub-projects and activities implemented in SABRN for year 2002-2003

No	Project Title	Country	Remarks
1	Race identification and breeding for resistance to bacterial diseases of beans in the SADC region	South Africa	On-going
2	Angular leaf spot race identification and breeding for resistant lines for SADC countries	South Africa	On-going
3	Selecting multiple resistant lines for diseases in South Africa	South Africa	On-going
4	On-farm evaluation of bean varieties in Mozambique	Mozambique	On-going
5	On-farm evaluation of different fertilizer levels/methods in beans.	Zambia	On-going
6	Screening bean genotypes resistance to angular leaf spot and common bacterial diseases in Malawi	Malawi	On-going
7	On-farm evaluation of promising bean varieties	Angola	New
8	Seed multiplication on fields of small scale production	D R Congo	New
9	On-farm evaluation of new bean varieties.	D R Congo	New
10	On-farm verification of improved bean varieties.	Lesotho	New
11	On-farm evaluation of vegetable oils and botanicals for protection of beans against bean	Malawi	New
12	Scaling-up of on-farm and on-station seed multiplication	Malawi	New
13	Bean survey to cover market studies in Swaziland	Swaziland	New
14	Participating in on-farm bean variety evaluation in two agro-eco zones.	Swaziland	New
15	Popularization of sun-hemp for bean production on-farm.	Swaziland	New
16	Multiplication of foundation seed of bean varieties in Zambia.	Zambia	New
17	Farmer assessment and selection of new bean varieties to enhance adoption	Tanzania	New
18	On-farm verification and promotion of elite bean varieties of multiple disease resistance and IDM technology for clean seed production in SHT	Tanzania	New

Research sub-projects and activities implemented in ECABREN for year 2002-2003

1. Developing new bean varieties that address market demands	**Lead Institution/Country**
Breeding programmes for different market classes	
1.1 Red mottled beans	NARO Namulonge/Uganda
1.2 Dark red kidney beans	DRD-SARI/Tanzania
1.3 Medium and small red beans	EARO Awassa/Ethiopia
1.4 Pinto bean	KARI Katumani/Kenya
1.5 Sugar bean, yellow & brown	INERA Mulungu/DR Congo
1.6 Carioca bean	EARO Nazareth/Ethiopia
1.7 Red mottled climbers	ISAR Rubona/Rwanda
1.8 Bush snap beans	NARO Kawanda/Uganda
1.9 Climbing snap and runner beans	KARI Thika/Kenya
1.10 Navy beans	NARO Nazareth /Ethiopia
1.11 Large white beans	FOFIFA Antana/Madagascar
1.12 Screening for low soil fertility of major market classes	INERA/DR Congo
1.13 Screening for drought tolerance of major market classes	ARC Hudeiba/Sudan
2. Wider impact achieved across Africa	
2.1 Wider impact strategy (dissemination/promotion)	All countries
2.2 Reinforcing sustainable approaches to decentralized seed systems	All countries
2.3 Disseminating improved root rot varieties	RUFAO Bungoma/Kenya
2.4 Disseminating banana ropes as staking options for climbing beans under banana fields	INERA Mulungu/DR Congo
2.5 Adapting and disseminating climbing beans in lower altitudes zones in western Congo	INERA M'vuazi/DR Congo
3. Empowering farmer communities to become more competitive and better managers of their resources	
3.1 Participatory research for improved agroecosystem management (PRIAM)	Institutions in Congo, Madagascar, Tanzania, Rwanda
3.2 Participatory bean breeding (included in breeding programs)	Bean programs in Ethiopia, DR Congo, Rwanda, Tanzania
4. Improving understanding of local, regional, and international bean markets	
4.1 Economic analysis of cross-border trade: case of Arusha and Nairobi regions	Moi University/Kenya
4.2 Structure, conduct and performance of bean marketing in EA: case of Western Kenya, eastern & south-west Uganda	
4.3 Marketability of different bean types in various urban Kenyan markets	

4.2 Proposals and Concept Notes submitted

- Scaling up and scaling out bean IDPM promotion activities including pest tolerant and improved high yielding bean genotypes. An extension phase submitted to DFID

- Bean root rot disease management in Uganda. An extension phase submitted to DFID

- Increasing crop water productivity in the Victoria Nile basin using stress tolerant maize and bean varieties in conservation agriculture systems. Submitted to the CGIAR Challenge Program on Water and Food with CIMMYT as a lead center. Total budget: US$1, 998, 000 over 3 years.

- Improving water productivity and nutrient use efficiency of cereals and grain legumes for food security and enhancement of the well-being of rural communities in the São Francisco River basin: a multidisciplinary and multi institutional approach. Submitted to the Water for Food Challenge Program with EMBRAPA as lead center.

- Really green beans: An environmentally clean alternative for small farmer employment and income generation. Concept note submitted to CONDESAN.

- Phaseomics RUIG-GIAN. Submitted by Univ. of Geneva with CIAT collaboration.

- Utilización de hierro y zinc en modelo animal y respuesta clínica al consumo habitual de fríjol de alta densidad mineral en mujeres y niños. Submitted by Universidad del Valle to COLCIENCIAS with CIAT collaboration.

- Seeds of Hope for Central America. Submitted to INIA-Spain, and under continuing development.

- Mejoramiento de fríjol y seguridad alimenticia: Control genético de la mancha angular en América Central. Submitted to FONTAGRO.

- Sustainable Management Strategies for Common Bean Diseases: the Angular Leaf Spot model, to be submitted to IBDC.

- Green alternatives for sustainable plant disease and insect pest management, to be submitted to IDRC.

- Comparative genomics and genetics in legumes, a collaborative research project between CIAT and University of Aarhus, submitted to DANIDA.

- Mejoramiento de fríjol para calidad de exportación y seguridad alimentaria: control genético de la mancha angular y mosaico dorado en Nicaragua, to be submitted to FAITAN.

- Biological nitrogen fixation and legume intensification for increased crop productivity in maize-based farming systems of Africa and Central America and the rice-fallows of South Asia." Donor: IFAD. Total amount: US$ 2,400,000 for 3 years.

- Unlocking Genetic Resources in Crops for the Resource Poor. Submitted to the Genetic Resources Challenge Program. Four subprograms contain a common bean component.

5. IMPACT MONITORED

- Last year we reported on publication of four important documents published by the Strategic Planning and Impact Assessment Unit of CIAT on the role of improved bean varieties in the creation of variability and on the importance of CIAT's role in the introgression of useful genes. This year a paper by Johnson, Pachico and Voysest was accepted for publication on the relative benefits to suppliers and users of germplasm among countries that have provided genetic diversity for international circulation and inclusion in breeding programs.

- As a follow up to past adoption and impact studies in Uganda, work on quantifying impact of bean technology was finished in five out of six target regions in that country. Adopting farmers benefited from both increased bean consumption and increased bean income, which doubled since 1995. See details in full report

- A strategy for creating wider impact with bean based technologies in Africa was developed and is being tested in collaboration with NARs in Eastern and Southern Africa. Farmer empowerment was strengthened and scaled up at project sites in Tanzania, Kenya and Malawi. Project plans and activities in Kisii and Rachuonyo (Kenya), Hai, Lushoto and Mbeya (Tanzania) and Dedza (Malawi) were led by farmer groups (both men and women holding key positions in decision making at group, village and district levels). Farmers demanded different services depending on the location, including to be facilitated to disseminate their IPM message to a wider audience.

6. AWARDS

- L. Sperling. Election as Chair of the Board: Sustainable Agriculture and Natural Resource Management CRSP (Collaborative Research Support Project)

- L. Sperling. Best Presentation: Annual Review CIAT (2003): “Keeping Research Off the Shelves: Making Emergency Relief More Effective”

- The 2002 Outstanding Research Publication Award (ORPA) conferred by the CIAT Board of Trustees was given to George Mahuku, María Antonia Henríquez, Jaime Eduardo Munõz and Robin A. Buruchara for the article entitled: Molecular Markers Dispute the Existence of the "Afro-Andean" group of the Bean Angular Leaf Spot Pathogen, *Phaeoisariopsis griseola*, published in Phytopathology 92: 580-589.

- The research paper “Marcadores moleculares para selección por resistencia al gorgojo pintado del fríjol, *Zabrotes subfasciatus* (Boheman) (Coleoptera: Bruchidae)” by Sergio Prieto, César Cardona, Matthew Blair, Jaime Muñoz, was nominated for the "Francisco Luis Gallego" award as the best paper presented by a student during the XXX Congress of the Entomological Society of Colombia, SOCOLEN in Cali, CO., 2003.

- These two research papers were nominated for the "Hernan Alcaraz Viecco" award as the best papers presented during the XXX Congress of the Entomological Society of Colombia. SOCOLEN, in Cali, CO, 2003:
  "El biotipo B de *Bemisia tabaci* (Gennadius) (Homoptera: Aleyrodidae) adquiere mayor importancia en le Valle del Cauca" by Isaura Rodríguez, Héctor Morales, Juan M. Bueno, César Cardona, and
  "Alternativas para el manejo de la mosca blanca *Trialeurodes vaporariorum* (Westwood) (Homoptera: Aleyrodidae) en fríjol en las comunidades del Valle del Chota, Ecuador" by Ximena Tapia, Mauricio Proaño, César Cardona, Isaura Rodríguez, Susan Poats.

- The "Hernan Alcaraz Viecco" award was given to Hainan Gu, Silvia Dorn, Andrea Frei, César Cardona, for the best paper presented during the XXIX Congress of the Entomological Society of Colombia, SOCOLEN in Monteria, CO., 2002 entitled "Estudio de los mecanismos de resistencia del fríjol común a *Thrips palmi* Karny".

- The 2003 Meritorious Service Award of the Bean Improvement Cooperative, an informal, US based information network of bean researchers, was given to S. Beebe.