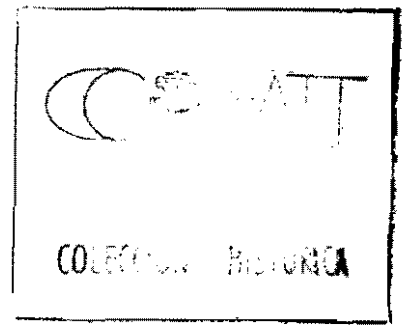

CIAT Annual Internal Program Review 1987

ANNUAL REPORT 1986

GENETIC RESOURCES UNIT

January 1987

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GENETIC RESOUCES UNIT

1986 HIGHLIGHTS

— The major task of duplicating the Phaseolus collection to CENARGEN, Brasil was begun.

— Planning was completed and tenders invited for the new building extension which included cold room and a cassava tissue culture faiclity.

— The Seed Health Laboratory was extended to permit an increased work load associated with routine testing of outgoing materials.

— An ICA quarantine official was posted within CIAT to increase the efficiency of movement of incoming and outgoing plant material.

— Planning was started for a post-entry quarantine greenhouse, probably to be located at ICA, Tibaitatá.

-- A major effort is continuing in the introduction to the CIAT Patures Program of African grasses.

— Work has continued strongly on Phaseolus coccineus/polyanthus, to the level of international trials and an investigation of P. lunatus has begun.

Introduction

The work of the Genetic Resources Unit falls into three parts:

The Seed Health Laboratory, responsible for routine tests of outgoing seed for seed-borne fungal, bacterial and viral diseases,

The handling of germplasm for the Tropical Pastures Program

(multiplication, storage, some evaluation, distribution),

The handling of germplasm for the Bean Program (collection, characterization, multiplication, storage, distribution), including work on Phaseolus coccineus and P. lunatus.

More detailed accounts of these three activities are given below (bean germplasm handling also appears, for the sake of completeness, in the Annual Report of the Bean Program).

A **Position Paper** on the work of the Genetic Resources Unit was written for the CIAT Board of Trustees early in 1986. This contained summaries of activities for the past ten years, and ideas for future development. These are not repeated here.

General Activities

Planned Building Extension.

The event of most significance in 1986 was the completion of the planning of an extension to the Genetic Resources Unit. This extension, financed by the Government of Italy, will contain long- and medium-term cold stores, fitted with mobile shelving, each with a capacity of 1000.000 seed samples. The medium-term store will be dehumidified (this feature alone will increase storage life by a factor of ten). The building will also contain a laboratory for in vitro maintenance of cassava.

The previous stores will be converted for temporary seed storage and as a walk-in germinator. A room is being reserved for future cryopreservation facilities. Cryopreservation, in this case storage over liquid N_2, could be particularly suitable for small-seeded pasture species. The seed storage characteristics of tropical pasture species are imperfectly known, however, initial work in Australia has shown that cryopreservation has the advantage of breaking seed

dormancy.

Quarantine

Some residual samples were received from the University of Gembloux after passing through third country quarantine. The main location for third country quarantine is now the National Institute of Horticultural Research (formerly the National Vegetable Research Station) in Wellesbourne, England. Some 800 samples from Africa, (final figures are not yet available) were grown at Wellesbourne for both the CIAT Bean program and the Genetic Resources Unit. This facility has been developed partly to clear the backlog of samples for quarantine, and partly to hasten the flow of beans from Africa, which will increase with expanding CIAT activities in Africa.

An ICA quarantine officer is now stationed in CIAT, under the terms of an ICA/CIAT agreement. This is a useful initiative to give closer control to incoming and outgoing material. This has been particularly useful for control of grasses entering Colombia from Africa (see later).

Funding from the Government of Japan will be used for the construction of a quarantine greenhouse under ICA control, probably in Bogotá.

During a visit of two officials from CENARGEN, Brazil, the quarantine procedures for introducing germplasm from CIAT to Brazil were clarified: this was a mutually useful experience.

Training

With support from IBPGR, four trainees, from Costa Rica, Cuba, Argentina, and Peru, were given training for periods up to three months. This hands-on experience in germplasm management within the GRU is a valuable service to national programs, and will be developed in future.

One of the GRU staff, Miss Isabel Natalia of the Seed Health Laboratory is attending a 5-month course at the Danish Institute of Seed Pathology for Developing Countries.

With the CIAT Seed Unit and the IBPGR a training course in seed physiology for genebanks was planned for 1987. This will be for about 20 staff of Latin American National Programs.

Contacts Outside CIAT

Although the major function of the GRU is to provide germplasm support for CIAT Pasture and Bean Programs, the existence within CIAT of the large germplasm collections allows us to take part in a network of activities with other institutions. Most of these activities involve the transfer of germplasm from and to CIAT: examples of other types follow.

A continuing effort is being made to identify samples in the GRU herbarium. Phaseolus samples are sent to Puerto Rico and England: Pasture species go to Holland, Australia, and England for identification. Such critical identification is necessary as a guide both to further collecting (to review the distribution of the taxa) and also to have a clearer view of the ecological relations of species - a useful indication of evolutionary history and, more importantly, potential for development.

The CIAT germplasm documentation capability has been strengthened by on-line access to the USDA Genetic Resources Information Network (GRIN). This contains information on accessions in the Plant Inventory - of which we have 10,000 samples of Phaseolus. We also now have the 'World Phaseolus data base', developed by the University of Gembloux, and handed over to CIAT by IBPGR, for further development. This data base will be useful to CIAT, as it contains evaluation information on 14 national collections.

While the GRU does not intend to accumulate all existing collections of Phaseolus, selected collections are being surveyed for interesting samples. This can be mutually useful: we have more than 500 samples from Spain not in the Spanish national collection, while they have many samples of great interest to CIAT. An exchange is planned. A review of the Unviersity of Cambridge Phaseolus germplasm catalog has indicated much of interest, particularly African samples. During this year CIAT returned almost 500 Iranian samples to Iran, to form part of their national collection.

The FAO Commission of Plant Genetic Resources has asked CIAT for information on base collections, on the legal status of the collections, and for two review papers on the development of germplasm at CIAT (tropical pastures and beans). Only four such papers were commissioned world wide.

A series of requests for research material emphasizes the increasing value of the colleciton as a research tool. The value of the collection to taxonomists is mentioned above. The collection of wild Phaseolus is being surveyed: a) electrophoretically (University of California) for relationships within and between species, b) for resistance to stored product pests (Tropical Pest Control Laboratory, England).

Staffing

Additional staff in the GRU include Dr. D. Debouck as CIAT Senior Research Fellow (formerly IBPGR Postdoctoral Fellow), who will develop Phaseolus collecting; and A. Maquet as Research Associate, through the Government of Belgium, who will develop work on Phaseolus lunatus.

The Head of the GRU is responsible for the staff shown in Table 1.

Table 1. GRU Staffing

	Germplasm Management	Seed Health Testing
Research Associate	1	
Research Assistant	2	1
Technicians	12	2
Laborers	10	1
FAO Associate Expert	1	
Senior Research Fellow	1	
Visiting Research Associate	1	
Secretary	1	
Statistical Expert(documentation)	1	

Seed Health Laboratory

(responsibility of I. N. Salas)

The intention in founding the Seed Health Laboratory was to check on seed-borne diseases of germplasm leaving CIAT. This would be in addition to the requirements for the issue of International Phytosanitary Certificates by the Colombian authorities, and any post entry check in the country of receipt.

Although under the control of the GRU, the Seed Health Laboratory has developed its working procedures with the advice of the program pathologists and virologists. An advisory panel has been set up including these people, to survey the work of the laboratory and to suggest modifications. The laboratory could develop a research function; present staff levels are sufficient for routine screening only.

The range of routine tests is shown in Table 2.

Table 2. Range of routine tests done in the Seed Health Laboratory.

Method	Crop	Pathogen
1. Elisa	*Phaseolus vulgaris*	Virus(BSMV/BMMV;BCMV-FLA 2-NL3)
2. Serological test	*Phaseolus vulgaris*	Bacteria (*Pseudomonas phaseolicola* and *Xanthomonas phaseoli*)
3. Blotter Test	*Phaseolus vulgaris*	Fingu (*Fusarium* spp., *Alternaria* spp., *Macorphomina phaseolina*, *Rizoctonia solani*, *Colletotrichum truncatum*, etc.).
	Sorghum vulgare	Fungi (Genera: *Alternaria*, *Cercospora*, *Corvularia*, *Fusarium*, *Gloeocercospora*, etc.).

4. Plated in Kings B Medium	Oryza sativa	Bacteria(Pseudomonas flurescens)
	Centrosema spp.	Bacteria(Pseudomonas fluorescens biotype II/Pseudomonas marginalis)
	Desmodium ovalifolium	Bacteria(Pseudomonas fluorescens biotype II (Pseudomonas marginalis)
5. Plated in YCDA medium	Zornia spp.	Bacteria (corynebacterium flaccumfaciens)

The number of samples tested by the various methods are shown in Table 3.

Table 3. Number of samples tested by the various methods.

Procedence	Species	No. samples Evaluated	METHOD (No. of postive samples) ELISA BSMV/ BMMV	ELISA BCMV FLA	ELISA BCMV NL3	Serology Pp	Serology Xp	Blotter Test	Plated King's B Media	Plated YCDA Media	Plated No. organisms found PDA Media With Shell	Plated No. organisms found PDA Media Without Shell	Plated No. organisms found AA Media	Positive samples per Program (Number)
Germplasm Bank	Phaseolus vulgaris	2.000	437			1	1	409						848
		20		11	1									12
Bean Physiology	Phaseolus vulgaris	6	2			-	-	3						5
Seed Unit	Oryza sativa	141							121					121
	Sorghum vulgare	3												
Phytopathology Tropical Pastures	Arachis pintoi	1									75	43		
	Stylosanthes capitata	1											33	
	Stylosanthes macrocephala	1											34	
	Centrosema spp.	121							8					8
	Desmodium ovalifolium	1							-					-
	Zornia spp.	4								2				2
ICA-CIAT	Phaseolus vulgaris	2				-	-	-						-
TOTAL		2.301												996

BSMV = Bean southern mosaic virus; BMMV = Bean mild mosaic virus; BCMV = Bean common mosaic virus (FLA=Florida;NL3=N13): Pp = Pseudomonas phaseolicola
Xp = Xanthosomas phaseoli

Pastos Tropicales

(responsabilidad de J. Belalcázar)

Durante 1986 la Sección Pastos Tropicales continuó sus esfuerzos en:

1. El aumento de la colección de especies prioritarias a nivel nacional.

2. Conservación de las colecciones en el banco activo y pos-cuarentena de gramineas procedentes de Africa en invernadero.

3. Rejuvenecimiento y conservación a "Largo plazo".

4. Distribución de germoplasma.

5. Muestreo de material de herbario.

6. Manejo computarizado de documentación de pasaporte por accesión.

Colección

Esta actividad fué realizada en conjunto con el programa de Pastos Tropicales e Instituciones Nacionales mediante 3 viajes exploratorios por algunas regiones de Colombia (ver Cuadro 1.).

a. Costa Norte: En colaboración con CSIRO, Townsville, Australia se muestreo una gran parte de ésta zona (ver Figura 1.). Con el objeto de aumentar la colección de leguminosas tolerantes a la sequía prolongada, particularmente Centrosema macrocarpum y Stylosanthes hamata.
Se colectó un total de 219 muestras, de las cuales el 30% correspondió a Centrosema y el 26% a Stylosanthes (ver Cuadro 2.). Se tomó material de hervario del 100% de Stylosanthes colectados

b. Guaviare: Un viaje de exploración se realizó a la zona de San José del Guaviare (ver Figura 1.), en conjunto con la secretaría de Planeación y Desarrollo de la Comisaría del Guaviare. Se encontró gran variedad de especies, estando presente Centrosema acutifolium y C. macrocarpum. Se colectó un total de 22 muestras, (ver Cuadro 2.).

c. Noroeste de Antioquia: Se realizó un viaje de recolección exploratoria conjunta con la Universidad Nacional de Colombia sede Medellín a la zona del Urabá, colectando en ecosistemas de bosque seco, húmedo y muy húmedo tropical (ver Figura 1.). De casi 100 muestras colectadas (ver Cuadro 2.) el 35% correspondió a Centrosema y el 14% a Desmodium siendo éstos dos géneros los más frecuentes.

Pos-cuarentena de gramineas Africanas

A nivel de invernadero se ha seguido conservando y manteniendo el material de gramineas, venido de Africa en cultivos de tejido (ver Cuadro 3.). Este material es liberado por el ICA en conjunto con Patología de Pastos Tropicales. Hasta el presente han sido liberados el 70% de estos materiales.

Rejuvenecimiento y Conservación a "Largo plazo"

La multiplicación de rejuvenecimiento para conservar a "Largo plazo" de colecciones completas, continúa siendo tarea importante en la U.R.G (ver Cuadros 4 y 5.); siendo complementada ésta conservación con un monitoreo de calidad de la semilla (ver Cuadro 6.) y su reclasificación taxonómica.

Distribución de Germoplasma

Como en años anteriores la distribución de germoplasma tanto dentro como fuera de CIAT de leguminosas y gramineas, continuó siendo una de las funciones de servicio importante en la Unidad de Recursos Genéticos. (ver Cuadro 7.).

Material de herbario

Sigue siendo responsabilidad de la Unidad de Recursos Genéticos mantener el herbario de referencia,colectando material de herbario de las accesiones que se encuentran en multiplicación y evaluación en invernadero y campo respectivamente. La capacidad del herbario para guardar muestras es de 14.400. Esta capacidad está copada en el 88%.

Manejo de documentación

Toda accesión introducida al banco de germoplasma, lleva un registro de pasaporte computarizado, el cuál sirve para elaborar catálogos o reportes de acuerdo a los programas previstos. Se llevan registros computarizados del material conservado a "Largo plazo"; así como el inventario computarizado de la cantidad de germoplasma en el banco para distribución de semilla. Tambien se llevan registros computarizados del material de herbario en existencia.

Planes futuras

El trabajo de multiplicar ó rejuvenecer germoplasma de colecciones completas para su conservación a "Largo plazo" así como la conservación a corto plazo y distribución de éste germoplasma, continuará en forma rutinaria. Se proyectá para 1987 continuar con las actividades de colección de germoplasma en Colombia en conjunto con el programa de Pastos Tropicales e instituciones nacionales.

Cuadro 1.

INTRODUCCION DE GERMOPLASMA DE FORRAJES TROPICALES MEDIANTE COLECCION E INTERCAMBIO CON OTRAS INSTITUCIONES DURANTE 1986 (No. DE ACCESIONES).

GÉNEROS	COLECCIONES COLOMBIA	VENEZUELA	MEXICO Y COSTA RICA	INDONESIA (SUMATRA)	INTRODUCCIONES POR INTERCAMBIO	TOTAL 1986	INVENTARIO OCT. 31. 1986
AESCHYNOMENE	4	29	33	6	17	89	866
CALOPOGONIUM	20	8	37	-	22	87	492
CENTROSEMA	108	122	88	-	65	383	1930
DESMODIUM	31	78	75	101	204	489	2548
GALACTIA	14	31	20	-	-	65	571
MACROPTILIUM/VIGNA	31	24	61	3	40	159	1200
PUERARIA	-	-	2	9	29	40	185
STYLOSANTHES	81	59	16	-	-	156	3282
ZORNIA	6	25	3	-	-	34	955
LEGUMINOSAS MISCELÁNEAS	86	91	152	124	231	684	4213
TOTAL LEGUMINOSAS	381	467	487	243	608	2186	16242
ANDROPOGON	-	-	-	-	-	-	115
BRACHIARIA	-	-	-	-	31	31	1035
PANICUM	-	-	-	-	-	-	536
GRAMÍNEAS MISCELÁNEAS	-	-	2	-	44	46	719
TOTAL GRAMÍNEAS	-	-	2	-	75	77	2405
GRAN TOTAL	381	467	489	243	683	2263	18647

Cuadro 2. RESUMEN DEL GERMOPLASMA DE LEGUMINOSAS FORRAJERAS TROPICALES COLECTADO EN COLOMBIA, 1986 (No. DE MUESTRAS).

GÊNEROS	COSTA NORTE	GUAVIARE	NOROESTE DE ANTIOQUIA	TOTAL
AESCHYNOMENE	2	1	1	4
CALOPOGONIUM	10	3	6	19
CENTROSEMA	67	3	33	103
ACUTIFOLIUM		1		1
MACROCARPUM	10	2	14	26
PLUMIERI	15		6	21
PUBESCENS	37		13	50
SAGITTATUM	1			1
SCHOTTII	2			2
VIRGINIANUM	2			2
DESMODIUM	9	5	13	27
GALACTIA	12	-	2	14
MACROPTILIUM/VIGNA	17	-	11	28
STYLOSANTHES	57	4	2	63
GUIANENSIS	5	4	2	
HAMATA	48			
HUMILIS	4			
ZORNIA	3	1	1	5
LEGUMINOSAS VARIAS*	42	5	26	73
TOTAL	219	22	95	336

* ABRUS (2), ACACIA (1), ALYSICARPUS (6), BAUHINIA (3), CANAVALIA (14), CHAMAECRISTA (2), CROTALARIA (4), DESMANTHUS (6), DIOCLEA (4), GLIRICIDIA (1), INDIGOFERA (3), LEUCAENA (4), MUCUNA (3), PHASEOLUS (2), PROSOPIS (1), RHYNCHOSIA (3), TEPHROSIA (3), TERAMNUS (11).

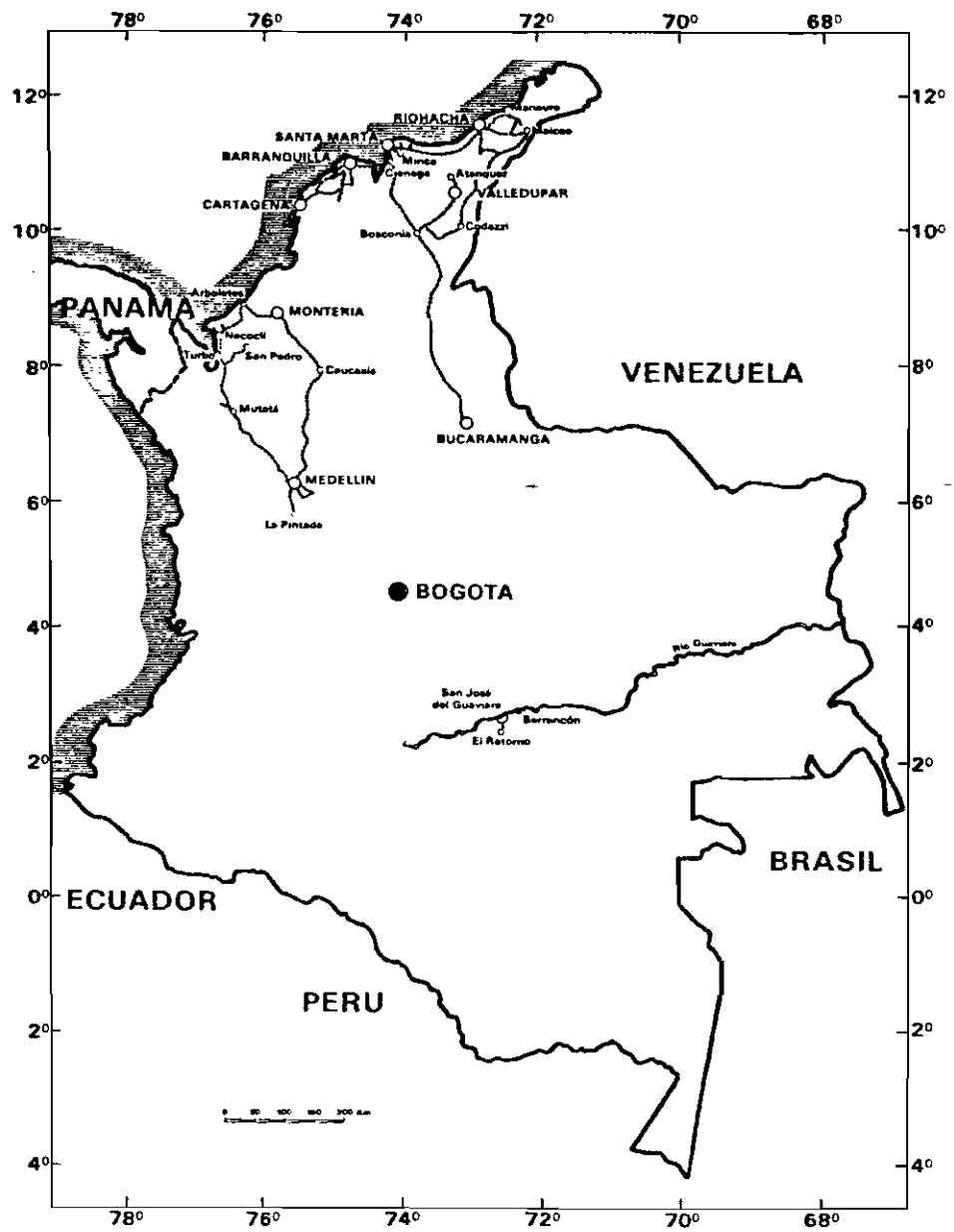


Figura 1. Rutas de la colección sistemática de germoplasma de forrajes tropicales en Colombia (Costa Norte, Guaviare y Noroeste de Antioquia - Febrero - Marzo, 1986).

Cuadro 3.

RESUMEN GRAMINEAS TENIDAS EN POS-CUARENTENA EN INVERNADERO
DURANTE 1986

GENERO	No. DE ESPECIES	No. DE ACCESIONES POR PAISES				
		ETIOPIA	KENIA	BURUNDI RWANDA	ZIMBABWE	TOTAL
Andropogon	2	-	-	-	17	17
Bothriochloa	2	-	1	-	1	2
Brachiaria	14	133	101	56	95	385
Eragrotis	2	-	1	-	1	2
Hyparrhenia	2	-	1	-	1	2
Ischaëmum	1	-	-	-	1	1
Panicum	4	-	4	-	3	7
Paspalum	3	-	2	-	1	3
Setaria	3	-	1	-	2	3
Stereochlaena	1	-	-	-	1	1
Urochloa	1	-	-	-	1	1
Gramineas varias	-	-	1	-	6	7
Total	35	133	112	56	130	431

Cuadro 4.

INVENTARIO DE GERMOPLASMA DE LEGUMINOSAS FORRAJERAS EN CONSERVACION A "LARGO PLAZO". DIC. 31 1986

GENEROS	No. ACCESIONES	
	TOTALES	REPLICAS
Aeschynomene	243	194
Centrosema	89	57
Crotalaria	134	115
Desmodium	81	70
Leucaena	84	82
Macroptilium	142	53
Pueraria	41	26
Stylosanthes	590	395
Vigna	81	57
	1.485	1.049

Cuadro 5.

RESUMEN DE LEGUMINOSAS FORRAJERAS EN REJUVENECIMIENTO PARA CONSERVAR EN EL BANCO A "LARGO PLAZO" DURANTE 1986

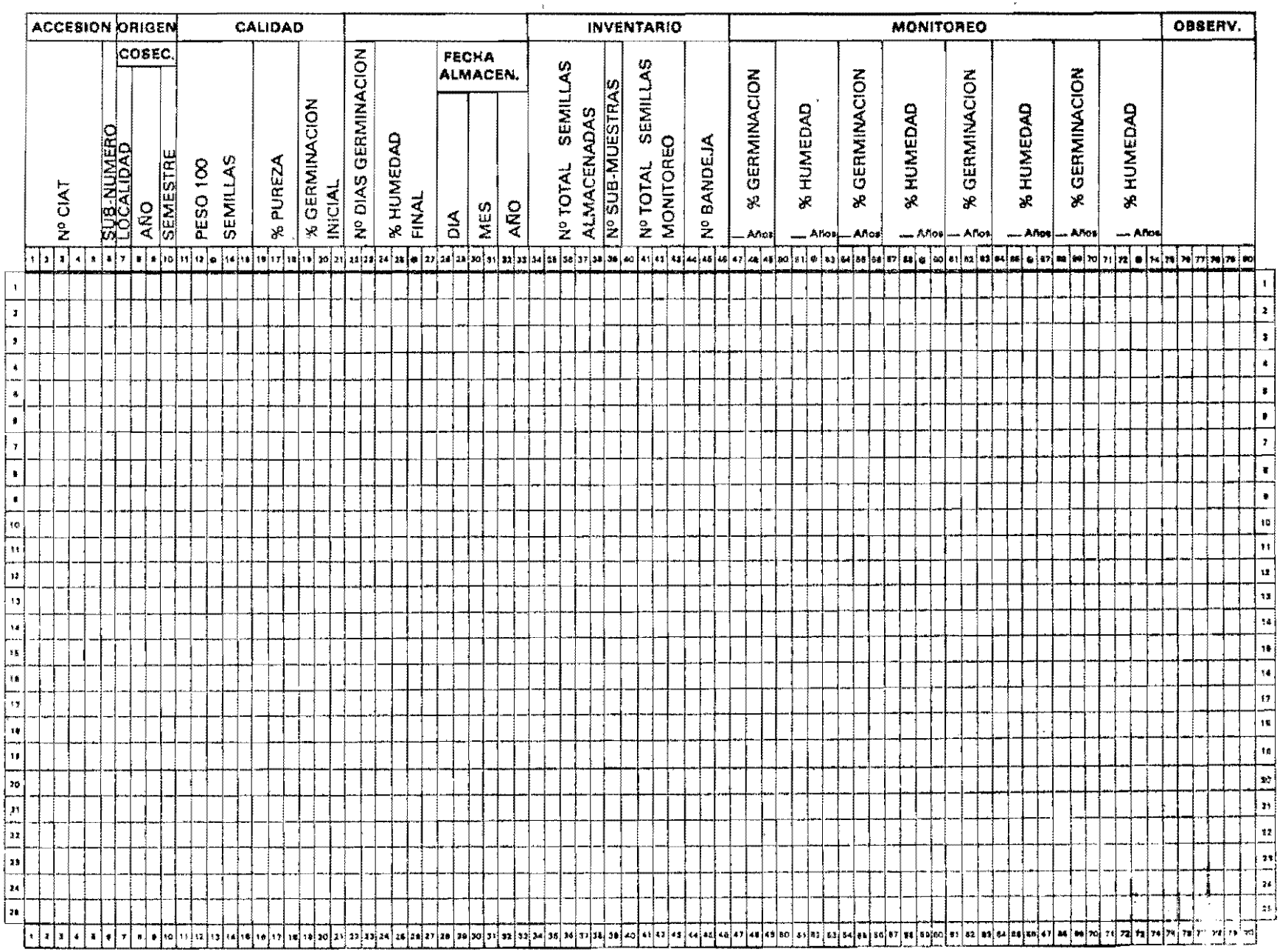
GENEROS	No. ACCESIONES
Calopogonium	300
Canavalia	189
Centrosema	572
Desmodium	350
Leucaena	30
Pueraria	144
Teramnus	240
Vigna	50
Leguminosas varias	81
	1.956

CIAT

UNIDAD DE SERVICIOS DE DATOS

Cuadro 6.

UNIDAD DE RECURSOS GENETICOS - PASTOS TROPICALES
FORMAS PARA CODIFICACION DE GERMOPLASMA - LARGO PLAZO



Cuadro 7.
DISTRIBUCION DE GERMOPLASMA DE ESPECIES FORRAJERAS A INSTITUCIONES NACIONALES Y AL PROGRAMA DE PASTOS TROPICALES DEL CIAT. 1986 (N. DE MUESTRAS)

PAISES	INVENTARIO Dic.31 1986
Argentina	35
Australia	84
Belgica	53
Burundi	6
Brasil	182
Colombia	25
Cuba	1
Ecuador	5
Escosia	9
Ethiopia	4
Filipinas	113
Italia	3
Indonesia	103
Inglaterra	14
Japon	1
Méjico	115
Perú	1.159
Puerto Rico	65
Rwanda	36
República de Sur Africa	2
Uruguay	15
U.S.A.	79
Venezuela	2
	2.111
Programa de Pastos Tropicales CIAT	1.971
Total	4.082

Bean Germplasm

(responsibility of R. Hidalgo)

1. Acquisition - Introduction

Emphasis on the acquisition of Phaseolus germplasm has been chiefly on land races and wild species. In fact, besides the intensive expeditionary work in Latin America (Section 7), several interesting materials from Europe, Asia, and Africa were received mainly from multicrop collecting expeditions funded by IBPGR, and also through donations from national banks.

Worth special mention are the germplasm donations of some countries like the Democratic Republic of Germany which sent a set of about 100 traditional landraces collected in the Republic of Georgia (Soviet Union). Bulgaria also sent more than 60 accessions mostly of native landraces. Italy donated about 250 accessions from its national bank at Bari. Finally, Turkey sent 117 accessions of their national collection at Izmir, which complements the Turkish germplasm that already exists in the CIAT collection which came via other banks. Special mention should also be made on the germplasm received from Rwanda (270 accessions) via Belgium, which served for third country quarantine, these are traditional germplasm materials collected in 1985-86. Also, it has to be pointed out that the number of different species collected in Mexico, Guatemala, and Argentina widens the spectrum of germplasm variability represented now in the bank for the genus.

Without considering the germplasm collected by the CIAT-IBPGR specialized collector (Section 7), the bank received through donations a total of 1498 materials distributed as follows: 1143 accessions of P. vulgaris, 174 of P. lunatus, 16 of P. coccineus, 4 of P. acutifolius, 161 of wild Phaseolus forms, and 181 accessions of other genera mainly of Vigna sp. (Table 4). CIAT's explorer collected 474 materials from Guatemala, Argentina and Mexico. All together with the expeditions adds up to 1972 accessions introduced to the bank during 1986 (Table 4).

Table 4. Phaseolus Introduction: Bean Germplasm introduced during 1986.

Region/Country	P.vulg.	P.lun.	P.coc.	P.acut.	P.wild	Others
Northamerica						
U.S.A.	3	-	-	-	-	-
Central America						
México (a)	30	-	15	-	57	-
Guatemala (a)	12	-	45	-	34	-
Nicaragua	8	-	-	1	-	-
Costa Rica	69	-	-	2	-	-
Caribbean						
Belize	-	-	-	-	3	-
Dominican Rep.	4	-	-	-	-	-
Puerto Rico	4	-	-	-	-	-
Andean South America						
Colombia	15	1	1	-	3	-
Ecuador	3	-	-	-	-	-
Peru (a)	174	46	7	-	8	2
Chile	-	1	1	-	-	-
Non-Andean South America						
Brazil	19	152	-	-	-	-
Argentina (a)	95	-	-	-	16	-
Europe						
England	41	-	-	-	-	-
Italy	224	-	13	-	-	15
Belgium	-	-	-	1	40	-
Netherlands	3	-	-	-	-	-
Bulgaria	63	-	-	-	-	-
Austria	28	-	1	-	-	1
Germany Dem.	97	-	-	-	-	-

Africa						
Ghana (b)	-	19	-	-	-	-
Zambia (b)	28	-	-	-	-	-
Madagascar (b)	15	-	-	-	-	-
Mauritius Isl.(b)	1	-	-	-	-	-
Rwanda	270	-	-	-	-	-
Asia-Oceania						
Bangladesh	-	-	-	-	-	163
Turkey	117	-	-	-	-	-
Philippines	-	1	-	-	-	-
Total	1323	220	83	4	161	181

a. Cosponsored CIAT-IBPGR

b. IBPGR Collecting expeditions.

2. Status of Phaseolus collection

The size of the collection has grown up to 37861 accessions introduced so far (Table 5), however the percentages reported in the last few years for the cultivated species have not changed significantly. The major change has been on the number of different wild species represented in the bank, which are now over 30. Special increase methodologies need to be devised in order to multiply these wild species and make them available to bean workers.

Table 5. Status of the bean collection held at the CIAT Genetic Resources Unit as of December 1986.

Species	No. of accessions Introduced	Increased
P. vulgaris	32942	19905
P. vulgaris wild ancestors	383	346
P. lunatus	2715	842
P. lunatus wild ancestors	63	40
P. coccineus subsp. *coccineus*	838	387
P. coccinues subsp. *polyanthus*	416	238
P. coccineus wild ancestors	68	19
P. acutifolius	138	116
P. acutifolius wild ancestors	50	50
Wild non-cultivated		
P. angustissimus, *P. anisotrichus*, *P. esperanzae*, *P. filiformis*, *P. glaucocarpus*, *P. galactoides* *P. glabellus*, *P. gravanus*, *P. jaliscanus*, *P. macrocarpus*, *P. metcalfei*, *P. pedicellatus*, *P. polystachius*, *P. pluriflorus*, *P. pachirrhizoides*, *P. parvulus* *P. ritensis*, *P. tuerckheimii*, *P. wrightii*, *P. anahuacensis*, *P. floribundus*, *P. neglectus*, *P. glaucocarpus*, *P. escabrellus* *P. xanthotrichus*	248	41
TOTAL	37861	21984

3. **Increase-Multiplication**

Of the last batch of 6000 new accessions approved by ICA for increase in CIAT greenhouse and isolated field, about 1100 materials were increased which covered 23 countries; among them, the highest percentage correspond to USA, Peru, and Rwanda (Table 6). Likewise, 1278 materials were rejuvenated.

With the above increase, the available germplasm for distribution is as follows: 19905 accessions of P. vulgaris and wild ancestral species; 842 accessions of P. lunatus; 644 accessions of P. coccineus and 168 accessions of P. acutifolius.

Table 6. Country distribution of new Phaseolus germplasm increased and/or regenerated in CIAT's greenhouse during 1986.

Region/Country	No. of accessions
North America	
U.S.A.	891
Central America	
Mexico	87
Guatemala	67
El Salvador	7
Honduras	2
Costa Rica	2
Nicaragua	11
Panama	4
Caribbean	
Cuba	11
Dominican Republic	7
Puerto Rico	19
Andean South America	
Venezuela	5
Peru	688
Chile	78

Non-Andean South America	
Brazil	34
Argentina	19
Europe	
Belgium	25
England	92
Netherlands	12
France	2
Bulgaria	17
Austria	28
Africa	
Rwanda	270
Total	2378

4. **Characterization**

The characterization of germplasm, using the descriptors proposed by CIAT, has been sustained. This year the medium seeded types of growth habits I, II, III were characterized aiming at the detection of similar groups of germplasm. Meanwhile, the first analysis of 752 accessions large seeded types of uniform color and growth habit I, showed that such number of materials can be reduced to 290 groups (Table 7). The components of each group are very similar regarding 14 field descriptors and 4 seed descriptors. It was also observed that if seed descriptors are precisely defined, the grouping based on these seed descriptors correlates very well with the grouping from field descriptors. The next step is to compare the components of each group using seed protein electrophoretic banding; with this information we can expect to have a better comprehensive view of the real variability of world Phaseolus vulgaris collection, and also to establish solid grounds for tracing back the path of germplasm exchange among the national collections.

Table 7. Grouping of similar P. vulgaris germplasm of growth habit I and large seeded type.

Seedcoat Color	No. of accessions	No. of similar groups
White	209	41
Cream-beige	67	51
Yellow	167	56
Brown	27	12
Pink	60	20
Red	82	40
Purple	109	46
Black	31	24
TOTAL	752	290

5. Storage

As part of the agreement with EMBRAPA for sending a duplicate of the base collection for preservation in long term storage, 2000 accessions were sent to CENARGEN this year. Each sample consisted of 400 grs of fresh and high quality seed which was previously dried down to 6-8% moisture content before packaging in laminated foil bags heat sealed.

Ten percent of this batch was tested for germination as well as for seed moisture content before packing; the results showed an average 6.8% seed moisture content and 94% germination for 220 accessions. Besides the 2000 accessions for storage, four additional replicates of the 220 tested accessions were also sent in order to monitor germination and seed moisture content at least every five years. Shipments of about 4000 accessions per year will be sent until an entire duplicate of the collection is stored in CENARGEN's bank.

6. Seed distribution Service

During 1986 a total of 6709 accessions of Phaseolus beans were distributed to 23 countries in 67 shipments. Most of this germplasm corresponded to P. vulgaris (80%), followed by P. coccineus (7%), P. acutifolius (3.5%), P. lunatus (1%) and the rest to other species (Table 8). In addition, the Bean Program requested 14,546 accessions of which 91% were domesticated forms of P. vulgaris, 5% of wild ancestral forms of P. vulgaris, 3% of P. coccineus and almost 1% of P. acutifolius (Table 9).

Table 8. Bean seed distribution outside CIAT (1986).

Region	No. of countries	No. of requests	No. of accessions
North America	2	12	408
Central America	2	7	1127
Caribbean	1	1	6
Andean South America	4	18	1139
Non-Andean South America	2	10	1479
Europe	8	10	425
Africa	5	7	1702
Asia-Oceania	2	2	423
Total	23	67	6709

Table 9. Bean seed distribution within CIAT (1986)

Program	No. of requests	No. of accessions
Breeding I	11	57
Breeding II	14	206
Breeding III	24	1757
Agronomy	1	1
Entomology	31	4917
Physiology	18	2742
Pathology	10	447
Virology	16	1530
Nutrition	3	157
Biotechnology	8	355
Others	3	5
Total	139	12174

7. Exploration and Collecting

The Genetic Resources Unit continued with its program of germplasm collection and study of genetic diversity in the three American centers of diversity of Phaseolus. This work is the responsibility of D. Debouck. In order to provide a service to breeders and agronomists on a worldwide basis germplasm collection concentrated on:

a) the old native varieties of the five species domesticated by the American Indian cultures,
b) the wild ancestors of the five cultivated species,
c) true wild species.

Four collection trips were carried out during this year, of

which the results and outstanding conclusions are presented. This activity is a collaborative CIAT-IBPGR program.

Guatemala

A collection trip was made in the western part of Guatemala to collect germplasm of cultivated P. coccineus and P. polyanthus. The following materials were collected:

Cultivated species:	
P. coccineus	34
P. polyanthus	11
P. vulgaris	9
Wild species:	
P. anisotrichus	8
P. coccineus	13
P. lunatus	2
P. macrolepis	1
P. polyanthus	1
P. vulgaris	4
P. xanthotrichus	5

Of the 88 materials, P. macrolepis and P. xanthotrichus were collected for the first time. P. polyanthus was found as a wild ancestor, indicating that the cultigen is the fifth true cultivated species. P. tuerckheimii was also found during this trip and germplasm collected later on.

Argentina

A collection trip was carried out in the northwestern part of Argentina to improve the representation of that region in CIAT's common bean collection. The following materials were collected:

Cultivated species:	
P. vulgaris	95
Wild species:	
P. vulgaris	10
P. augusti	4

It is the first time that germplasm is available of the latter species.

Peru

A morpho-agronomic evaluation was performed on the 573 landraces of P. vulgaris collected in 1985, to establish were variability was concentrated. A complementary collection trip was carried out in northern Peru, which also emphasized native varieties of lima bean. The following materials were collected:

Cultivated species:	
P. vulgaris (including 6 weedy types)	143
P. lunatus (including 6 weedy types)	46
P. polyanthus	
Wild species:	
P. vulgaris	2
P. lunatus	4
P. pachyrrhizoides	2

This second exploration confirms Cajamarca and Amazonas as a transition area between the North Andean Center and the South Andean Center, as shown especially by the distribution of ñuñas, P. polyanthus and P. pachyrrhizoides. The presence of wild forms of P. vulgaris and P. lunatus in intermontane valleys close to the Peruvian Coast, as well as the presence of weedy types, shed new

light on the domestication of beans in Peru, and on the use of this germplasm in breeding.

Mexico

Germplasm of P. pedicellatus group was almost absent in germplasm banks, preventing study and use of this group in breeding. An exploration was carried out in Northeastern Mexico to improve this situation. The following materials were collected:

Wild species:

P. anahuacensis	2
P. anisotrichus	10
P. coccineus	15
P. floribundus	2
P. glabellus	5
P. glaucocarpus	3
P. neglectus	6
P. pedicellatus	11
P. polymorphus	3
P. pluriflorus	1
P. scabrellus	1
P. vulgaris	1
P.xanthotrichus v. zimapanensis	11
P. sp. (gr. pedicellatus)	1
P. sp. (gr. metcalfei)	1

In these 73 samples are present typical specimens of P. floribundus, P. polymorphus and P. xanthotrichus v. zimapanensis. The presence of wild P. vulgaris in the Sierra Madre Oriental, not reported before, opens new prospects for further exploration, use in breeding, and a better understanding of the evolution of this crop. Germplasm is now avaialble for the very poorly known species of the P. neglectus group.

Conclusion

a) A total of 474 samples were collected this year, resulting in the availability of germplasm for 27 different taxa. For 12 taxa, germplasm was collected for the first time. As a consequence of these explorations, germplasm (sometimes just a very few samples) is now available for 31 out of 56 species belonging to Phaseolus.

b) Genetic erosion is severe in several places of western and central Guatemala, central and northern Mexico, northern Peru, and northwestern Argentina mainly because of overgrazing and/or urban growth. A list of sites can be drawn up for in situ conservation for the type of most representative specimens.

c) The present list of species is still a provisional one: new materials were found in Mexico and in Guatemala. On the other hand our knowledge about the distribution of each species has improved considerably because of samples found this year: for instance the distribution of wild P. vulgaris in Mexico and Peru. The latter could give us a better idea on how they contribute to the different gene pools.

Future Plans

A tentative schedule for specific and complementary germplasm exploration in 1987 is:

— Costa Rica: mainly for bean germplasm grown on acid soils and in zones of high web blight pressure, and wild ancestors.

— Guatemala: Mayan varieties of lima beans, tropical tepary germplasm, and wild species.

— Peru: wild forms of P. vulgaris and P. lunatus and wild species.

-- Mexico: wild ancestral forms of the cultigens and wild species.

A revision of the status of Phaseolus germplasm for several African countries will be carried out to plan future field work.

Research work on P. lunatus collection

As part of the collaboration between the CIAT and the University of Gembloux (Belgium), work started in April 1986, on the P. lunatus collection held by CIAT. This work is the responsibility of Alain Maquet. The following activities have been planned:

-- seed multiplication of the entire collection taking care to avoid outcrossing.

-- morpho-agronomic evaluation with the view to implementing a yield and adaptation trial.

-- Production of a catalogue

During the first months, the most urgent problems have been identified: seed multiplication of accessions with very old seeds or seeds which have not been multiplied at CIAT, setting up of a trial to estimate the outcrossing rate of P. lunatus in different environments, and collecting together passport data.

For this last point, it is necessary to look for the information about the origin of 966 accessions which represent 38,6% of the total P. lunatus germplasm at CIAT. The large majority of those accessions came from the International Institute of Tropical Agriculture (IITA) in Nigeria and we are requesting more information from IITA, to allow completion of a catalog. A catalog will facilitate the selection of accessions for regional trials and help with the recognition of duplicates.

Seed Increase

The seed increase of the accessions is mainly done in a meshhouse at CIAT. This only permits a maximum multiplication of 400 accessions per year. At present a total of 448 accessions are in multiplication, of which 306 are at CIAT and 142 at Popayán.

During the seed increase, a preliminary morphological evaluation is being made, collecting data on hairyness of the outer face of standard; degree of the wing opening; and the color pattern of flowers, pods and seeds. The aim of such observations to produce a preliminary description of the variability of the germplasm and to identify the presence of genetic markers.

A range of variability has been observed for seed coat color, pod curvature and days to flowering. Most of the accessions in multiplication are of indeterminate growth habit.

It was decided to aim for a base stock of a least 200 seeds for each accession. Only 38 accessions from the 400 multiplied, reached this quantity.

The 'Big Lima' cultigroup is not easy to manage: several accessions, mainly from Peru, produced pods with seeds germinating before maturity. This problem will be surveyed in future to discover the factores involved.

Estimation of Outcrossing

A field trial was established at three locations ((Palmira, Dagua, and Popayán) to estimate the outcrossing rate of P. lunatus. In order to obtain sufficient information, two different dominant characters were used with 3 different varieties and different planting distances. This was done with the cultigroups 'Big Lima' and 'Sieva' which are the more important parts of the P. lunatus germplasm collection. The aim was to find a methodology of seed increase taking into account the level of outcrossing observed at each location.

The resulting seed has been sown at Palmira and the first observation will be made on the hypocotyl color ('Sieva') and on the indeterminate growth habit ('Big Lima'). This will be repeated each season with modifications depending on the results.

This preliminary work on P. lunatus is related to the three main objectives:

— To improve the existing documentation with the aim of gathering

in one document the passport and characterization data on ~~each~~ accession,

— To speed up the seed increase process, particularly for those accessions which have never been multiplied before at CIAT.

— To determine the outcrossing rate for P. lunatus in environments used for multiplication and/or evaluation. A survey will also be made of pollinating insects.

All these activities are necessary before any agronomic trials can be estbalished. Nevertheless, the accessions multiplied this season, which have sufficient passport data could be included in a preliminary agronomic evaluation in different sites. This could include 100 to 150 accessions and can be repeated at CIAT and Dagua.

This new effort by CIAT on P. lunatus will fill a need for beans for hotter environments. However, the perennial characteristics of P. lunatus, with its year-round production and its preodminant use as green pods and green beans, provide a useful alternative to the seasonal production of common bean.

Phaseolus coccineus (including *P. polyanthus*)

These two taxa have a value in their own right as crops - particularly for higher, colder regions - and also provide useful characters, particularly of disease resistances for introducing to *P. vulgaris*. They are both outcrossing, making varietal maintenance labor intensive. This work is the responsibility of Veronique Schmit an FAO Associate Expert with the GRU. Further details appear in the Bean Program Annual Report.

1. Multiplication and characterization

- At Río Negro, 157 accessions with CIAT number were planted to get enough seed from open pollination for distribution. At the same time, a characterization is made using the following descriptors:

Anthocyanin pigmentation on main stem
Growth habit
Bracteole size
Bracteole length
Anthocyanin pigmentation of bracteole
Anthocyanin pigmentation of calyx
Flower color
Stigma shape
Leaf hairiness (density)
Leaf Anthocyanin

A preliminary evaluation is also made for disease resistance:

Ascochyta leaf spot
Anthracnose
Angular leaf spot
Rust
Powdery mildew

- At Popayán, another big meshhouse was built this year: 90 accessions can now be multiplied twice a year.

In addition to accessions with CIAT number, 99 *P. coccineus*

accessions without CIAT number were increased:

78 P. coccineus

9 P. polyanthus

15 P. coccineus wild ancestors

CIAT numbers will be soon attributed to these accessions.

They were also characterized with the following descriptors:

Type of germination

Hypocotyl or epicotyl color

Leaflet length and width

Distance from cotyledon scar to primary leaves

Clear marking along veins of fully developed primary leaves

Growth habit

Size of bracteole

Shape of bracteole

Shape of stigma

Flower color

Anthocyanin pigmentation on main stem

2. **Evaluation for disease resistance**

Ascochyta leaf spot:

33 polyanthus and 15 coccinues have been evaluated at Rio Negro 1985B

30 polyanthus and 30 coccineus are going to be evaluated at Rio Negro 1986B

Bean fly:

92 accessions have been sent to Rwanda and 184 to Taiwan for evaluation.

Bean common mosaic virus:

305 accessions have been evaluated at Palmira during 1986, using a laboratory test.

Plans for the Future

Tropical Pasture Germplasm

Increasing emphasis will be given within the GRU to the special problems of germplasm management of tropical pasture species. The diversity of tropical pasture species creates problems of storage, documentation, multiplication and characterization.

New seed stores and tissue culture facility

The new stores will provide technically better storage conditions than the present stores. This will increase the time interval between rejuvenation - and to this extent reduce the work load in the field. However, there is now a need to prepare the working collections for long-term storage. This involves rejuvenation to provide the highest quality seed for drying and packing. This will take several years (and for Phaseolus, will be done in conjuction with the preparation of a duplicate collection for CENARGEN, Brazil).

The tissue-culture facility will be used initially for routine maintenance of cassava in vitro. This will be taken over from the BRU, which will continue with detailed research aspects of cassava tissue culture germplasm. There are also prospects of in vitro maintenance of pasture species - particularly grasses.

Duplicate base collections

In addition to the firm commitment to duplicate Phaseolus at CENARGEN, there are other possibilities to be explored. CATIE, Costa Rica has agreed to provide additional duplicate storage for Phaseolus. ILCA (Ethiopia), ICARDA (Syria) and CSIRO (Asutralia) all have an interest in storing duplicates of the CIAT pasture collection. In return, CIAT could offer reciprocal storage for germplasm collections of other institutes.

Seed Health Laboratory

A modest upgrading of the Seed Health Laboratory would allow the laboratory to keep pace with the increasing work load. The facilities could be used for research if necessary.

Seed Physiology

There is an increasing need for more research and the application of research results to seed physiology - including germination testing, breaking dormancy, and seed storage characteristics. This is most needed for pasture species, but also would be useful for Phaseolus species (particularly wild relatives) and Manihot species. Cryopreservation in liquid N_2 needs investigating. Equipment would be shared with the BRU, which could study cryopreservation of in vitro cultures.