

A. G. G. G.

U N C L A S S I F I E D

AGENCY FOR INTERNATIONAL DEVELOPMENT

Washington, D. C. 20523

PROJECT PAPER

INDIA: Plant Genetic Resources
(386-0513)

August 30, 1988

U N C L A S S I F I E D

UNCLASSIFIED

PROJECT PAPER

INDIA

PLANT GENETIC RESOURCES
(PGR) PROJECT

(386-0513)

AUGUST 1988

USAID/INDIA

UNCLASSIFIED

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UNITED STATES AGENCY for INTERNATIONAL DEVELOPMENT

NEW DELHI, INDIA

August 29, 1988

ACTION MEMORANDUM FOR THE MISSION DIRECTOR

FROM: Graham Thompson, PRJ

SUBJECT: Plant Genetic Resources Project (386-0513) - Project Authorization

ACTION: Your signature of the Project Authorization for the \$13.0 million grant from Section 103 of the Foreign Assistance Act for the Plant Genetic Resources Project (386-0513). It is planned that a total of \$2.6 million of the grant will be obligated in FY 1988.

DISCUSSION: The Government of India's National Bureau of Plant Genetic Resources (NBPGR) is charged with developing and coordinating a national plant genetic resources system. The system, while maturing under NBPGR's leadership, needs further improvement. Germplasm collections remain fragmented and dispersed in various institutions throughout the country. They are often maintained under inadequate conditions mainly due to the lack of proper storage facilities. The NBPGR itself, while rapidly gaining in expertise and stature, has begun to make significant strides in improving its own operations and has just begun to start work leading towards a coordinated national germplasm system.

AID assistance will enable the GOI to substantially improve its capacity to preserve India's rich and diverse plant genetic resources particularly for use in sustaining advances in agriculture. The purpose of the project is: (1) to assist India's efforts to fully develop the physical, administrative and technical resources of the NBPGR so that it and the institutions to which it provides technical support can manage a national system which sustains all aspects of exploration, collection, preservation, evaluation, documentation, quarantine and exchange (nationally and internationally, public and private) of plant germplasm; and (2) to enhance India's regional and global capability in plant genetic resource conservation and use.

AID's contribution to the subject project will finance implementation and management support, construction of a Gene Bank building & facilities, technical assistance, equipment, training, collaborative research, joint explorations and project monitoring and evaluation. The project will concentrate on building within India a greatly strengthened system for collecting, evaluating, preserving and using indigenous and exotic plant

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genetic resources, particularly those of agricultural importance. It will enable the NBPGR to provide for well maintained germplasm that is more accessible to scientists in India, the United States and on a world-wide basis for crop improvement research.

This project was reviewed on February 15, 1988 and again on March 14, 1988 by the Mission Review Committee. Issues raised during these reviews were subsequently discussed in detail with senior officials of ICAR/NBPGR. The jointly agreed to resolution of these issues was incorporated in the final version of the PP which was reviewed and approved by the MRC on August 3, 1988. Thus all the outstanding issues have been either resolved or adequate provisions have been made for their resolution in the PP.

FAA Section 612(b): When the Development Assistance program in India was re-established in 1978, it was determined that Local Costs could be financed from Foreign Exchange contributions to projects rather than from U.S. owned excess rupees. PPC reaffirmed this policy by Memorandum on May 7, 1980, with the understanding that all interested agencies would have an opportunity to express their views on the matter at the CDSS and ABS reviews. The ABS submission included this project for FY 1988 funding. This was reviewed and approved by AID/W without objection. Likewise there was no objection to this general policy raised in the July 1986 reviews of the India 1989-1994 CDSS. Therefore, the use of Foreign Exchange to finance Local Costs expenditures of this project can be approved. In accordance with past practice, your signature on the attached Project Authorization will provide the certification that is required to use Foreign Exchange under the project as required under Section 612(b) of the FAA.

CONDITIONS PRECEDENT: In addition to the standard Conditions Precedent to the initial disbursement of funds, the Project Agreement requires that prior to disbursement of funds in excess of the \$750,000, the GOI will furnish to A.I.D.:

- a) A Management Plan, satisfactory to A.I.D., indicating the Administrative Approval or such other GOI approval(s) regarding the establishment and staffing of the Administrative Support Office (ASO) or Project Implementation Unit (PIU), including the appointment of the personnel who will head this office. Upon receipt of this information A.I.D. will review, in conjunction with the ASO/PIU, the contracting payment verification and audit procedures and practices of the NBPGR to comply with its mandate in this regard; and
- b) A letter from the Additional Representative of the implementing agency concurring in the jointly developed final Scope of Work for a Management Services contract that will be directly contracted by A.I.D. under the Project.

COVENANTS: The Project Agreement also contains the following Covenants:

- a) That within 180 days of the date of signing this Agreement, the Grantee will furnish a Management Plan, satisfactory to A.I.D., for upgrading the computerized Germplasm Data Base-Management Systems Unit. The plan shall show that this unit will become fully functional by the completion of the project;
- b) That within 180 days of the date of the Agreement, the NBPGR will provide A.I.D. with a copy of their U.S.-based Training Plan for the life-of-the-project;
- c) The NBPGR will confirm to A.I.D. that it will work closely with the established Crop Advisory Committees concerning the upgrading of germplasm collection;
- d) That the Indian Council for Agricultural Research will assure A.I.D. that they will continue to support and finance the existing germplasm collection activities after the Project is completed; and
- e) That the parties agree to establish an Evaluation Program as part of the Project.

CONGRESSIONAL NOTIFICATION: A Congressional Notification (CN) was forwarded to the Congress on July 11, 1988. The CN expired, without objection, on July 25, 1988.

RECOMMENDATION: That you sign the attached Project Authorization and the Project Data Sheet, thereby authorizing a \$13.0 million grant from Section 103 Funds of the FAA for the Plant Genetic Resources Project and a FY88 obligation of \$2.6 million for this project.

Approved: _____

Disapproved: _____

Robert M. Bakley
Director
USAID/NEW Delhi

ATTACHMENTS

1. Project Authorization
2. Project Data Sheet and Project Paper

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- (J) Bibliography

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ACRONYMS

INDIAN INSTITUTIONS

- CAC - Crop Advisory Committees
- CFWD - Central Public Works Department
- GOI - Government of India
- ICAR - Indian Council of Agricultural Research
- IARI - Indian Agricultural Research Institute
- NBPGR - National Bureau of Plant Genetic Resources

U.S. INSTITUTIONS

- AID - Agency for International Development, Washington, D.C.
- APHIS - Animal and Plant Health Inspection Service
- ARS - Agricultural Research Service
- FAR - Federal Acquisition Regulations
- GRIN - Genetic Resource Information Network
- NPGRS - National Plant Genetic Resource System
- NSSL - National Seed Storage Laboratory
- USAID - United States Agency for International Development, India
- USDA - United States Department of Agriculture

INTERNATIONAL AGENCIES

- *CGIAR - Consultative Group on International Agricultural Research
- TAC - Technical Advisory Committee of CGIAR
- IARC - International Agricultural Research Centers
- IBPGR - International Board for Plant Genetic Resources
- WINROCK - Winrock International Development Institute

GENERAL

- PACD - Project Assistance Completion Date
- PSC - Personal Services Contract
- NMIC - Not Manufactured in India Certificate

*CGIAR centers include: IRRI, CIMMYT, CIAT, CIP, ICRISAT, ICARDA, ILRAD, ILCA, ISNAR, IFPRI, IBPGR, WARDA

AGENCY FOR INTERNATIONAL DEVELOPMENT
PROJECT DATA SHEET

1. TRANSACTION CODE
 A = Add
 C = Change
 P = Print
 Amendment Number: N/A
 DOCUMENT CODE: 3

COUNTRY/ENTITY: INDIA
 3. PROJECT NUMBER: 386-0513
 4. BUREAU/OFFICE: ASIA/NEAR EAST [03] 5. PROJECT TITLE (maximum 40 characters): PLANT GENETIC RESOURCES
 6. PROJECT ASSISTANCE COMPLETION DATE (PACD): MM DD YY 019 310 95
 7. ESTIMATED DATE OF OBLIGATION (Under "B" below, enter 1, 2, 3, or 4):
 A. Initial FY: 88 B. Quarter: 3 C. Final FY: 93

8. COSTS (\$000 OR EQUIVALENT \$) = Rs 13.0

A. FUNDING SOURCE	FIRST FY			LIFE OF PROJECT		
	B. FY	C. L/C	D. Total	E. FY	F. L/C	G. Total
AD Appropriated Total	2.6	-	2.6	9.8	3.2	13.0
(Grant)	2.6	-	2.6	9.8	3.2	13.0
(Loan)	-	-	-	-	-	-
Other:						
U.S.						
Host Country		0.9	0.9		8.6	8.6
Other Donors)						
TOTALS	2.6	0.9	3.5	9.8	11.8	21.6

9. SCHEDULE OF AID FUNDING (\$000)

A. APPRO- PRIATION	B. PRIMARY PURPOSE CODE	C. PRIMARY TECH. CODE		D. OBLIGATIONS TO DATE		E. AMOUNT APPROVED THIS ACTION		F. LIFE OF PROJECT	
		1. Grant	2. Loan	1. Grant	2. Loan	1. Grant	2. Loan	1. Grant	2. Loan
1) F+N	111	000		000		2.6		13.0	
2)									
3)									
4)									
TOTALS						2.6		13.0	

10. SECONDARY TECHNICAL CODES (maximum 6 codes of 3 positions each): 968 958 978
 11. SECONDARY PURPOSE CODE

12. SPECIAL CONCERNS CODES (maximum 7 codes of 4 positions each):
 A. Code: R/AG TECH
 B. Amount:

13. PROJECT PURPOSE (maximum 480 characters):
 1. To accelerate the development of an efficient national plant germplasm system which fosters the collection, preservation, evaluation, and exchange of India's plant genetic resources.
 2. To enhance India's regional and global role in plant genetic resource conservation and use.

14. SCHEDULED EVALUATIONS: Interim: MM YY 11 8 8 | MM YY 10 9 1 | Final: MM YY 019 9 5
 15. SOURCE/ORIGIN OF GOODS AND SERVICES: 000 941 Local Other/Specify

16. AMENDMENTS/NATURE OF CHANGE PROPOSED (This is page 1 of 8 page PP Amendment)

Clearance: G.A. Eider
 Controller USAID/India

17. APPROVED BY: Robert N. Bakley, Director
 Signature: [Signature]
 Title: Robert N. Bakley, Director
 Date Signed: MM DD YY 08 30 88

18. DATE DOCUMENT RECEIVED IN AID/W, OR FOR AID/W DOCUMENTS, DATE OF DISTRIBUTION:
 MM DD YY

PROJECT AUTHORIZATION

Country: INDIA

Project Title : Plant Genetic
Resources

Project Number: 386-0513

1. Pursuant to Section 103 of the Foreign Assistance Act of 1961, as amended, I hereby authorize the Plant Genetic Resources Project (the "Project") for India (the "Grantee") involving planned obligations of not to exceed Thirteen Million United States Dollars (\$13,000,000) in grant funds over a six year period from the date of authorization, subject to the availability of funds in accordance with the A.I.D. OYB/allotment process to help in financing foreign exchange and local currency costs of the project. The planned life of the project is seven years from the initial obligation.

2. The Project is designed to assist the "Grantee" by providing technical and financial support to the Indian National Bureau of Plant Genetic Resources (NBPGR) to strengthen the national system of plant germplasm collection, preservation, evaluation, documentation, quarantine and exchange in India. Strengthening the Indian germplasm system through this project will support the NBPGR's effort to collect and preserve germplasm of agricultural crops, medicinal plants and herbs. Availability of this germplasm is essential to agricultural research and to efforts to increase the agricultural productivity of India. The grant funds provided under this project will finance inputs of technical assistance, training, commodities and equipment, administrative and operating costs, construction costs and evaluation/monitoring costs. These inputs, in conjunction with the Grantee's resources, will result in a more capable and mature National Germplasm System for India.

3. The overall project will result in an expanded and coordinated system of national and regional germplasm repositories where active and base collections of plant germplasm are available to national and international scientists. Specific project outputs will include: (a) a new National Headquarters building and Gene Bank; (b) a strengthened germplasm preservation system, including storage facilities for active "working" collection; (c) a Training Center; (d) staff trained in important chemical and management aspects of Plant Genetics; (e) an increase in the number of accessions through accelerated programs of exploration and collections; (f) an integrated national data base and research system; and (g) an expanded national plant quarantine system for germplasm research purposes.

4. The Project Agreement which may be negotiated and executed by the officer to whom such authority is delegated in accordance with A.I.D. regulations and Delegations of Authority shall be subject to the following essential terms, covenants and major conditions, together with such other terms and conditions as A.I.D. may deem appropriate.

A. Source and Origin of Commodities, Nationality of Services: Commodities financed by A.I.D. under the project shall have their source and origin in India or the United States or in countries included in A.I.D. Geographic Code 941 except as A.I.D. may otherwise agree in writing. Except for ocean shipping, the suppliers of commodities or services shall have India or the United States or countries included in A.I.D. Geographic Code 941 as their place of nationality, except as A.I.D. may otherwise agree in writing. Ocean shipping financed by A.I.D. under the project shall, except as A.I.D. may otherwise agree in writing, be financed only on flag vessels of the United States or the Grantee.

B. Conditions Precedent: In addition to the standard Conditions Precedent to the initial disbursement of funds, the Project Agreement will require that prior to disbursement of funds in excess of the \$750,000, the GOI will furnish to A.I.D.:

- (1) A Management Plan, satisfactory to A.I.D., indicating the Administrative Approval or such other GOI approval(s) regarding the establishment and staffing of the Administrative Support Office (ASO) or Project Implementation Unit (PIU), including the appointment of the personnel who will head this office. Upon receipt of this information A.I.D. will review, in conjunction with the ASO/PIU, the contracting payment verification and audit procedures and practices of the NBPGR to comply with its mandate in this regard; and
- (2) A letter from the Additional Representative of the implementing agency concurring in the jointly developed final Scope of Work for a Management Services contract that will be directly contracted by A.I.D. under the Project.

C. COVENANTS: The Project Agreement will contain the following Covenants:

- (1) That within 180 days of the date of signing this Agreement, the Grantee will furnish a Management Plan, satisfactory to A.I.D., for upgrading the computerized Germplasm Data Base Management System Unit. The Plan shows that this unit will become fully functional by the completion of the project;
- (2) That within 180 days of the date of the Agreement, the NBPGR will provide A.I.D. with a copy of their U.S.-based Training Plan for the life-of-the-project;
- (3) The NBPGR will confirm to A.I.D. that it will work closely with the established Crop Advisory Committees concerning the upgrading of germplasm collection;

- (4) That the Indian Council for Agricultural Research (ICAR) will assure A.I.D. that they will continue to support and finance the existing germplasm collection activities after the Project is completed; and
- (5) That the parties agree to establish an evaluation program as part of the Project.


Robert N. Bakley
Director
USAID/India

Date August 30, 1988

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PLANT GENETIC RESOURCES PROJECT (386-0513)

AMPLIFIED PROJECT DESCRIPTION

I. GENERAL PROJECT DESCRIPTION

Elements of the General Project Description outlined below may be changed by written agreement of the authorized representatives of the parties named in the Project Agreement without formal amendment of the agreement, provided that such changes are within the general scope of the project as set forth in the text of the agreement.

- A. Project Goal and Purpose: The goal of The Plant Genetic Resources (PGR) Project is to achieve the preservation of India's rich and diverse plant genetic resources particularly for use in sustaining advances in agriculture. The purpose of the project is to: (1) assist India's efforts to fully develop the physical, administrative and technical resources of the National Bureau of Plant Genetic Resources (NBPGR) so that it and the institutions it supports can manage a national system which sustains all aspects of exploration, collection, preservation and exchange (nationally and internationally, public and private) of plant germplasm; and (2) enhance India's regional and global capability in plant genetic resource conservation and use.

NBPGR is charged with developing and coordinating a national plant genetic resources system. The system, while maturing under NBPGR's leadership, needs further improvement. Germplasm collections remain fragmented and dispersed in various institutions throughout the country. They are often maintained under inadequate conditions mainly due to the lack of proper storage facilities. The NBPGR itself, while rapidly gaining in expertise and stature, has only recently begun to make significant strides in improving its own operations and has yet to start a coordinated national germplasm system. Thus the project will concentrate on building within India a greatly strengthened system for collecting, evaluating, preserving and using indigenous and exotic plant genetic resources, particularly those of agricultural importance. It will enable the NBPGR to provide well maintained germplasm collections that can be used by scientists in India, the United States and on a world-wide basis for crop improvement research.

- B. Outputs and End-of-Project Status: Project outputs will be: (1) a significantly strengthened national plant genetic resources system including vastly upgraded facilities and greatly improved management, technical and training capabilities; (2) a NBPGR

headquarters facility and a national gene bank building (with a capacity of 600,000 accessions) constructed and completed in New Delhi; (3) greatly strengthened regional germplasm stations with necessary equipment and trained staff; (4) strengthened facilities and staff at key ICAR cooperating institutes and universities; (5) a fully equipped and staffed national plant genetic resources data base management system; (6) four fully equipped and staffed NBPGR quarantine stations; (7) a fully trained core staff of scientists and administrators to manage the NBPGR system; (8) a comprehensive five year plan for exploration and collection; and (9) well developed international joint exploration and research programs.

The end-of-project status will include the following accomplishments: (1) a comprehensive inventory will have been completed of nearly 121 working germplasm collection units located throughout India; (2) the quality of working collection units will have been upgraded; (3) collected samples from 60% of NBPGR stations and 100,000 samples from cooperating institutions will have been incorporated into the NBPGR gene bank; (4) NBPGR plant exploration and collection programs will be based on annually revised five year work plans; (5) a computerized germplasm data base management system will be in place and in use at NBPGR headquarters and at selected regional NBPGR centers as well as at key ICAR research centers and agricultural universities; (6) long-term (base collection) storage for up to 600,000 accessions will be in place at the NBPGR gene bank in New Delhi; (7) plant germplasm will be readily available for research purposes to scientists in the public and the private sector in India and world-wide; (8) four plant quarantine stations will be operable to facilitate exchange of germplasm; (9) NBPGR will be playing a leading role in the development and conducting the regional and global plant genetic resource conferences and workshops; and (10) linkages between the U.S. and Indian germplasm systems will have been strengthened, particularly in the area of collaborative research and germplasm exchanges.

II. RESPONSIBILITIES OF THE PARTICIPANTS

- A. A.I.D. Inputs: A.I.D. will contribute an estimated \$13,000,000 (see Section III, Illustrative Budget below): for project implementation and management support, construction, short-term technical assistance, equipment, training, collaborative research, joint explorations, and project monitoring and evaluation as illustrated below:

Up to \$1,300,000 of A.I.D.'s contribution will finance the costs of the establishment and operation of a Project Implementation Unit (PIU) and a direct A.I.D. Management Services Contract. The services of the Contractor will be used to provide project inputs such as: arranging equipment procurement, coordinating training,

arranging for the required specialized technical assistance, coordinating U.S. based collaborative research, and arranging for any necessary monitoring assistance. These inputs/services will be competitively procured by A.I.D. under direct contracts. Government of India (GOI) and A.I.D. procurement regulations for such services will be followed.

An estimated \$1,950,000 of A.I.D.'s contribution will finance part of the construction costs of the new NBPGR headquarters/gene bank facilities to be located in New Delhi and A.I.D. will also finance up to \$700,000 of the cost of erection and procurement of a Greenhouse/Screenhouse.

Approximately \$5,000,000 of A.I.D.'s contribution will finance equipment costs in the following general categories: laboratory; field; cold storage and refrigeration; computerized data management; vehicles; and shop maintenance. Procurement of imported equipment will be under direct A.I.D. contracts.

Up to \$700,000 of A.I.D.'s contribution will finance U.S. based training for NBPGR personnel in key areas of plant genetic resources management. These NBPGR personnel will in turn conduct training programs in India which will be financed by the NBPGR. A.I.D. will also fund approximately \$100,000 of in-country training costs. The main components of a plant genetic resources system are exploration, collection, evaluation, conservation, tissue culture, biotechnology, documentation, quarantine and exchange. Accordingly, in-country courses will be developed in these areas in order to present a comprehensive overview of a plant genetic resources system.

A.I.D. will also provide funding under direct A.I.D. contracts for the support of short-term consultancies including the services of a U.S. A&E firm, collaborative research and joint exploration. A.I.D. will provide approximately \$750,000 to pay for specialized short-term consultancies in areas such as tissue culture, cryopreservation, quarantine programs and gene bank design criteria, specifications, review bid documents and periodic construction monitoring including the services of a consulting U.S. A&E firm when required. NBPGR and other appropriate ICAR institutions will be linked with appropriate U.S. collaborating institutions to strengthen both parties' knowledge and skills. A.I.D. will provide up to \$450,000 for collaborative activities in biotechnology, cryopreservation, in vitro preservation, phylogenic relations, seed health research and collection and evaluation activities. Joint explorations are planned to collect germplasm in the U.S. and in India.

A total of \$250,000 of A.I.D.'s contribution will finance project evaluation and monitoring with approximately \$150,000 set aside for evaluation costs.

Finally an estimated \$1,800,000 of A.I.D. contribution will be held in reserve to cover inflation and contingencies costs.

- B. Government of India Project Inputs: The GOI will contribute incremental to project costs an estimated Rupee equivalent of \$8,660,000 of inputs (including funding for the costs of contingency and inflation). Additional GOI funding support to strengthen the NBPGR is discussed under notes of the Illustrative Project Budget, Attachment A. GOI inputs will finance: (1) the purchase of certain locally manufactured equipment; (2) in-country training; (3) in-country operating costs of joint exploration; (4) collaborative research; (5) land needed for the construction of the gene bank; (6) recurrent operating costs; and (7) the cost of construction of the proposed staff housing. (The GOI will finance an estimated \$5,400,000 including contingency and inflation in construction costs for the Gene Bank building.)
- C. General Implementation Schedule: It is anticipated that the provision of all project funded inputs will be completed within the seven year life-of-the-project.
- D. Managerial Support: It is anticipated that the timely provision of project-funded inputs will rest with the Management Services contractor selected to manage the project. In addition, A.I.D. will provide a direct-hire U.S. Foreign Service Officer, within its Directorate of Agriculture and Resource Management, as a Project Manager responsible for the overall management and implementation of the project. The project-funded construction element will be managed by the GOI's Central Public Works Department (CPWD) with A.I.D. providing reimbursement per the requirements of the PIL which will earmark the funding for these activities. The construction will be carried out under the direct supervision of the CPWD and by private sector construction contractors selected using competitive bidding procedures.

III. PROJECT FUNDING AND ILLUSTRATIVE BUDGET

The total project cost is estimated at \$21.66 millions. The Government of India plans to contribute the rupee equivalent of \$8,660,000. A.I.D. intends to contribute, subject to availability of funds to A.I.D. and mutual agreement of the parties, \$13,000,000. An illustrative Project Budget for the Life of Project is given as Attachment A. Attachment B provides an illustrative budget for the funding provided under this initial Agreement.

The budgets are illustrative only and changes may be made by representatives of the parties named in this Project Grant Agreement without formal amendment to the Agreement if such changes do not cause: (1) A.I.D.'s contribution to exceed the amount specified in the text of the Agreement; (2) the borrower/grantee's contribution to be less than the amount specified in the text of the Agreement; and (3) which are unacceptable to the parties named in the Agreement. Future A.I.D. obligations are subject to the availability of funds and mutual agreement of the parties to proceed.

IV. FINANCING METHODS

It is anticipated that A.I.D. will reimburse the GOI for eligible expenditures under this project. The detailed procedures to be followed will be set forth in Project Implementation Letters (PILs) at the time of earmarking funding for specific activities or as part of a "Basic PIL" to be issued subsequent to the signing of this Project Grant Agreement. In cases where A.I.D. directly contracts for specific goods or services, A.I.D. will initially earmark required project funding with an appropriate internal document and make payments for the eligible expenditures in such contracts, directly.

V. EVALUATION

The project will be subject to one Initial Review and two separate Project Evaluations. The Review will take place shortly after all the Agricultural Research Project financed start-up activities have been completed. The first Project Evaluation will cover all aspects of the project and will take place no later than the end of the fifth project year. A Project Evaluation Summary will be prepared following the completion of the first Project Evaluation. In addition, at the end of the project A.I.D. will conduct a standard End-of-Project Evaluation and prepare a Project Activity Completion Report (PACR). A.I.D. will directly contract for any technical assistance required to conduct these Project Reviews and Evaluations. The costs of such direct A.I.D. contract will be funded from the Evaluation and Monitoring line items of the project budget.

Annual reviews and site visits will provide information on the value of project inputs (i.e. technical assistance, training, construction, commodities, etc.) flowing into the project. Information generated from these annual reviews and monitoring visits will be used to provide background information for the Mid-Term and End-of-Project Evaluations and to make appropriate recommendations to the GOI concerning the management and implementation of the Project.

Subject to the availability of funding from other A.I.D. central or regional sources, there will also be an Impact Evaluation conducted 3-5 years after the Project Assistance Completion Date (PACD) which will focus on the long-term impact of the Project.

VI. SPECIAL CONSIDERATIONS

In addition to the standard Conditions Precedent to the initial disbursement of project funds, the Project Agreement contains the following Conditions Precedent (CPs) to the disbursement of any additional funds:

- A. A requirement that the GOI provide a management plan, satisfactory to A.I.D., indicating establishment and staffing of the Administrative Support Office or Project Implementation Unit for the implementation of the project, including the appointment of the personnel who will head this office; and
- B. A requirement that the Additional Representative of the implementing agency concurring, in writing, in the jointly developed final Scope of Work for Management Services contract that will be directly contracted by A.I.D. under the Project.

In addition, the Project Grant Agreement contains the following Special Covenants:

- A. That within 180 days of the date of signing this Agreement, the Grantee will furnish a management plan, satisfactory to A.I.D., for strengthening of the computerized data base management unit;
- B. That within 180 days of the date of this Agreement, the NBPGR will provide A.I.D. with a copy of their U.S.-based Training Plan for the life of the Project;
- C. The NBPGR will confirm to A.I.D. that it will work closely with the established Crop Advisory Committees concerning the upgrading of germplasm collection;
- D. That the Indian Council for Agricultural Research will assure A.I.D. that they will continue to support and finance the existing germplasm collection activities after the Project is completed; and
- E. That the parties agree to establish an evaluation program as part of the Project.

PLANT GENETIC RESOURCES PROJECT
ILLUSTRATIVE SUMMARY OF PROJECT COSTS FOR LIFE OF THE PROJECT
(IN THOUSANDS OF DOLLARS)

COMPONENTS	A.I.D.			GOI	Total
	FX costs	LC costs	sub total	Incremental 1/ contributions	
1. CONSTRUCTION					
A. Headquarters/Gene Bank	0	1,950	1,950	2,610	4,560
B. Greenhouse/Screenhouse procurement/erection	600	100	700	0	700
C. Staff housing	0	0	0	0 2/	0
D. Construction contingency and inflation allowances:					
i. contingency	0	0	0	685	685
ii. inflation	0	0	0	2,105	2,105
2. EQUIPMENT (laboratory, field, office and vehicles) 5/	4,500	500	5,000	500	5,500
3. TRAINING					
a) India	0	100	100	100	200
b) Overseas	700	0	700	0	700
4. TECHNICAL ASSISTANCE, COLLABORATIVE RESEARCH AND JOINT EXPLORATION	1,200	0	1,200	200	1,400
5. PROJECT OPERATIONS, IMPLEMENTATION AND ADMINISTRATIVE SUPPORT COSTS	1,200	100	1,300	1,400	2,700
6. EVALUATION/MONITORING	250	0	250	50	300
7. LAND	0	0	0	0 3/	0
8. SUBTOTAL	8,450	2,750	11,200	7,650	18,850
9. CONTINGENCY (not including items 1 and 7) (5%)	423	137	560	110	670
10. ALLOWANCES FOR INFLATION 4/ (not including Items 1 and 7)	930	310	1,240	900	2,140
11. TOTAL	9,803	3,197	13,000	8,660	21,660

NOTES:

1/ Aside from "incremental" costs directly attributable to this project to be borne by the GOI, the GOI will be paying for the salaries and operations of NBPGR, much of whose staff will be contributing to this project. These costs are estimated at \$7.5 million over LOP including allowance for inflation but not senior staff housing costs.

- 2/ The NBPGR is proposing to provide staff housing on a nearby area after approval from the local authorities. The GOI contribution for this item is estimated at \$2.25 million including contingency and inflation. Alternatively, the GOI will supplement for housing by way of house rent allowance to the staff throughout the project at an estimated cost of \$750,000.
- 3/ The GOI contribution of land for the headquarters/gene bank facility is a non-cash contribution with a conservative value of \$4 million. The GOI may make a further land contribution for a staff housing area.

GENERAL NOTES:

- 4/ Inflation rates are projected at 6% per annum in dollar terms except for headquarters construction which is projected at 10% per annum in dollar terms. A.I.D. expects that inflation in rupee terms will be 10% per annum for all categories except building construction, including materials in which local prices are estimated to increase at 14% compounded over the next several years.
- 5/ The costs of the project component "equipment" were determined by plant genetic experts and reviewed by NBPGR scientists. During these reviews certain allowances for inflation and contingencies were built into the costs. The line item 10 of this table includes 3% compounded allowance for price increases for the equipment component.

PLANT GENETIC RESOURCES PROJECT
ILLUSTRATIVE SUMMARY OF PROJECT COSTS FOR THIS INITIAL AGREEMENT
(IN THOUSANDS OF DOLLARS)

COMPONENTS	A.I.D.*			GOI	Total
	FX costs	LC costs	sub total	Incremental contributions	
1. CONSTRUCTION					
A. Headquarters/Gene Bank	0	200	200	200	400
B. Greenhouse/Screenhouse procurement/erection	80	20	100	0	100
C. Staff housing	0	0	0	0	0
D. Construction contingency and inflation allowances:					
i. contingency	0	0	0	50	50
ii. inflation	0	0	0	20	20
2. EQUIPMENT (laboratory, field, office and vehicles)	900	100	1,000	100	1,100
3. TRAINING					
a) India	0	40	40	60	100
b) Overseas	315	0	315	0	315
4. TECHNICAL ASSISTANCE, COLLABORATIVE RESEARCH AND JOINT EXPLORATION	390	0	390	130	520
5. PROJECT OPERATIONS, IMPLEMENTATION AND ADMINISTRATIVE SUPPORT COSTS	340	40	380	300	680
6. EVALUATION/MONITORING	0	0	0	0	0
7. LAND	0	0	0	0	0
8. SUBTOTAL	2,025	400	2,425	860	3,285
9. CONTINGENCY (not including items 1 and 7) (5%)	100	20	120	10	130
10. ALLOWANCES FOR INFLATION (not including Items 1 and 7)	40	15	55	30	85
11. TOTAL	2,165	435	2,600	900	3,500

* A.I.D. contribution is subject to the availability of funds for this project.

I. Project Rationale and Description

A. Rationale

1.01 India is extremely rich in plant genetic resources. It contains primary and secondary centers of origin of at least 20 important crop species including rice, citrus, banana, pepper, mango, cotton, and millet. Nearly 17,000 known species of higher plants are found in India, of which about 160 species are of considerable agri-horticultural value.

1.02 The importance of plant germplasm has long been recognized by plant breeders. Germplasm is the raw material used by scientists to assure stable and improved supplies of food, feed and forage. Recent advances in biotechnology have reinforced the critical importance of genetic resources as the manipulation of genes is expanding our ability to alter plant traits. Genetic resources are the raw material for these new techniques. Moreover, with destruction of natural habitat and hybrid seeds replacing naturally selected varieties of many crops, it is more important than ever to protect and preserve plant genetic resources.

1.03 Preserving India's plant genetic resources is especially important since India is the natural home of many useful food, feed and fiber crops. The GOI has recognized the importance of germplasm and in 1976 the Indian Council for Agricultural Research (ICAR) created the National Bureau of Plant Genetic Resources (NBPGR) to accelerate the activities that started in 1946. The NBPGR is responsible for collection, evaluation, and conservation of India's plant genetic resources.

1.04 Recently, the GOI has given renewed emphasis to plant genetic resources. The GOI's seventh "five year plan" states that the conservation of plant, animal, and fish germplasm is a high national priority. Further, the fourth (1985) and the fifth (1987) Indo-U.S. subcommission on Agriculture meetings identified the conservation and management of plant genetic resources as a priority for both countries. At the meeting both countries agreed that the U.S. government should support India's efforts in plant germplasm preservation. As a result of the Subcommission's recommendations and the GOI's increasing interest in plant germplasm preservation and use, ICAR sought collaboration with USAID to help plan and implement a program to improve its plant germplasm system. This was to be done through the existing GOI/USAID Agricultural Research Project (ARP) implemented by ICAR.

1.05 Thus in the fall of 1986 a team of U.S. scientists and administrators spent six weeks in India working closely with NBPGR colleagues. The team assessed the plant genetic resources system, visited some of the NBPGR regional stations and a number of ICAR institutes and university locations and prepared a report which recommended actions to strengthen the functioning in overall prospective.* The report concluded that

* "Plant Genetic Resources: Subproject Design" by Drs. Khan, Roos and Skaria; New Delhi, October 1986.

outside support to strengthen the Indian plant germplasm system was critical to conserve the vast array of plant germplasm. It recommended an activity which was very comprehensive. However, the proposal was too large and complex to be funded under the ARP. Thus USAID and ICAR agreed to a separate project. Consequently USAID financed a June-July 1987 follow up study elaborating the earlier proposal. The new study recommended a program by which USAID could best assist NBPGR in its efforts to build a comprehensive, workable national plant genetic resources system. This team's recommendations were reviewed by USAID and NBPGR and form the basis of this paper. In particular the team prepared drafts of the project analyses contained herein as Annex D.

1.06 The proposed activity is consistent with the Mission's ODSS which focuses on science and technology. The strategy statement points out that the development and utilization of improved varieties through the application of science and technology has dramatically increased yields in crops such as wheat and rice in India. These inter-related activities are research-intensive and are based on germplasm technologies which can be made more efficient if a national system exists for collecting, evaluating, preserving and disseminating newly identified sources of germplasm to crop improvement programs.

1.07 Our agricultural sector goal is to promote sustainable increases in the productivity of land, water and biotic resources for improved systems efficiencies over the long term through the application of new agricultural production and resource management technologies. Given funding and staff constraints USAID is targetting activities with high multiplier effects and is building on current institutional relationships. USAID has a close and increasingly productive working relationship with NBPGR's parent ICAR and has already been able to establish growing professional ties with NBPGR (see Spring 1988 Report of the Evaluation of the USAID New Delhi Agricultural Research Project). The multiple and far reaching positive effects access to and use of vigorous germplasm has in crop science programs and ultimately agricultural production suggest the ultimate value of a project such as this (see Annex D for detailed information).

1.08 Currently a rigorous scientific analysis to determine the economic impact of access to and use of rice genetic resources in India is confirming the long held opinion of researchers that germplasm (DNA, usually contained in the form of seeds when discussing plant germplasm, but also in the form of cuttings such as bamboo shoots) in the case of rice is truly invaluable in plant and yield improvement successes. In fact the work generally points not as much as to if germplasm resources are important but rather towards helping rank order priorities within this critical agricultural science sub-set given limits on scientific personnel and funds. This project which, inter-alia, will in many dimensions increase NBPGR's access to and knowledge of state-of-the-art advances in the field (which is in ferment in developed countries because of genetic engineering, tissue culture and other new technologies and techniques) can be of exceptional importance to India's rice crop research efforts.

1.09 Another facet of this project is it will promote and foster professional interchange within and between Indian and the international agricultural science community, particularly promoting American-Indian exchanges and collaboration. This will be increasingly emphasized as the project unfolds and the more traditional elements of the project come towards completion.

1.10 AID's worldwide goal of preserving the planet's bio-diversity mandated by Congress is directly in keeping with the outputs and purpose of this project. Protecting bio-diversity generally infers to the very laudable efforts to protect the wild environment, particularly in areas with unique and varied flora and fauna. This project will help preserve the very essence of flora, the genetic codes locked in seeds and tissues, and provide for its use to achieve agricultural production systems which lower stress on land and other resources.

1.11 Moreover, AID's involvement will be of major benefit to the U.S. and to other national and international agriculture institutions through enhanced free and safe exchange of plant germplasm for research. The pre-eminent role of the USA in germplasm preservation systems makes USAID an especially attractive partner to ICAR. Through the resources we provide, USAID will have an unparalleled opportunity to help with this crucial undertaking to support Indian agriculture research.

B. Project Description

1. Sector Goal

1.12 The Plant Genetic Resources Project directly addresses the following goal: to achieve the preservation of India's rich and diverse plant genetic resources particularly for use in sustaining advances in agriculture.

1.13 In support of this goal a comprehensive and well coordinated national plant germplasm system is needed in India. NBPGR is charged with developing and coordinating such a system. The system, while maturing under NBPGR's leadership, needs improvement. Germplasm collections remain fragmented and dispersed in various institutions throughout the country. They are often maintained under inadequate conditions mainly due to the lack of proper storage facilities. The NBPGR itself, while rapidly gaining in expertise and stature, has only recently begun to make significant strides in improving its own operations and has yet to start a coordinated national germplasm system.

1.14 Thus project will concentrate on building within India a greatly strengthened system for collecting, evaluating, preserving and using indigenous and exotic plant genetic resources, particularly those of agricultural importance. It will enable the NBPGR to provide well maintained germplasm collections that can be used by scientists for crop improvement research. Germplasm is the key resource for building sustainable agricultural systems and for increasing agricultural productivity.

2. Project Purpose

1.15 The primary project purpose is to assist India's efforts to fully develop the physical, administrative, and technical resources of the NBPGR so that it and the institutions it supports can manage professionally a national system which sustains all aspects of exploration, collection, preservation and exchange (nationally and internationally, public and private) of plant germplasm.

1.16 While the GOI has increased its financial and administrative support for a coordinated germplasm system, and the NBPGR is a well managed positive organization with a growing scientific cadre and a mission, much remains to be done. Today germplasm that enters India from the International Agricultural Research Centers (IARCs) or other crop evaluation and development centers often goes to researchers without adequate samples being selected and stored by a formal germplasm system. The national plant exploration and collection program of NBPGR needs further support to accelerate collection of native diversity including endangered germplasm. The base collection storage capacity is inadequate for much needed future expansion. Some active field collections have to be grown each year because of inadequate storage facilities. Researchers often are still not fully aware of germplasm accessions available in the many scattered collections around India even though information on germplasm and the access to it has improved in recent years.

1.17 Still NBPGR has taken several laudatory steps. For example, it has initiated the beginning of an information exchange program which links NBPGR and local institutions holding germplasm. Also the NBPGR is building a more active nationally coordinated program that shares information and accessions and builds field (active) collections around a solid base collection. NBPGR is expanding its international contacts as well. The NBPGR signed a Memorandum of Understanding with the IBPGR which specifically provides for the free exchange of germplasm and germplasm information among research scientists and institutions worldwide. The expected increased GOI financing to NBPGR during the eighth five year plan period will enable these programs to become more effective. The proposed USAID assistance will accelerate and broaden NBPGR capabilities even more and is designed to forge strong institutional linkages between US groups involved in germplasm and NBPGR.

1.18 USAID recognizes that the project's primary purpose is very ambitious. Unanticipated institutional, political and practical issues will probably be uncovered as this activity moves ahead. Despite these obstacles the meeting of the project purpose should be well under way within the life of this project. The project inputs will lead to measurable outputs pointing to a greatly strengthened Indian plant germplasm system. By the PACD, the NBPGR should reach institutional maturity and have adequate staffing and institutional capabilities in the Indian context. While the designers believe it is inappropriate and overambitious to expect this project to achieve the ultimate project

purpose within the PACD, the institution itself should have the full capacity to attain the stated project purpose within a reasonable time thereafter.

3. Accomplishments

1.19 By the end of this project:

(a) A comprehensive inventory will have been completed the more than one hundred working germplasm collections located throughout India. This includes NBPGR's working collections and the collections dispersed throughout India at various agricultural institutions. Because no comprehensive inventory now exists the NBPGR is constrained in making a full range of germplasm available to researchers.

(b) Considerable progress will have been made in upgrading the quality of germplasm in these collections. Many collections currently have comparatively low seed germination rates and are partly contaminated with pests, pathogens and weed seeds.

i) At least 100,000 accessions will have been upgraded at non-NBPGR working collection sites and samples of these accessions sent to the NBPGR base collection in New Delhi. The expertise and the organizational strength to upgrade accessions has been insufficient. The project will train and assist non-NBPGR organizations to upgrade their accessions. It is premature now to say more than this at this point. We will expect that planning for and achieving such upgradations will be an important NBPGR priority as this project implements.

ii) At least 60% of NBPGR's field station collections will have been regenerated/recollected with samples sent to the base collection. The increased staff training and greater level of resources provided through this project will make this possible.

iii) Plans and programs will be in place to complete the remaining regeneration/recollection work at both NBPGR and non-NBPGR sites.

(c) NBPGR plant exploration work will be properly functioning based on annually revised five year "rolling" plans. About 75,000 new accessions will have been added to the NBPGR base and working germplasm collections. NBPGR will have established collection priorities and programs for exploring and collecting diverse species deemed important to India's agricultural development as well as known endangered species. This important goal will be supported through the project's technical assistance.

(d) A standardized germplasm data base management system will have been established by NBPGR and will be used at NBPGR headquarters and at selected regional NBPGR centers. It will also be used by key ICAR research centers and agricultural universities. Plans will have been

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made and financing arranged to expand this system in an orderly manner to other appropriate stations after the PACD (three to six years). The operative system will include computer compatible software with system wide access and data base information generated from the comprehensive inventory [see para 1.19(a)].

(e) The capacity for long term (base collection) storage of up to 600,000 accessions will be in place at NBPGR headquarters. Also, state of the art technology for long term seed and tissue culture storage will have been adapted to Indian conditions and included in the base collection storage facility.

(f) The NBPGR will be capable of managing germplasm programs in India, including managing associated research, with only occasional outside assistance.

(g) Plant germplasm will be readily available to all research scientists in the public and the private sector in India and worldwide.

4. Corollary Project Purpose

1.20 A corollary project purpose is to enhance India's regional and global capability in plant genetic resource conservation and use.

1.21 The International Board for Plant Genetic Resources (IBPGR) which comes under the Food and Agriculture Organization of the United Nations has recognized India's germplasm storage and exchange capacity by selecting India, with the GOI's consent, as a primary germplasm repository country. In this regard India has agreed to be the primary repository for several important crop species and is actively collecting and preserving the relevant germplasm. With this charge NBPGR has broadened its role in the region. USAID fully supports this role.

1.22 NBPGR's regional training programs and workshops will benefit Indian professionals as well as non-Indians. The improvements in India's quarantine procedures on germplasm imports and exports will speed new germplasm to Indian researchers and mark Indian germplasm more useful elsewhere. These and other examples are reasons why this corollary project purpose has been an important consideration during the design and will remain an important part of NBPGR's efforts.

5. Corollary Accomplishments

1.23 By the end of the project NBPGR's regional and international role will be strengthened by the following accomplishments.

(a) An international program in collaboration with the International Board for Plant Genetic Resources (IBPGR), will train Indian, South and South East Asian, and other international participants in tropical and subtropical germplasm exploration and collection, evaluation and documentation, conservation, quarantine and exchange.

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(b) A plant germplasm quarantine program will be operable which facilitates free exchange of germplasm.

(c) NBPGR will be playing a leading role in the development of regional and global plant genetic resource conferences and workshops.

(d) Linkages between the U.S. and Indian germplasm systems will have been strengthened, particularly in the area of research collaborations and germplasm exchanges.

6. Project Outputs

1.24 Project outputs are the tangible evidence of USAID's and GOI's financed inputs of equipment, training, short-term technical assistance, land, administrative support costs, staff salaries, construction costs etc. and provide the NBPGR the capability to meet the accomplishments listed above by PACD. The outputs will be:

(a) A significantly strengthened national plant genetic resources system including vastly upgraded facilities overall and a greatly improved management, technical and training capacity;

(b) An operative, fully staffed and equipped NBPGR headquarters facility with offices and a national gene bank building (with a capacity of 600,000 accessions) in New Delhi;

(c) Greatly strengthened regional germplasm stations with necessary equipment and trained staff;

(d) Strengthened facilities and staff at key ICAR institutes and cooperating universities;

(e) Computer operators and scientists trained in data base management systems. Computer hardware and software installed to run systems operative at NBPGR headquarters and at selected NBPGR and non-NBPGR locations;

(f) Four operative NBPGR quarantine stations with the necessary facilities, equipment and staff to process on a timely basis imported and exported germplasm;

(g) A new international training center located at NBPGR headquarters in New Delhi for training national and international participants in various germplasm subject matter areas;

(h) A core staff of scientists and administrators in place at NBPGR with the necessary training and experience to manage the NBPGR system and to train national and international scientists in all important functions of a national plant genetic resources system;

(i) A five year exploration plan carried yearly according to national and international needs and priorities.

(j) A five year plan for upgrading germplasm collections revised annually according to priorities and designs provided by Crop Advisory Committees (CACs).

(k) A well developed collaborative research program operating at national, regional and international levels.

1.25 These outputs are ambitious and require timely delivery of inputs and the full attention of NBPGR management and staff. To help reach these output levels, USAID and NBPGR have agreed to have a formal annual management review of the project and if advisable, issue annual PILs reflecting prospective one year workplans.

7. Project Inputs

(a) USAID Project Inputs

1.26 USAID will provide funds for equipment, training, construction, short-term technical assistance, collaborative research, joint explorations, project monitoring and evaluation and project implementation and management support. The successful deployment and use of these inputs will require an integrated and well managed activity encouraging the transfer of technical, administrative and management expertise in all aspects of a germplasm systems including gene bank construction and management, equipment operation and maintenance, quarantine procedures and enforcement, data base management and germplasm exploration, preservation and exchange. One of the principal inputs to be provided to the project will be the knowledge of leading experts from the U.S. and elsewhere. The projected AID inputs are discussed below:

(i) Equipment:

1.27 A substantial portion of USAID financing is for equipment. The NBPGR, as pointed out by the two expert teams, is significantly constrained by lack of field and laboratory equipment needed to operate effectively. Provision is also made for financing maintenance equipment and tools for keeping the research equipment and storage facilities in working order. Equipment purchases will be made by the Management Services Contractor upon request by GOI.

1.28 The equipment needed was identified by the design team experts and the NBPGR's estimates of requirements to strengthen national plant genetic resources system program. The list includes sufficient spare parts for five years beyond the expected equipment life. USAID financing of equipment is estimated at \$5,700,000 including \$700,000 for greenhouses and screenhouses which includes the costs for assembly and erection. USAID financed equipment is divided into the following general categories:

(a) Laboratory equipment: Essential laboratory equipment such as moisture analyzers, germination equipment, dryers, microscopes, centrifuges which are needed to expand the capacity to receive, test, evaluate and store germplasm;

(b) Field equipment: Essential field equipment for evaluation and rejuvenation of accessions, including field machinery and small plot equipment - i.e., cultivators, harvesters, and small volume seed threshers;

(c) Special cold storage and refrigeration equipment: Storage units, compressors, and emergency power units for proper conservation of plant germplasm materials for medium and long-term storage. This equipment reduces the need for frequent rejuvenation and also reduces the chance of damage to valuable germplasm through loss of seed viability.

(d) Data management equipment: Equipment and computers will be provided for organizing, recording and sorting massive amounts of data and for communications of data between stations;

(e) Vehicles: A limited but essential number of non-U.S. right hand drive four wheel drive vehicles will be provided for field exploration, evaluation and conservation work. Also a right hand drive mini-bus will be provided to move scientists, staff and trainees between headquarters and field activities. These vehicles can be purchased under the current blanket waiver for right hand drive vehicles if purchased prior to March 8, 1989. This blanket waiver is generally extended from year to year. In total, AID agrees to finance up to \$125,000 of vehicles from offshore non-Indian sources subject to a determination that no suitable Indian vehicles exist and subject our authority to so purchase under our legislation. If suitable Indian vehicles exist these should be purchased directly by the GOI;

(f) Shop maintenance equipment: A reasonable amount of shop machines and tools will be provided to maintain the upgraded network of germplasm storage facilities, field laboratories, quarantine stations and the headquarter facilities.

(ii) Training:

1.29 USAID will finance up to \$700,000 of U.S. based training for selected NBPGR personnel primarily in key areas of plant genetic resources management. Many of the NBPGR personnel undergoing U.S. training will acquire skills in the U.S. as trainers and they will in turn run training programs in India financed by the NBPGR. A limited number of internationally recognized plant genetic resources experts will be contracted for specialized in-country training. USAID will provide \$100,000 for the in-country training costs. In-country training will be designed to increase the numbers of trained NBPGR and associated institution's staff, improving the capacity of the total system to carry out its work. A training plan to be prepared by NBPGR and USAID financed experts will be jointly reviewed and approved. This plan will: identify needs of the NBPGR training system; assess staff capability and resources; and outline proposed course curricula. It is expected to be completed within six months of grant execution (see covenant para 7.04). U.S. training will be coordinated by NBPGR with assistance from a U.S. based Management Services Contractor.

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1.30 The main components of a plant genetic resources system are exploration, collection, evaluation, conservation, documentation, quarantine and exchange. Accordingly, in-country courses will be developed in these areas in order to present a comprehensive overview of a plant genetic resources system to all NBPGR professionals and to develop planning capabilities in the NBPGR. The development and application of these courses will be addressed in the training plan. USAID expects overview and detailed courses to be attended by many non-NBPGR technicians and scientists. A good training plan, subsequent curricula development and well run training sessions are all critical to ultimate project success. The following outlines basic course subject matter:

(a) Exploration/Collection: Courses will outline components of comprehensive exploration/collection programs.

(b) Evaluation: Courses will discuss techniques of plant genetic resources evaluation.

(c) Quarantine: Courses will outline current and new techniques for testing seed and vegetatively propagated materials for pests and pathogens.

(d) Conservation: Courses will discuss packaging, viability testing, rejuvenation, data management, new technologies, (i.e., cryopreservation and tissue culture) and genebank management including systems maintenance.

(e) Data Base Management: Courses will be designed to familiarize scientists and officers with the newly installed data based management systems which document germplasm accessions.

(f) Exchange: The courses will provide information on the safe and rapid procedures for the exchange of plant germplasm.

(g) General Management: Courses will be offered covering general management considerations, such as operations and maintenance, equipment procurement, personnel etc.

(iii) Construction:

1.31 USAID will provide \$1,950,000 or 15% of its grant to finance part of the construction costs of the new NBPGR headquarter facilities to be located in Delhi. This is a fixed amount. The GOI will finance the balance of the construction costs, an estimated \$5,400,000 (Total \$7,350,000: see Table I) including all contingency and inflation cost increases. USAID's total contribution will go to gene bank construction costs. The quality and utility of the gene bank is critical to the effective functioning of the NBPGR.

(iv) Short-term consultancies:

1.32 USAID will provide approximately \$750,000 of its grant to pay for specialized short-term consultancies. Many of these consultancies will center on first understanding NBPGR's scientists' skills and experience in technical areas such as tissue culture techniques and cryopreservation of germplasm and then upgrading their knowledge and skills through training and demonstration. Other consultancies will cover problems or issues which are bound to arise in gene bank construction and operation, quarantine programs, plant collection activities, general management and the like.

(v) Collaborative Research:

1.33 Some of the work related to plant germplasm is best done by specialized research institutions and universities. Collaborative research is needed in biotechnology, cryopreservation, in vitro preservation, phylogenic relations, seed health research and collection and evaluation activities. Various institutions in India and in the U.S. have active research programs in these areas. NBPSR and other appropriate ICAR institutions will be linked with appropriate U.S. institutions in collaborations to strengthen both parties' knowledge and skills. USAID will provide up to \$450,000 for these collaborative activities. The NBPGR will enter into agreement with national and international institutions to establish these collaborative research programs and will carefully monitor and evaluate the results.

(vi) Joint Explorations:

1.34 Joint explorations to collect germplasm first in the U.S. and later in India are planned under this project. India is one of the primary or secondary centers of origin of about twenty very important crop species and several other economically important plant species. North America is rich in wild sunflower species, and indigenous material of tepary bean, jojoba, buffalo gourd, guyule, oilseed, halophytes, pecan, pome and stone fruits. Hydrocarbon plants and non-tuber bearing Solanum species, some for possible commercial adaptation in India, can be found wild in southern and western U.S. areas. Up to \$100,000 of USAID project funds from the collaborative research funding item (see para 1.33) will be made available to finance field explorations; the first of these will be in the U.S. Exploration will be undertaken by joint teams; the first exploration should be launched within 15 months of the execution of the project agreement.

(vii) Implementation and Administrative Support:

1.35 USAID will provide up to \$1,300,000 to finance a portion of the administrative cost of the Project Implementation Unit (P.I.U.) and a contract or contracts to manage the flow of USAID inputs to the project. USAID, upon request from GOI, will enter into a direct contract following USAID procedures and charge the cost to the project. A.E. and

NBPGR will develop jointly a scope of work for this contract. The administrative approval or such other approval(s) indicating establishment and staffing of the PIU, and joint approval of scope of work for a direct contract are the two project's preconditions to major disbursements and are to be satisfied within six months of the signing the grant agreement (see para 7.02).

1.36 The Management Services Contractor(s) will manage the flow of USAID financed inputs. The Management Services Contractor(s) will coordinate US based collaborative research, arrange equipment procurement, coordinate training, arrange the specialized technical assistance (see 1.28) and arrange outside monitoring/assistance. It is expected that this contractor will have one expatriate stationed in country for approximately four years. However, this will be further considered in the joint process to develop the scope of work. If in final negotiations the scope of the Management Services Contractor is reduced the resultant savings will be held in the contingency line item for reallocation within the project, particularly for technical assistance.

1.37 USAID believes that currently it has the staff resources to manage this project. Thus no separate project funded line item provides for PSCs to handle liaison/coordination within USAID. However, the possibility of using the AID grant funds for such a purpose was explored with ICAR and found reasonable. This additional staff will only be sought if monitoring or reviews determine it essential.

(ix) Evaluation and Monitoring:

1.38 USAID will provide \$250,000 for evaluation and monitoring of the activity of which \$150,000 will fund Evaluation Costs. The Grant will also note that USAID will directly contract with expatriate contractors for this work. (Please note that USAID will actively encourage participation in the evaluation(s) by ICAR and/or other Indian scientists and administrators). The \$100,000 of the evaluation and monitoring budget will fund expertise primarily to help conduct annual reviews (see para 8.03).

(x) Inflation and Contingencies

1.39 An estimated \$1,800,000 of the proposed \$13,000,000 grant will be held in reserve to cover inflation and contingencies. (See Tables I and III for further explanation).

(b) Government of India Project Inputs

1.40 The Government of India will contribute an incremental amount of \$8.66 million to fund project inputs listed in Table I. Their incremental inputs will include:

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(i) The major part of the construction costs including contingency and inflation for the NBPGR headquarters facilities (gene bank and office building) in New Delhi; \$5,400,000;

(ii) Locally purchased equipment to complement the USAID equipment contribution; \$500,000;

(iii) In-country training courses for NBPGR and other Indian scientists: \$100,000;

(iv) Support for joint exploration and collaborative research programs: \$200,000;

(v) Funds for implementation and administrative support; \$1,400,000;

(vi) Support for evaluation: \$50,000;

(vii) Contingencies and inflation; \$1,010,000.

In addition to incremental costs directly attributable to this project, the GOI will contribute land, NBPGR salaries including allowances for inflation and operational costs as well as provide funds for proposed staff housing (see Table I, notes).

II. Cost Estimate and Financial Plan

A. Costs and Plans

2.01 The project cost estimates and financial plans are summarized in Tables I, II and III below. The total project costs are noted in Table I, AID project costs by FY are noted in Table II and GOI incremental project costs by US FY are shown in Table III. Equipment lists and costs were carefully determined from a requirements analysis done by the design team members who had considerable experience in plant genetic resources programs. As a check, certain of these equipment costs have since been verified. Estimates of other USAID financed costs were arrived at after determining NBPGR needs and then using estimates based on roughly comparable program costs.

2.02 Table IV provides a visual view of how project inputs will be spent to achieve project outputs. Note that since contingency and inflation allowances other than for the Headquarters/Gene bank construction are unassigned, the total row at the bottom does not add up to \$21,660,000.

TABLE I
ESTIMATE OF PROJECT COSTS (IN \$US '000)

COMPONENTS	USAID			GOI	Total
	\$	LC	sub	Incremental 1/ contributions	
	costs	costs	total		
1. CONSTRUCTION					
A. Headquarters/Gene Bank	0	1,950	1,950	2,610	4,560
B. Greenhouse/Screenhouse procurement/erection	600	100	700	0	700
C. Staff housing	0	0	0	0 2/	0
D. Construction contingency and inflation allowances:					
i. contingency	0	0	0	685	685
ii. inflation	0	0	0	2,105	2,105
2. EQUIPMENT (laboratory, field, office and vehicles)	4,500	500	5,000	500	5,500
3. TRAINING					
a) India	0	100	100	100	200
b) Overseas	700	0	700	0	700
4. TECHNICAL ASSISTANCE, COLLABORATIVE RESEARCH AND JOINT EXPLORATION	1,200	0	1,200	200	1,400
5. PROJECT OPERATIONS, IMPLEMENTATION AND ADMINISTRATIVE SUPPORT COSTS	1,200	100	1,300	1,400	2,700
6. EVALUATION/MONITORING	250	0	250	50	300
7. LAND	0	0	0	0 3/	0
8. SUBTOTAL	8,450	2,750	11,200	7,650	18,850
9. CONTINGENCY (not including component 1 and 7) (5%)	423	137	560	110	670
10. ALLOWANCES FOR INFLATION (not including Item 1 and 7)	930	310	1,240	900	2,140
11. TOTAL	9,803	3,197	13,000	8,660	21,560

NOTES ON GOI FUNDING:

1. Aside from "incremental" costs directly attributable to this project to be borne by the GOI, the GOI will be paying for the salaries and operations of NBPGR, much of whose staff will be contributing to this project. These costs are estimated at \$7.5 million over LOP including allowance for inflation not including senior staff housing costs.
2. The NBPGR is proposing to provide staff housing on a nearby area after approval from the local authorities. The GOI contribution for this is estimated at \$2.25 million including contingency and inflation. Alternatively, the GOI will supplement housing by way of house rent allowance to the staff throughout the project at an estimated cost of \$750,000. Neither of these items are included as costs incremental to this project as housing construction has been planned in any case.
3. The GOI contribution of land for the headquarters/gene bank facility is a non-cash contribution with a conservative value of \$4 million. The GOI may make a further land available for the staff housing area.
4. Total GOI financial and other resources, incremental and non-incremental, housing to be provided for this project is estimated to be \$21 million to \$24 million.

GENERAL NOTES:

1. Generally inflation rates are projected at 6% per annum in dollar terms except for headquarters construction which is projected at 10% per annum in dollar terms. USAID expects that inflation in rupee terms will be 10% per annum for all categories except that building construction inflation, including materials in local prices are estimated to increase at 14% compounded over the next several years.
2. The costs of the project component "equipment" were determined by plant genetic experts and reviewed by NBPGR scientists. During these reviews certain allowances for inflation and contingencies were built into the costs. Because of this the inflation line item of Table I and II includes only a 3% compounded allowance for price increases for the equipment component.

TABLE II
USAID Project Cost By Input And Fiscal Year *
 (Estimates)

(U.S. \$ 000)

AID INPUT	FY 89	FY 90	FY 91	FY 92	FY 93	FY 94	FY 95	Total
1. CONSTRUCTION								
- Headquarters/Gene bank	0	0	850	1,100	0	0	0	1,950
- Greenhouse/Screenhouse procurement/erection	0	350	300	50	0	0	0	700
2. EQUIPMENT (laboratory, field, offices and vehicles)	100	450	1,600	1,700	850	300	0	5,000
3. TRAINING								
- US	100	180	220	120	60	20	0	700
- In-country	0	25	25	15	15	10	10	100
4. TECHNICAL ASSISTANCE, COLLABORATIVE RESEARCH AND JOINT EXPLORATION	50	150	300	350	230	100	20	1,200
5. PROJECT OPERATIONS, IMPLEMENTATION AND ADMINISTRATIVE SUPPORT	50	280	380	340	170	80	0	1,300
6. EVALUATION & MONITORING	20	20	20	120	20	20	30	250
7. CONTINGENCY	15	140	330	430	210	105	10	1,240
8. INFLATION	10	50	155	215	85	35	10	560
GRANT TOTAL	345	1,645	4,180	4,440	1,640	670	80	13,000
ACCRUED EXPENDITURES BY FISCAL YEAR	2.7%	12.7%	32.1%	34.1%	12.6%	5.2%	0.6%	100%
CUMULATIVE PERCENTAGE	2.7%	15.4%	47.5%	81.6%	94.2%	99.4%	100%	100%

1/ See Table I for note section.

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TABLE III
GOI Direct Incremental Project Costs by Input and US Fiscal Year
(Estimates)

(US \$000)

	YEAR EXPENDITURES ACCRUE							Total
	FY 89	FY 90	FY 91	FY 92	FY 93	FY 94	FY 95	
1. CONSTRUCTION								
- Headquarters/Gene bank	0	0	900	1,710	0	0	0	2,610
- Contingency	0	0	255	430	0	0	0	685
- Inflation	0	0	575	1,530	0	0	0	2,105
2. EQUIPMENT	0	150	180	100	70	0	0	500
3. INCOUNTRY TRAINING	0	25	25	15	15	10	10	100
4. TECHNICAL ASSISTANCE, COLLABORATIVE RESEARCH AND JOINT EXPLORATION	20	30	45	50	35	15	5	200
5. PROJECT OPERATIONS, IMPLEMENTATION AND ADMINISTRATIVE SUPPORT	20	150	250	320	280	200	180	1,400
6. EVALUATION/MONITORING	5	5	5	20	5	5	5	50
7. LAND	0	0	0	0	0	0	0	0
8. SUBTOTAL	45	360	2,235	4,175	405	230	200	7,650
9. CONTINGENCY ¹	2	13	25	25	25	10	10	110
10. INFLATION ¹	3	42	150	200	220	125	160	900
11. GRAND TOTAL	50	415	2,410	4,400	650	365	370	8,660
	==	===	=====	=====	===	===	===	=====

¹/ Not including Component 1

NOTE:

Inflation allowances in Table #IV are quite high in out years due to difficulties in estimating GOI incremental contribution and high rate and variability of Indian domestic inflation. See notes to Table I also. Also note that this table includes only GOI expenditures directly incremental to this project. It also does not include the value of land donated by the GOI for the headquarters facilities which has a conservative market value of an estimated \$4 million.

TABLE IV
COSTING OF PROJECT OUTPUTS/INPUTS
(in \$000 or equivalent)

	PROJECT INPUTS	PROJECT OUTPUTS						TOTAL	
		Strengthened Network	National Genebank	Information System	Quarantine Stations	Trained Scien- tists & Staff	International Activities		
AID									
1.	CONSTRUCTION	1,950	0	1,950	0	0	0	0	1,950
	- Greenhouses	0	350	0	0	350	0	0	700
2.	EQUIPMENT	5,000	500	3,000	300	800	0	400	5,000
3.	TRAINING	800	0	0	0	0	800	0	800
4.	TECHNICAL ASSISTANCE	1,200	200	400	150	200	100	150	1,200
5.	PROJECT MGT & SUPPORT	1,300	300	450	100	350	50	50	1,300
6.	EVALUATION & MONITORING	250	40	40	40	40	50	40	250
7.	CONTINGENCY*	1,240	0	0	0	0	0	0	1,240*
8.	INFLATION*	560	0	0	0	0	0	0	560*
9.	SUBTOTAL	13,000	1,390	5,840	590	1,740	1,000	640	13,000
GOI									
1.	CONSTRUCTION (BASIC)	5,400	0	4,900	0	0	0	500	5,400
	-Contingency	(685)	0	00	0	0	0	0	0
	-Inflation	(2,105)	0	00	0	0	0	0	0
2.	EQUIPMENT	500	50	300	30	80	0	40	500
3.	INCOUNTRY TRAINING	100	0	0	0	0	100	0	100
4.	TECHNICAL ASSISTANCE	200	25	95	20	20	30	10	200
5.	PROJECT SUPPORT	1,400	100	600	250	250	100	100	1,400
6.	EVALUATION & MONITORING	50	5	15	10	10	5		50
7.	CONTINGENCY*	110	0	0	0	0	0		110
8.	INFLATION*	900	0	0	0	0	0		900*
9.	SUBTOTAL	8,660	180	5,910	310	360	235	655	8,660**
	TOTAL	21,660	1,570	11,750	900	2,100	1,235	1,295	21,660

* Unassigned

** It was specifically requested by GOI that no routine NBPGR costs be included as their contribution. When recurring costs which would have occurred in any case are total GOI costs including a land contribution of \$4 million are expected to be approximately \$21 to \$24 million over the LOP.

*** Bottom row totals and subtotal rows do not add since contingency and inflation allowances (items 7 and 8) are unassigned.

B. Audit

2.03 The project will be implemented by the NBPGR under the overall guidance and supervision of the ICAR. ICAR is a semi-autonomous research institution established by the Government of India. The annual budgets of ICAR as well as its various institutions, including NBPGR, are financed by the GOI. ICAR and NBPGR are subject to the contracting, payment verification and audit procedures and guidelines prescribed by the GOI for such institutions. USAID has reasonable assurance, based on USAID's thirty-odd years' experience here, that the GOI and its institutions have the necessary financial and management capacity to implement projects. Our direct experience funding projects implemented by ICAR leads us to the same positive conclusion. Additionally the USAID Controller's office will review NBPGR's internal controls and procedures as part of our process to approve the Project Implementation Unit plan. Those procedures found to be deficient will be corrected prior to an approval of the Management Plan for the Project Implementation Unit (see para 7.02a).

2.04 ICAR has been actively involved in the implementation of various USAID projects and is currently carrying out several USAID financed development activities under ARP (386-0470). Although USAID has had limited association with NBPGR, the fact that the project will be initiated and implemented through and under the broad supervision and guidance of ICAR is reasonable assurance of competent operation and performance. USAID payments for local cost expenditures under this project, as usual, will be to the Ministry of Finance, (MOF) GOI.

2.05 The MOF provides local currency resources to ICAR in monthly tranches based on ICAR's estimated budget requirements and then reviews and endorses USAID ICAR/NBPGR expense vouchers. USAID pays against these vouchers. ICAR and NBPGR are both subject to normal GOI audit processes. The project agreement, like all other bilateral USAID project grants to India, will contain the standard audit provision allowing the USAID Inspector General to exercise his right to audit project operations. No separate USAID project funds are earmarked for non-federal audit purposes.

III. Implementation Plan

3.01 The implementation of the project will take place in four stages:

An early Implementation Phase has already started and is financed from \$200,000 of ARP funds. This amount is not counted as a project cost:

- Phase I, the Initiation Phase, running from the execution date of the grant through year 2;
- Phase II, the Headquarters Construction phase, running through year 4; and
- Phase III, the Maturity Phase, extending from years 5 through 7.

A. Early Implementation Phase

3.02 The \$200,000 provided under ARP will fund six key project actions prior to the main implementation phases. These actions, which started in March 1988, will take approximately 12-14 months to complete except for item 5 the completion which could extend beyond mid 1989 (paragraph 3.09 and 3.10). After all but the latter of these activities are completed there will be an USAID-NBPGR consultation funded from the monitoring line item of the PGR project grant. This consultation expected in June 1989 will adjust the project's detailed implementation plan in part based on findings of this early implementation effort (see paras 3.27-3.31). Further major adjustments in implementation are likely to correspond to the final construction schedule.

1. NBPGR Management Team Trip to the U.S.

3.03 A team of up to three of ICAR/NBPGR's senior management staff will tour U.S. plant genetic resources system sites and facilities to study the operation of the system and to identify opportunities for further scientific collaboration. This trip is crucial in developing NBPGR understanding of the US program and in GOI planning of a more modern system in India. This trip is planned for summer/fall 1988.

2. Data and Information Management Consultancy/Training

3.04 One important project output will be a computerized national plant genetic resources data base which will store and make available plant germplasm data from the working collections and the base collection. A well run and accessible data base is critical for efficient use of NBPGR's germplasm resources. The first step has been a review of NBPGR's current capabilities in data base management. A data base expert from USDA has surveyed NBPGR's resources and needs and has made detailed recommendations on the beginning steps. The consultant also determined the costs of achieving a mature data base program for NBPGR (but not for all potential users). The costs, including training and personnel, for the data base program have been included in the project. (See report referred to under item 11, Annex J).

3.05 Because of the long lead time expected in achieving a functional Data Base Management (DBM) system two NBPGR information management personnel will be trained at the Germplasm Resources Information Network (GRIN) offices of the USDA Research Center at Beltsville, Maryland using this ARP funding. This training will take place in the fall of 1988.

3. Plant Genetic Resources: Scientific Visits/Study Tours

3.06 Successful implementation of the PGRP depends in part upon the capability of division heads and sectional leaders who will be responsible for handling the expanded work load resulting from the project's activities. Their skills will be improved through scientific study tours. This will consist of short term on-the-job experience at U.S. germplasm facilities and/or attendance at workshops and seminars in India and/or the U.S. Selected scientists then rotate through operating/

administrative divisions of U.S. facilities to assess techniques needed to run their divisions efficiently.

4. Updated and Prioritized Equipment Lists

3.07 U.S. and Indian scientists will prepare updated equipment lists with more complete specifications, revised cost estimates, with agreed on ordering priorities and timings, and with suggested dates of need on major items. There is currently a fairly comprehensive list of equipment now expected to be financed under this project. This list was developed by germplasm professionals in close association with USAID and NBPGR and has provided enough information so USAID and NBPGR are satisfied the overall equipment cost estimates are reasonable. Nevertheless a refined list is required for actual procurement to commence.

3.08 Final approval of the list must be given by NBPGR management and USAID must agree to the items it is being asked to finance. The NBPGR, working through ICAR will then proceed immediately to process the required NMIC custom duty exemption forms. Given these and other considerations the procurement process will be lengthy. Preparation and agreement on a final list is imperative to move forward on procurement as soon as possible.

5. Consultants in Gene Bank Construction and Operations

3.09 Two important components of the PGRP are the construction of the NBPGR New Delhi headquarters and gene bank facilities and the construction/erection of greenhouses and screenhouses at quarantine stations and at research/mid-term storage sites. The base collection gene bank is being designed for a capacity of 600,000 accessions. All of this space will not be needed for storage of accessions immediately, but within 15 years the number of accessions in the base collection should approach two-thirds of the capacity as active collections throughout India are duplicated and sent to New Delhi for long-term storage. The facility will be built so that areas not being used for the base collection can house working collections, labs, classrooms and offices. It will also be designed to allow for expansion beyond 600,000 accessions if the number of accessions becomes significantly greater than predicted. This situation occurred at the U.S. central gene bank in Fort Collins, Colorado when actual accessions far outran projections, costing the U.S. taxpayer much more in the end than if an expandable building had been built in the first place.

3.10 NBPGR has recently completed preliminary plans for the gene bank and headquarter facilities. These were prepared by GOI's Central Public Works Department (CPWD). The design team and USAID have reviewed these plans and have found them adequate for project paper purposes. However, these plans need to be further refined and reviewed in more detail, keeping the full requirements of the system in mind in order that the most appropriate facilities are built. Accordingly some of the early implementation funds will be used to support visits by U.S. scientists and engineer(s)/architect(s) familiar with gene bank construction and management.

3.11 They will visit India and assist CPWD and NBPGR scientists in reviewing the preliminary designs and plans. They will also assist in developing the basic design criteria and the building plans and specifications for the specialized/scientific elements of the buildings. The CPWD will use these documents and plans in working out the detailed designs and drawings, specifications and IFB documents.

6. Consultants on Cryopreservation/Tissue Culture

3.12 The early implementation funds will be used for cryopreservation/tissue culture experts from the U.S. to assess the capabilities of the NBPGR and provide plans for future needs. The cryopreservation expert has already been provided and his report is on file at USAID. The assessment covers laboratory staffing and equipment needs as well as recommendations about future cryopreservation research programs for India. The visit of the tissue culture expert is planned during the fall of 1988.

7. Initial Implementation Review and Detailed Project Planning

3.13 In order to ascertain more comprehensively the project implementation, this review is planned for the late spring in 1989. (See para 3.02).

B. Main Project Implementation Plan

3.14 The PGRP is divided into three inter-related main implementation phases. The Initiation Phase, the first and second years of the project, will have a focus on taking inventory and centralizing the working collections now located at NBPGR field stations and cooperating institutions. During the Construction Phase (third and fourth project years) the NBPGR will concentrate on building the headquarter/gene bank facilities. The inventory work started in the first phase will continue. Finally, during the Maturity Phase (last three years) of the project, NBPGR will concentrate on consolidating and making operational a fully functional national germplasm system. During all these phases USAID and GOI inputs of training, exploration support, technical assistance, collaborative research and general implementation support will be occurring.

3.15 The Project Initiation phase; Phase I, sets the stage for the accomplishment of project objectives. Plans for training, procurement, project implementation management, construction, technical assistance and lesser elements of the project some of which will have been started by pre-implementation actions will be totally worked out and approved by the end of this Phase. Concurrently NBPGR will be initiating and continuing actions to strengthen the germplasm system.

1. Phase I: Initiation Phase (Years 1-2)

3.16 The NBPGR will consolidate and upgrade working collections at its field stations and cooperating institutions. There are thirteen NBPGR field stations located at widely dispersed locations throughout

India; Akola, Amaravati, Cuttack, Delhi (Issapur), Hyderabad, Jodhpur, Ranchi, Shillong, Shimla, Srinagar, Bhowali, Trichur, and the Andaman Islands. Many of the germplasm collections at these stations have not been stored under ideal conditions, thus causing rapid loss of germinability. In order to re-establish viable collections, careful procedures must be followed.

3.17 Collections that have low germination rates will be regenerated or recollected. Accessions with low germination will be grown out in fields to obtain new seeds with high germination and the resultant seeds will be carefully preserved. Hopefully, recollection efforts will be kept to a minimum. Once collections are upgraded each field station will maintain its working collection and will prepare duplicates to be sent to the NBPGR base collection for long-term storage. This process should be well underway at all thirteen field stations by the end of this initiation phase and will continue for at least two more years.

3.18 Over the course of the project, regional NBPGR centers will be provided with properly sized medium-term cold storage facilities. These will be constructed by NBPGR or under contract using local materials and equipment. The organization has considerable experience with such construction, which requires less executing specifications than the central gene bank. Approximately 2-3 such facilities will be completed each year. This will come from NBPGR's regular budget has been planned and is not considered by NBPGR as costs incremental to this project even though upgrading of these facilities will be important to the project. Accordingly although these costs are not noted in the tables, implementors must take into account progress on these facilities.

3.19 NBPGR field station scientists will, over time, work with the more than 100 non-NBPGR working collections to evaluate them and then regenerate systematically identified germplasm. This work, which will start as soon as possible, will continue through this project and beyond.

3.20 NBPGR will continue its plant exploration work doing this in part according to priorities set by the National Crop Advisory Committees advising on germplasm needs on important food crops. These are now being formed on the crops that have all-India research programs such as rice and wheat and others will follow. To improve exploration and collection efforts and to encourage wider participation, NBPGR will also host exploration/collection workshops that will include both private and public sector participants.

3.21 Selected non-NBPGR scientists will begin receiving U.S. training in seed/tissue culture, preservation, evaluation (according to crop speciality), exchange quarantine techniques, database management and general systems management. After this U.S. training, the NBPGR will organize in-country training programs for both NBPGR and non-NBPGR scientists in these areas. In-country training will be reinforced by periodic short-term consultants from abroad.

3.22 NBPGR will contract for the services of a Management Service Contractor. USAID will execute a direct contract for these services with

a Scope of Work developed jointly and agreed to by NBPGR and USAID, and will charge the costs to the project. This contract is expected to be executed approximately 15 months after the grant is signed.

3.23 By the end of this period, the NBPGR and USAID will also have approved the design, specifications and building plans for the gene bank headquarters' facilities. Thereafter, during early Phase II period, NBPGR and USAID will have approved IFB documents and award of the contracts.

3.24 The appropriateness of local design and construction plans for greenhouses, screenhouses and other facilities for the four quarantine stations will be resolved by the end of this phase. Exacting standards for quarantine station facilities are required to protect against pathogen spread. Tissue culture research on in vitro conservation of clonally propagated crops will also require precisely controlled greenhouses and growth chambers. While the technical analysis to date provide a reasonable basis for overall estimates of costs for both these requirements, such requirements will vary from station to station and will only be precisely determined through a comprehensive needs and task analysis of each facility. This work will be done during Phase I by NBPGR assisted by outside expertise as required and should be completed well before the end of this phase so the lengthy procurement, erection/construction and shake down processes can be completed by the end of the fourth project year.

3.25 In any case a considerable number of orders for equipment and parts financed by USAID will have been placed by the end of Phase I. U.S. based training will be continuing from the early implementation phase and by the end of the first six months of Phase I a training plan acceptable to USAID should be in place at NBPGR.

3.26 A Project Implementation Unit (PIU) will be established in Phase I. The PIU will have sufficient staff and financed resources to perform the myriad of tasks required to get the right quality and quantity of inputs delivered on time. The project agreement will contain a condition precedent to major disbursements calling for a time phase plan to establish and staff such a unit. Currently it is expected the PIU will be operational approximately 10 to 12 months after the execution of the grant (see para 7.02 and para 6.47).

2. Phase II: Construction of Headquarters (Years 3 and 4)

3.27 The second phase of this project will be focused on the construction of the NBPGR headquarters. The PIU will have had about one year's operational experience by the start of this phase and will be the project's focus point within NBPGR. By the end of the second phase, all the gene bank buildings and headquarter facilities should be near completion.

3.28 In addition, the following activities will occur during Phase II:

a. Scientists who have received U.S. training will participate in the program of in-country, in-service training of other NBPGR personnel.

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b. The inventorying of regional working collections which started in Phase I will continue. The base collection will be moved into the new gene bank building after the temperature and humidity controls are tested and necessary back up systems are in place. This shift should start towards the very end of Phase I and will continue into Phase III.

c. The bulk of the equipment and supplies to be purchased under USAID financing for use at the headquarters facilities will have been ordered, with some equipment arriving by the end of year three. USAID financed equipment and supplies for the outlying stations will all have been ordered. This equipment will begin arriving in year four.

d. At the end of Phase II, (or year 4) USAID and the ICAR/NBPGR will evaluate the project and implement any necessary adjustments in the light of experience and knowledge gained.

3. Phase III: Early Maturity Stage: A Functional National Genetic Resources System (Years 5, 6 and 7)

3.29 During this phase, the national system will begin to mature. All headquarter buildings and the gene bank will be completed and occupied. A portion of the base collection will have been transferred to the new gene bank facility and much of the collection will already have been upgraded or replaced as necessary.

3.30 Towards the end of year 5, each of the NBPGR's functional divisions and NPPGR's regional stations will have received the bulk of USAID financed equipment and will be using the same in general activities. By then each will have the necessary trained staff and finances to deal with increased activities.

3.31 By the end of the sixth year the NBPGR's field stations will have updated, properly stored, active or working germplasm collections although improvements to and upgrading of accessions will be by no means completed.

3.32 By the middle of the seventh project year, NBPGR's data base management activities will be far advanced with substantial documentation on NBPGR's own collections completed. Associated germplasm collections will have been substantially inventoried and systems to record and catalogue on computers new accessions will be in place at all NBPGR facilities and a substantial number of affiliated field collection points. The organization will be physically, managerially, scientifically and financially in the position so that it can manage its own move into full maturity by the 21st century.

3.33 Moreover, the NBPGR will, by PACD, have begun to play a major role within South and Southeast Asia and in the international plant genetic resources community. The International Training Center at NBPGR headquarters is expected to be fully operational, busy training scientists from the Asia region.

4. Main Implementation Plan: Summary Statement

3.34 This project has planned ambitious accomplishments. The main project implementation plan and the following procurement plan and Table V provide only a basic framework for implementation. Enough planning analysis and discussion have taken place so that USAID is reasonably assured that there will be sufficient and timely flows of Indian and U.S. resources to the project, that the timing of resource flows is projected on a reasonable basis that the estimated costs of the activities including contingency and inflation allowances are sufficiently covered by GOI and USAID financing plans and that both USAID and GOI can meet the basic expectations of the overall implementation of the project. Additionally, there is enough time leeway in the project so that reasonable slippage in one area can be adjusted for in others. However, this is not enough to make detailed decisions as to the flow of the project resources, including provisions of goods and services, provisions of training, increments to staff and the like.

3.35 Implementation planning and monitoring reviews will be integral to this activity. First, during the spring of 1989 a joint comprehensive detailed initial implementation and planning review using appropriate expertise will be undertaken. This review will be used to supplement plans already being developed or in place (training plan), to adjust preliminary planning (Scope of Work for implementation contractor) and to either complete plans or provide more detailed preliminary planning on other project elements (such as joint explorations). The expected outcome of this work will be much more comprehensive planning information, inter-alia, time interrelationships of project elements, implications of the implementation activities on management and staff capacities, updated estimations on resource flows and the like.

3.36 USAID expects the issuance of an Project Implementation Letter (PIL) based on this detailed plan which will be annually updated by joint US/GOI agreement annually earmarking funds for project elements to be used in each upcoming Indian fiscal year. This information will result from the "annual review" (see para 5.03). These review and planning exercises during implementation will help accomplish a more coordinated flow of resources into the project reducing costs and frictions. Such PILs will not be a requirement for the project to proceed and may not be used, but are nevertheless by USAID to be a way to assure good implementation management of this activity.

3.37 As noted above, the issuance of annual PILs (or issuance of certain future PILs which make agreed on project adjustments even if not done as annual PILs) will follow annual review visits financed from USAID's and GOI's monitoring contributions. These annual reviews will enable more formal information on which to base decisions on future resource allocation.

3.38 The results of the annual reviews and the mid project evaluation (see para 8.01-8.04) will be important determinants of the NBPGR's expected maturation as the project progresses. It is important that

these reviews be undertaken on a timely basis and recommendations therefrom be acted upon.

C. Procurement Plan

3.39 The project envisions major procurements of equipment and services. It is planned that a project Management Services Contractor will handle the major goods and services procurements. However, it is likely to take about 15 months to have such a contract executed and a bit longer to mobilize. Accordingly the project allows a tranche of up to \$750,000, before project specific CPs are met to be used for training, TA, some equipment etc to enable immediate visible project progress. Also up to \$200,000 of ARP funds have been used to finance pre-project actions. All AID financed procurements will follow normal USAID procedures and likewise GOI procurements will follow their procedures. Proper attention by USAID and the GOI to their respective acquisition rules and procedures will be essential in accomplishing all procurements in a timely fashion. Accordingly, the Management Services Contractor will periodically prepare and send to USAID and NBPGR a summary of actions taken towards these procurements/acquisitions and will hold timely project implementation review meetings with relevant USAID and GOI personnel in order to help accomplish procurement actions within properly set time limits. The acquisition and financing methods are shown in Table V. A preliminary implementation plan by phases is shown in Table VI.

1. Early Project Implementation Phase

3.40 Winrock International, a non-profit agricultural institution, is arranging the early implementation phase services through their current ARP implementation support contract using \$200,000 of ARP funds. (see paragraphs 3.01 to 3.12). These services include refining equipment lists, detailing specifications, refining cost estimates, and developing source lists. Winrock is also providing short-term technical assistance to help strengthen NBPGR's computerized data base management system. Winrock also is arranging: 1) U.S. short-term training for two Indian information management specialists, 2) on-the-job managerial training in U.S. plant genetic resources facilities, 3) a visit of top NBPGR managers to US facilities; 4) technical services to NBPGR to help develop detailed genebank building plans.

2. Main Project Implementation Phase

3.41 Once the project is operational the following procurements will be implemented.

a. Management Services Contractor

3.42 The Management Services Contractor (MSC) is expected to carry out the offshore commodity procurement to procure a limited amount of local equipment, arrange for US technical assistance and offshore participant training. It will also provide services support to the proposed collaborative research and plant conservation programs and arrange provide assistance in the monitoring/evaluation areas. The work scope and other

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TABLE V
Acquisition and Financing Methods
 (Illustrative Example)

Item	Method of Implementation	Method of Financing	Expected AID Contribution- \$	
1. <u>Construction</u>				
a. Facility	HC Contract	HC Reimbursement	1,950	
b. Greenhouse	HC Contract	HC Reimbursement	<u>700</u>	2,650
2. <u>Equipment</u>				
a. US (offshore) purchases *	Direct Contract	Direct Payment	4,500	
b. Local purchases	HC Contract	HC Reimbursement	400	
c. Shelf items procurement	HC Contract purchases	HC Reimbursement	<u>100</u>	5,000
3. <u>Training</u>				
a. US	# AID direct contract	Direct payment	700	
b. Local	HC Contract	HC reimbursement	<u>100</u>	800
4. <u>Technical Assistance</u>				
a. Short term consultants (US)	# AID direct contract	Direct payment	750	750
5. <u>Project Implementation @ & Administrative Support</u>	# AID direct contract	Direct payment or LOC and HC reimbursement	1,300	1,300
6. <u>Collaborative Research/ Joint Exploration</u>				
a. US Costs	# AID direct contract	Direct payment or LOC	400	
b. Local costs	HC contracts	HC Reimbursement	<u>50</u>	450
7. <u>Evaluation/Monitoring</u>				
a. Evaluation	# AID direct contract	Direct payment	150	
b. Monitoring	# AID direct contract or Host Country Contract	Direct payment or HC reimbursement	<u>100</u>	250
8. <u>Contingency/Inflation</u>	Various	Var		<u>1,800</u>
TOTAL				13,000

NOTES:

- ⊙ Preliminary A&E and other technical services are being paid from Agricultural Research Project funds. The remainder of necessary services will be provided under the project implementation support contractor.
- * A limited amount of procurement from Code 935 sources is expected (not to exceed US \$500,000) as it is expected not all necessary equipment will be available from U.S. or India.
- # USAID proposes to execute a direct contract with a firm/institution for project management services. This has been agreed to in negotiations and will be reaffirmed.

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information needed for the Request for Proposals for this contract will be developed jointly by USAID and NBPGR within six months of the signing of the project grant agreement. Proposals will be solicited and the contractor selected following US Government rules and regulations. The contract should be in place approximately 15 months after the grant is executed. USDA is likely to be a key technical assistance source since it has many of the world's germplasm experts. Thus USAID expects the contractor to be able to arrange for USDA technical assistance services either directly through USDA research agencies, the individuals themselves or through USAID's Office of International Cooperation and Development (OICD).

3.43 The MSC to be selected must be fully capable or subcontract with organizations/individuals to provide the necessary capability in procurement of advanced scientific equipment and must have not only a basic understanding of a plant germplasm system but also demonstrate the capability to access the germplasm community both for technical assistance and for training opportunities.

b. Local Procurement

3.44 The NBPGR will procure using normal GOI procurement procedures the bulk of the \$500,000 USAID financed local equipment and the \$500,000 worth of equipment it will self finance. AID, over the years, has accepted GOI procurement procedures as acceptable. AID or the MSC may procure limited amounts locally for the project.

c. Construction

3.45 The GOI will directly finance the construction of the headquarters facilities. The CPWD will provide design and construction management/supervision services for the gene bank and headquarter facilities. The project funded A&E firm will provide services in India of the high level reputed gene bank designers and managers at timely intervals and during the construction as and when necessary. These consultants will assist CPWD in designing and developing the building plans. After CPWD finalizes the building plans, specifications and cost estimates in consultation with the U.S. A&E firm consultants, these will be reviewed and approved by USAID. During construction a USAID/India engineer will periodically visit the site to monitor the project. This engineer will ensure the quality of work, verify progress and certify payment. USAID's reimbursements for construction will be periodic and will be based on an "actual cost reimbursement basis." The A&E firm consultants will also provide periodic assistance in monitoring the project in India as and when required by USAID.

d. USAID Approval of Building Construction Activity

3.46 The headquarters facility/gene bank which is to be partially financed by AID will be constructed by a private Indian contractor selected under normal competitive bidding. NBPGR will furnish to USAID the detailed drawings, specifications, cost estimates and IFB

documents; and the proposed award of the contract for the gene bank building. USAID will review and approve these documents before reimbursement of the construction costs.

3. Gray Amendment Considerations

a. Training and Technical Assistance

3.47 Contracting for U.S. training and technical assistance will be handled by the MSC generally working through the USDA/OICD or USDA/ARS, although some private sector training might be feasible. These institutions are acutely aware of the Gray Amendment considerations of USAID's programs and work closely with USAID worldwide to help USAID meet Gray Amendment objectives. Due to the advanced scientific nature of the training and technical assistance required, USAID anticipates using only the most highly experienced professional assistance. To the extent Gray Amendment institutions and individuals can meet these requirements they will be actively recruited.

b. Procurement Services

3.48 It is USAID's present view that an 8(A) or Gray Amendment procurement services advisory firm (PSA) be subcontracted to handle offshore procurement. Gray Amendment firms have proven capable of purchasing scientific equipment for USAID projects. Accordingly USAID will make every effort to assure use of Gray Amendment and/or an 8A PSA including assuring appropriate language in any RFPs issued.

c. Coordination/Timing of Procurements

3.49 Although only generally spelled out in this document, timing of goods procurements and meshing the items' arrivals at sites is of utmost criticality to this activity's success. Accordingly the late spring 1989 project implementation review will make much more complete determinations of these dates than now contained in the PP. This review will pin down more fully details on goods to be purchased and when items are to be on site. The SOI for the Management Services Contractor will require that the contractor lay out a rigorous analysis of a procurement program so that the bidders' understanding what is required and their capacity to undertake successfully project procurements can be fully considered in the contractor selection evaluations. Likewise, how contractors will handle T.A. and other service procurements have to be spelled out in their proposals.

3.50 An estimated \$500,000 of items, including shipping, may need to be purchased from eligible free world countries other than the U.S. and India. While it would seem managerially efficient to request blanket waiver now, every effort should first be made to purchase roughly comparable equipment of US source/origin, thus the Project Data Sheet makes no forward provision for procurement from Code 935 Countries.

IV. FINANCING METHODS

4.01 The methods of implementation and financing of the various project elements are shown in Table V. The total AID contribution to the project is estimated to be \$13 million which consists of \$11.2 million for seven specific project elements and \$1.8 million for contingency/inflation. Of the \$11.2 million, it is envisaged that \$3.95 million will be HC reimbursements, \$7.15 million direct payments by AID and \$0.1 million either of the two, depending on the method of implementation to be decided upon later.

4.02 HC reimbursements will be mostly for construction, local purchases of equipment, local training and local costs of Collaborative Research/Joint Exploration programs. AID direct payments will be for offshore procurement, overseas training, technical assistance, collaborative research programs (U.S. costs) and evaluation. An amount of \$0.1 million of project funds will be for monitoring. This may be implemented through AID direct contract or by HC contract.

4.03 HC reimbursements will be in Indian Rupees purchased from the Reserve Bank of India in accordance with the procedures established for the purpose jointly by DEA, USAID and the Reserve Bank. Detailed procedures to be followed for voucher preparation and submission by DEA will be spelt out in Project Implementation Letters.

4.04 AID direct payments will be through (a) letter of credit or cost reimbursements under AID contracts and (b) direct payment for overseas training and offshore procurement.

V. MONITORING PLAN

5.01 The NBPGR will, through the NBPGR Project Implementation Unit (PIU) (see para 6.30), coordinate and monitor project activities. Working with the PIU office director, appropriate USAID and contract personnel will visit sites and periodically, but not less than once a quarter during project implementation, meet with the director of NBPGR and his staff to assess progress.

5.02 The PIU management unit will develop annual work plans, report on project inputs and expenditures, and monitor the overall performance of the project. It will ensure that annual project performance reports are prepared by itself and by the Management Services Contractor and made available to NBPGR and USAID within 90 days after the end of each Indian fiscal year. PIU and the MSC will be charged with collecting the relevant information on a timely fashion, conducting the reviews and preparing recommendations to NBPGR and USAID for follow-up. It will assure feedback information on project problems and progress is provided promptly to headquarters and cooperating institutions. This unit will also develop and issue quarterly information on progress including accumulated project expenditures and inputs delivered over the prior 12 months. Data generated during monitoring by this unit will also be designed to address some of evaluation information needs discussed in section VI paragraph 8.07.

5.03 The NBPGR and the USAID/India technical office will jointly undertake annual reviews of project progress. The past year's progress will be reviewed, the following year's plan of work finalized, and the work plan for the remaining years of the project discussed and agreed upon in general terms. This cycle will be repeated each year. The annual review will be the focal point for the NBPGR and USAID guidance of project activities including training, construction, and equipment procurement actions. Appropriate high level consultation between in NBPGR/ICAR and USAID will be encouraged in the event of unanticipated delays or difficulties.

VI. SUMMARIES OF ANALYSES

6.01 Detailed analyses are available in annexes of this Project Paper. Additional supporting documents are maintained in USAID/New Delhi files. See Annex J for a list of the main documents consulted.

A. Technical Analysis

1. Development of a National Plant Genetic Resources System

6.02 The NBPGR was created by the ICAR and charged to meet national requirements for plant germplasm including collection, evaluation, documentation, conservation and exchange of agri-horticultural crops. The NBPGR is also responsible for the safe and expedient import and export of seed/plant material for research purposes. Accordingly, the NBPGR is directly responsible for all technical components that will be supported during this project.

6.03 The NBPGR had its origin in 1946 as the Section of Plant Introduction in the Division of Botany of the IARI. This division was renamed in 1976 the National Bureau of Plant Genetic Resources (NBPGR) and since that time it has been developing the country's plant genetic resources system. India has developed over the past 45 years and most particularly since 1976 the basic capacity to put in place a comprehensive national plant genetic resources system.

6.04 Although India does not currently have a totally coordinated national plant genetic resources system, the basic components exist. The GOI now has an active program that links key institutions into a national network designated to preserve India's wealth of plant genetic resources. The NBPGR is the cornerstone of this program; one might refer to it as the apex germplasm agency. The analyses of its capacities undertaken by the two design teams provide USAID evidence that it has the basic institutional competency required for successful project implementation. See reports referred to under item Nos. 7 and 14 in Annex J for details of these teams' findings.

2. Components of a National Plant Genetic Resources System

6.05 During the design phase of this project two teams of experts from the U.S. visited India to assess the NBPGR capacity to undertake the

development of a national plant genetic resources system. Team members represented expertise in key components of a national germplasm system (i.e., collection, evaluation, conservation, documentation, quarantine and exchange). They concluded that the NBPGR had the technical and administrative capabilities to successfully implement the range of activities envisioned in this project. The components of a national germplasm system and NBPGR capabilities in this regard are summarized below.

(a) Germplasm Acquisition - Exploration, Collection and Exchange

6.06 The NBPGR, and its predecessor organizations, have an impressive history in plant germplasm exploration and collection. Explorations for primitive "landrace" varieties of cereals, millets, legumes, vegetables, fruits, oilseeds, fibers, sugar sources, spices, condiments, and plants with medicinal properties have been undertaken in India's eight agro-ecological zones. In addition, these same zones support some 320 recognized wild or weedy relatives of important crop plants. It is important to collect the germplasm of these landrace and wild varieties and species to provide the basic materials both for traditional plant breeding and for state of the art genetic work. With increased pressure on land and wild habitat losses germplasm variability will decrease fairly quickly unless preserved.

6.07 To continue this important but far from completed work, the project will strengthen the NBPGR and its collaborators' exploration capabilities. To accomplish this task the NBPGR will implement a 5-year annually updated plans for exploration and collection.

6.08 The ICAR policy, as carried out by the NBPGR, supports the safe international exchange of germplasm. The 1986 NBPGR annual report (see Annex J for reference) states that "NBPGR is an approved Official Agency for the exchange of germplasm material of agro-horticultural and silvicultural crops in a healthy condition" between India and other countries. The report also states that one of the principal objectives of the NBPGR is "to undertake introduction and exchange of plant genetic resources through effective linkages with concerned organizations abroad." In the decade 1976-1985, NBPGR developed exchange links with over seventy countries. Over that period those exchange partners sent India 732,990 accessions of germplasm and India sent out 45,399 accessions. Although the imbalance is substantial it does nevertheless reflect an active program of germplasm exchange. The project will further expand India's capability to safely exchange germplasm through improved collection, storage and plant quarantine facilities and should lead to India's access to a much wider variety of germplasm as well as give foreign countries easier access to Indian germplasm in the more open scientific exchanges which should result from this project.

(b) Germplasm Evaluation

6.09 An organized plant genetic resources organization obtains data on crop-specific characteristics of germplasm that is useful to plant breeders, plant pathologists, entomologists and other scientists involved

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in crop improvement research. This information assists scientists in selecting promising germplasm for breeding programs.

6.10 Currently, the ICAR is setting up a Crop Advisory Committee (CAC) for each crop or crop group for which there are active breeding programs. NBPGR will take the lead role in these CAC's. It is expected given progress to date some CAC's will be functional within the first year of this project. The CACs will assist in identifying germplasm needs to be met through exploration and/or exchange. And The NBPGR has already started this process working through the All India Coordinated Research Projects on wheat, rice, sorghum and other important crops. The CAC's will provide further focus to this effort. The project also calls for the NBPGR, with advice from the CACs, to organize a 5-year rolling plan for evaluation of germplasm accessions of each crop and to report results. Equipment and training will be provided for this stepped-up program of germplasm evaluation.

(c) Germplasm Conservation and Storage Facility Construction

i) Germplasm Conservation

6.11 Of all the functions that comprise a plant genetic resources system, conservation is perhaps the most important and the most expensive. Seed and clonal germplasm conservation facilities and equipment have high initial costs. Operations and maintenance costs are also high in comparison with those of other functions in the germplasm system. Even so, these costs are just a small fraction of the total agricultural research costs in crop improvement and varietal development.

6.12 Germplasm collections and their conservation facilities are classified under two categories. Germplasm accessions that are readily available for use by plant breeders or other users are maintained in "active" or "working" collections. Under U.S. procedures active collections are maintained in seed storage facilities that will permit retention of germination viability in excess of 80% for 15-20 years. This preservation mode is called medium-term storage. The second category of collections is the base collection which contains the material used to replenish the active collections. Base collections are maintained in seed storage facilities that will permit seed to be stored for 50-100 years without significant loss of viability. This preservation mode is called long-term storage.

6.13 The long-term storage facility in New Delhi will have sufficient capacity to house 600,000 accessions. This capacity is large but it is needed given the NBPGR's wide-ranging mandate to collect and conserve the accessions of over 150 important agro-horticulture species within India as well as obtain germplasm from important collections worldwide. Although the entire capacity will not be utilized during the life of the project, it will be needed during the next 10-20 years as the system reaches its effective size (i.e., adequate collections of the mandate species). There are currently some 300,000 accessions of mandate species in working collections in the over 100 participating institutions throughout India. These will be inventoried and rejuvenated and their

non-repetitive samples held in the central long-term gene bank. A good part of this can be accomplished in the seven year project. Explorations will add a considerable number of new accessions and international exchange will add at least another 50,000 or more accessions of just the mandate species to the gene bank and to medium-term storage collections during the project.

6.14 Both long-term and medium-term storage facilities are needed to build safety into the system. Samples of all important mandate accessions will be maintained in the base collection facilities and also at one or more of the mid-term facilities. In this manner the integrity of the collection can be maintained even if losses occur in a specific collection.

ii) Design & Construction

6.15 A vitally important component of this project is the construction of the NBPGR facilities housing headquarter offices and the gene bank for the long-term base collection. These facilities will be located at the campus of the principal agriculture research institute in India, the Indian Agriculture Research Institute, in New Delhi.

6.16 The project envisions contracting the design and engineering of the gene bank building with the CPWD. It is envisioned that the CPWD architect(s), responsible for designing the proposed gene bank building, will visit the gene bank building in U.S. and also meet with the gene bank managers and designers in U.S. to conceptualize the design for the proposed gene bank building. Their visit will be financed from the project funds. Later, they would consult closely with the NBPGR and internationally known gene bank managers and designers financed by project funds and brought in to India through an IQC or AID direct contract with a U.S. A&E firm. After the detailed design, specifications, cost estimates and plans have been finalized by CPWD in consultation with the U.S. A&E firm, these will be reviewed and approved by USAID. Thereafter, the IFBs will be invited by the CPWD under their normal and well established bidding procedures. The CPWD will also supervise the construction of the project. Working closely with the CPWD, the USAID engineer will periodically make site visits to ensure that the various project elements are being implemented in accordance with the agreed design and specifications and to ensure a good quality of work. As and when required, the A&E firm will also provide the services of their short term specialists in the areas of gene bank cryo-storage construction and air conditioning to assist USAID in resolving incipient problems spotted during USAID reviews.

6.17 NBPGR will hire qualified and trained staff for the maintenance of the buildings and for the operation and maintenance of machinery and plant. Based on observations we do not expect any problem in this regard.

6.18 The preliminary plans and cost estimates for the facilities are technically, financially and administratively sound and the USAID engineer certifies that they meet the requirements of FAA 611(a).

(d) Information Management

6.19 The NBPGR has started preliminary activities leading to the establishment of a data base on germplasm which can be accessed easily by participating institutions and will provide, inter alia, conservation and evaluation data on germplasm. Under the project an information management division (or data base management unit) will be established (i.e. starting from the de-facto unit which now exists. This unit will be more firmly recognized and be provided the full authority, resources and responsibilities to run a data base system) having primary responsibility for germplasm information needs of all NBPGR units and cooperating institutions in the system. The Grantee will covenant that this division or unit will be strengthened and be provided the proper staff, resources and financing (see para 7.03). While the data base is a key element of an information system, for NBPGR there will be other user needs such as information on general storage techniques, on budgets and the like. The plan will cover these aspects as well. To facilitate implementation of the data base management programs some funds have been provided under the Agricultural Research Project (ARP) for relevant training for NBPGR staff members. They will study the Germplasm Resources Information Network (GRIN) system at Beltsville, Maryland. These staff members will then train NBPGR information specialists in various techniques learned in the U.S., applying them to the special Indian conditions. (See report referred to under item 11 in Annex J for a 1988 review of NBPGR's data base management information system).

6.20 It is expected that either ARP funds or the first project tranche will finance specialists in germplasm data base management systems who will advise NBPGR on the details of the establishment of the data base management unit and help in the planning and setting up to make the database system fully operational at headquarters sometime after project year four. The system will be operating at several field locations by PACD and data will be exchanged over phone lines (if found feasible).

(e) Training

6.21 Germplasm biology and management of germplasm functions are not subjects generally available through college/university curricula, although some U.S. graduate schools are beginning to include these areas in course work and occasional courses are available elsewhere. Thus specialized training is needed for scientists and technicians involved in modern integrated plant genetic resources systems. India, because of the inputs of this project and because it is endowed with a rich variety of plant germplasm, will be in an excellent position to provide training in this area.

6. Accordingly, the project provides support for the NBPGR to develop training courses in plant genetic resources systems through the International Training Center (ITC) being established at NBPGR headquarters in New Delhi. The training center will be largely self-supporting through tuition fees, sponsorships, and grants-in-aid paid by countries sponsoring trainees. Training facilities will include lecture rooms and demonstration laboratories.

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(f) Plant Quarantine

6.23 Plant germplasm is widely exchanged among countries worldwide. However, germplasm exchanges increase the risk of transmitting pathogens, weeds and insects. Thus, plant quarantine programs are instituted to safeguard against sending or receiving infested germplasm.

6.24 NBPGR has the mandate to ensure safe movement of germplasm and required quantities of seeds for research through its Plant Quarantine Division. Headquarters and the Regional Quarantine Office at Hyderabad have plant quarantine programs underway, although both require additional equipment and staff to process effectively the current volume of germplasm. The project will support an expanded quarantine capability which will not only ensure safe movement of germplasms but reduce processing backlogs and thus speed exchange.

B. Financial Analysis

1. Financing Under Seventh and Eighth Plans

6.25 The timing of the development of this project is fortuitous because it coincides with GOI's mid-term review of the Seventh Five Year Plan as well as the start of detailed planning for the Eighth Five Year Plan period. The financial projections of this project provide a good basis for estimating what funds ICAR will have to provide and approximately when such funds will be needed by NBPGR. ICAR proposes to support fully the objectives and activities of the project and is in USAID's estimation making adequate provision to do so both on an annual and a long term basis.

6.26 Projected funding levels which have been required and are estimated to be required to carry out NBPGR programs during the Seventh Five Year Plan period (1985-1989) are as follows:

TABLE VII
NBPGR Seventh Plan Expenditures
(Rupees in Lakhs)

A. <u>Recurring Expenditures</u>		Plan <u>1/</u>	Non Plan <u>2/</u>
a.	Pay/Allowances	101.88	270.00
b.	T.A.	5.00	5.00
c.	Contingency	80.00	95.00
	TOTAL (A)	186.88	370.00
B. <u>Non-Recurring</u>			
a.	Equipment	71.94	-
b.	Works	166.00	-
c.	Land	-	-
d.	Vehicles	20.50	-
e.	Library Books	4.00	-
f.	Livestock	-	-
g.	Others	-	-
	TOTAL (B)	262.44	-
	TOTAL (A&B)	449.32	370.00

NOTE: 1/ Plan Rs. 44,932. equivalent to \$3,456,307
 2/ Non Plan Rs. 37, equivalent to \$2,846,000
 Exchange rate - \$1.00 = Rs. 13.00

6.27 The approved Seventh Five Year plan expenditure level for in-plan NBPGR expenditures was set at Rs. 394 lakhs (39,400,000) or U.S. \$ 3,030,769 for the five year period. As shown, the current estimate for plan expenditures is Rs. 44,932,000 or \$3,456,307. This increase has not caused a funding problem for NBPGR since ICAR through which NBPGR receives its budget authorization and funding has enough flexibility in its overall budget and its work program to increase funding for some programs and decrease or defer funding for others. As the NBPGR program is a stated ICAR priority the increase expenditures over original estimates experienced in the seventh plan have been easily absorbed by ICAR.

6.28 During the first implementation year of the PGRP, the NBPGR will begin drawing up a detailed budget for the Eighth Five Year Plan. ICAR has to plan now for expenditures required for the 1990-94 period (8th Plan), essentially the remaining years of the PGRP. The construction of the central gene bank and headquarters facilities and the implementation of a stronger national germplasm system will entail substantial increases in budget appropriations. Substantial increases have already been proposed by the ICAR and accepted in the Eighth Plan document. Moreover ICAR has enough flexibility in its annual budget to cover any unexpected cost increases in any number of the several score programs it supports including its support of NBPGR programs and expenditures. Thus, as long as this activity maintains its high priority status, NBPGR and USAID anticipate no GOI budget issues or actual funding shortfalls.

6.29 An important activity NBPGR will be carrying out during the course of this project involves upgrading and consolidating the more than one hundred germplasm collections in agricultural institutes and universities throughout India. The NBPGR has been designated by ICAR as the agency to coordinate this program. In most cases NBPGR does not have direct responsibility over the collections and many of the institutions involved are strained for resources. Because of this ICAR will instruct germplasm-holding institutes to include requests in their annual budgetary submissions funds to carry out germplasm conservation and consolidation work. NBPGR will include in its annual budgetary submission requests for sufficient funding to allow it to provide assistance to selected institutes which hold/collect germplasm for research or in adjunct to their main purposes to help them upgrade storage facilities and evaluate their present germplasm holdings. At this stage the financial and other implications of this support are not fully understood. The NBPGR proposes to move cautiously on this and AID funding can be used to support analyses of how to proceed. We are suggesting rank-ordering of these institutes by various factors, size of collections, vulnerability of collection to damage, types of germplasm collected etc. so to plan a decision matrix on what resources to use where.

2. Project and Financial Management

6.30 The NBPGR will establish a Project Implementation Unit (PIU) responsible for financial planning, control and management and for general project implementation including associated project processing

work. The unit will report directly to the NBPGR director and must have adequate staff, authorities, resources and funding to accomplish these responsibilities. (See Para 7.02)

6.31 Critical to this planning is the timely submission of the yearly budgets that take into account the needed infusion of local rupees to be reimbursed by USAID. Other financial planning functions linked to this project are: 1) planning and budgeting for the higher spending levels that will be required in the Eighth Five Year Plan to accommodate increased operating and staffing costs and 2) providing for future ICAR costs such as customs, duties and inland transportation for equipment of non-Indian origin. The PIU must be competent to take the lead in organizing this needed information, presenting it and making proper recommendations to the director, NBPGR. This unit must also be competent in processing USAID reimbursement vouchers and accounting documents; securing waivers (NMIC and duty-free status for scientific equipment); and providing operating expenditure feedback to the NBPGR director.

3. Recurrent Cost Analysis:

6.32 The costs of running the NBPGR will increase somewhat on account of this project. NBPGR operating costs have been increasing annually as it has added staff and services to meet the growing demands of the agricultural research community for germplasm. These increased costs have been met by ICAR. The expected increases are not only planned for in the 8th Plan but if experience is a judge, will be met. The incremental operating cost increases to NBPGR are shown in Table III. The project will enable NBPGR to bring on more staff more quickly, but except for a very marginal potential number of new positions which might be caused explicitly by the project, in the longer run NBPGR staff size would not be much different.

6.33 The costs of operating and maintaining the central gene bank facility can only be estimated but appear well within the financial capacity of ICAR. Moreover, having such a centralized facility will centralize costs to some extent at headquarters. Thus NBPGR field facilities and affiliated institutions will not have to bear proportionately the same level of costs as the pressure for them to further expand their active collections and grow out seed continuously will abate due to the extremely long term and much larger storage capacity provided by the project financed central gene bank facility.

C. Economic Analysis

6.34 The project does not have a predictable investment-return cycle. Given its nature, it is not possible ex ante to quantify its economic benefits. The benefits of germplasm collection are directly manifested in varietal improvement - in the development of crop varieties with desirable characteristics such as high yield, resistance to moisture stress and to pests and diseases. As these varieties are increasingly used, the benefits pass on to farmers and consumers. Broadly speaking, the larger the collection of germplasm, the greater the probability that economic gains will be substantial.

6.35 Plant breeders draw upon germplasm collections on a regular basis, searching primarily for resistance to diseases and pests and tolerance to adverse soils and climates. A single gene can provide a major contribution of significant economic importance. For example, the Norin 10 dwarfing gene provided the basis for the Green Revolution by imparting short stature to wheat. This inhibits these varieties from lodging when provided with high amounts of fertilizer to increase yield. It has been conservatively estimated that varietal improvement through germplasm availability and use has accounted for increased agricultural production in the United States totalling over \$1 billion per annum. Of this total, a conservative estimate made of the contribution of wild or primitive germplasm to agricultural production is \$114 million per annum. The returns may actually be much more substantial in India; for example, since the introduction of the new high yielding wheats, wheat production has increased from about 10.40 million metric tons in 1966 (12.57 metric tons per ha.) to 46.89 million metric tons in 1986 (23.07 metric tons per ha.). The increase of 36.49 million metric tons increment represents roughly \$6.7 billion annually.

6.36 An additional consideration concerns risk insurance. As farmers adopt more advanced, high yielding varieties and monocultural farming systems, risks are extended in terms of crop susceptibility to disease and insect epidemics. This can occur because of the genetic uniformity necessary for modern varieties. The only way to keep the "genetic edge" on such events is by providing breeders with an accessible source of new genetic material. Thus, germplasm collections are the farmer's insurance against unforeseen threats to his crop production.

6.37 In the agricultural science community, work is just starting in analyzing directly the economic value of germplasm. Seeds or tissues have unusual properties, each carry in themselves DNA codes with unique characteristics bred into them by chance or by design. In a micro sense seeds with their genetic codes represent the sum of the natural selection and controlled breeding each has undergone. Scientists are learning quickly how to identify and use seeds' "codes" in ways not even imagined a generation back, using gene manipulation, tissue culture, and other advances in biotechnology. Science is unlocking the code secrets and forcing rates of change impossible to achieve in nature. Thus the value of diverse germplasm is increasing even as plant life comes under ever more environmental stress. The preliminary study, indicates India, for one, is and will be in the foreseeable future nowhere near the point where the marginal value of collecting and protecting new units of germplasm is at the marginal cost. India will be nowhere near the point in the foreseeable future where the opportunity costs of rationally expanding and preserving major collections, especially in high value crops and plants with known or suspected medicinal value, would support relative funding shifts away from germplasm activities. In fact all expert opinion points to just the opposite; germplasm activities should command a small but growing percentage of India's agricultural research budget.

6.38 The only economic issue extant is essentially a management one, cost efficiency, in the estimation of the pre-eminent experts who reviewed India's germplasm system and made the basic recommendations herein this project represents a very cost efficient approach (see Annex K for main references on Consultants' Reports).

D. Social Soundness Analysis

6.39 The demands placed on the Indian agricultural sector by the food requirements of an already large and rapidly growing population are well known. This project, by preserving the existing diversity of germplasm and facilitating new germplasm acquisitions, will provide the basis for the development of plant varieties with higher yields and greater pest resistance. The project will contribute not only to a greater quantity, quality and variety of food for India but to a reduced vulnerability of the food supply to diseases and insect pests. Thus, the ultimate beneficiaries are the consumers of India who will profit from larger and more stable supplies of locally produced food with improved nutritional value and quality.

6.40 To the extent that the project leads to higher yielding and more disease-resistant varieties, it will improve the well-being of the agricultural producers. Farmers throughout India will be able to increase production in diverse agro-ecosystems. Women carry out the bulk of the agricultural tasks in India. High-yielding varieties and pest-resistant crops make their work more productive and lead to increased well-being of their households. In addition, increasing yields provide greater employment opportunities.

6.41 The most direct beneficiaries of this project will be the agricultural scientists in India and their institutions, both public and private, who are qualified for and interested in acquiring and using new germplasm to improve plants. U.S. institutions and their researchers also benefit from field exploration opportunities and germplasm evaluations carried out by the NBPGR. Linkages will be established between U.S. and Indian scientists during the course of implementation and such linkages are expected to continue far beyond the project period as enhanced access to a wide range of agro-horticultural germplasm is obtained.

6.42 The ultimate goal of this project really depends upon how well NBPGR does its job in preserving germplasm and in making sufficient amounts of good quality germplasm available to agricultural researchers and, of course, the researchers' capabilities of using the germplasm efficiently and the resultant spread of good research results. Currently, NBPGR's main concern is to have germplasm available for research, especially food crop research. A secondary concern rapidly becoming more felt is preservation of biological diversity as an end in itself. Its planned stepped-up program of exploration along with better facilities will address this directly. Ultimately, all human kind will benefit from the priceless heritage preserved by NBPGR and its system participants.

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E. Administrative Analysis

1. Organizational Pattern

6.43 The National Bureau of Plant Genetic Resources is an independent organization that operates under the Crop Sciences Division of the Indian Council for Agricultural Research. The Director of the NBPGR is in charge of administration and research management of NBPGR and reports to the Director General of ICAR through the ICAR Crop Sciences Deputy Director General. The NBPGR operates as a self-contained unit. Its headquarters is at ICAR's Indian Agricultural Research Institute campus (IARI) at Pusa, New Delhi. NBPGR has five operating divisions, the directors of which report to the NBPGR Director. The division directors and program staff of the NBPGR, except those located at the regional stations, are all located at the PUSA facility. The five divisions focus on the following activities: 1) plant collection and exploration; 2) germplasm evaluation; 3) germplasm conservation; 4) germplasm exchange and 5) plant quarantine. Germplasm documentation/data management activities are handled by the evaluation division.

6.44 The NBPGR, by virtue of the fact that it has been assigned responsibility for the national plant genetic resource system, has the responsibility to coordinate germplasm programs of the more than hundred Indian government institutions where germplasm collections are maintained. ICAR makes provision in the budgets of those institutions to support the germplasm work for which these institutions have agreed to assume responsibility. The NBPGR, using its own funds, is providing certain specific assistance to them (i.e. consultants, training) and these institutions are in turn responsible to the NBPGR for the proper care of the germplasm in their collections.

2. Delegation of Authority

6.45 The NBPGR has been given the responsibility and authority by the ICAR to coordinate, supervise, and implement actions regarding all aspects of plant germplasm management for the GOI. This authority is exercised through the Director General and the Council of ICAR. The five division Directors in the NBPGR provide guidance in their respective areas to affiliate institutions and oversee the work within these areas in the NBPGR. While still a relatively new organization, NBPGR has earned a good reputation as a progressive, accomplishment oriented entity and is considered by germplasm experts who worked on the design of this activity to be most capable of implementing this project successfully.

3. Staffing

6.46 The authorized number of NBPGR scientific and technical staff positions is currently 137. Positions which will be added in the Eighth Plan (1990-1995) will increase authorized scientific and technical positions to over 180. If all these positions are filled with experienced staff, their number and composition appear adequate to carry out the NBPGR program activities envisioned in this project. There are

45esently 123 scientific and technical staff on board. The Director is currently adding professional staff within his authorized levels only as such staff can be effectively used (about at the rate of one a month). Personnel quality is generally high and there are a considerable number of advanced degree holders as shown below. USAID anticipates that, with the expectation of sufficient budget, NBPGR staffing will reach over 80% of the projected Eighth Plan authorized staffing levels within two years may be at close to full strength of 180 in five years.

6.47 However, based on the preproject preparation work, USAID believes NBPGR may need to increase staff above authorized eighth plan levels in several areas, particularly general administration, finance, data management, exploration and tissue culture research. NBPGR has agreed to set up a Project Implementation Unit and provide it with the necessary staff and controls to utilize effectively project funds. To set up this PIU, NBPGR may have to sanction new positions or move a few people within its organization. This will be determined and a plan agreed to by AID prior to the release of the majority of project funds. Even so our expectations that the total additional increment in scientific and technical manpower levels to be of the order of 5% with actual administrative and data management staff increases of perhaps half a dozen professionals.

TABLE VIII
Actual Staffing July 1987 at NBPGR

Division	Ph.D.	M.S.	B.S.	Technicians	Total
Administration	1	-	-	1	2
Exchange	2	4	-	3	9
Exploration	4	8	-	3	15
Evaluation	17	24	-	11	52
Quarantine	10	7	-	7	24
Conservation	2	4	-	2	8
Tissue Culture	6	3	-	1	10
Medicinal Plants	1	-	-	-	1
Under Util. Plants	1	-	-	-	1
Other	-	1	-	-	1
Totals	44	51	-	28	123

Please note this table does not include information about numbers or qualifications of general administrative, secretarial, clerical or other support personnel, but these have been found to be reasonably sufficient except in the case of the yet to start data management.

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F. Environmental Analysis

1. Background and Determination

6.48 The PGR PID stated that, in USAID's opinion, the project qualified for categorical exclusion from further environmental action in accordance with USAID's environmental procedures set forth in 22 CFR 216.2 (c) (i) (ii) and 216.2 (c) (2) (ii). In the rationale for this opinion it was pointed out that the project would help preserve India's plant genetic resources and significantly enhance environmental protection through preservation of important wild and cultivated species. AID/W in 87 State 212053 (PID Review) informed USAID that an Initial Environmental Examination (IEE) would be required to discuss the possible movement of pests and pathogens which can occur in germplasm exchanges and to address environmental concerns regarding the proposed gene bank and headquarters facility construction. As the result of our IEE, USAID has made a determination that there will be no significant negative environmental problems caused by this project, to the contrary much positive good to the environment is likely, as explained in the next paragraph.

2. Pest and Pathogen Movement

6.49 USAID requested USDA/Animal and Plant Health Inspection Service (APHIS) to assess the environmental risk (i.e. movement of pests and pathogens) associated with the PGRP. The resultant APHIS report concluded that the intended equipment purchases, short-term technical assistance and consultancies, plans for construction of greenhouse and screenhouse facilities, and plans for training of Plant Quarantine Division personnel indicates the thrust of the program will not increase but significantly reduce the risk of pest and pathogen entry into India and thus contribute to enhanced environmental protection and preservation of biological diversity. These conclusions by APHIS were based on a review of the proposed activities for construction, equipment purchases, staffing, research, training, and short-term technical assistance. A comparison was made with the proposed activities in India and comparable activities conducted by APHIS personnel at the Plant Quarantine Facility (postentry greenhouse quarantine) and Plant Germplasm Quarantine Center at Beltsville, Maryland. Relevant portions of the APHIS report are included as Annex I (Indian Germplasm Facility - Environmental Analysis) and have been accepted by USAID as the IEE elements dealing with pest and pathogen movement. USAID agrees with the APHIS conclusions that the project will significantly benefit the environment through reduced risk of pest and pathogen movement.

3. Construction of Storage Facilities

6.50 The ICAR has provided the land on the premises of the IARI for construction of a new NBPGR headquarters facility in the gene bank. Some of this land is currently used for field research. Early generation and advanced lines of various crops are grown on this

land. During the off season the land is fallow. The land has been approved for the building as part of the IARI master plan. The Delhi Development Authority, the organization concerned with land use within the Delhi urban zone, has also approved the basic plans. We do not anticipate any significant negative environmental impact as a result of construction and operation of the gene bank building.

6.51 Engineering drawings and plans and other relevant documents will be reviewed by competent professionals to ensure that necessary precautions are to be taken in the construction of quarantine and fumigation facilities at headquarters and elsewhere. Additionally, plans will be carefully reviewed to ensure that proposed building operations will be able to follow environmentally sound procedures for isolation of pathogens, if any, and to ensure proper use, storage or disposal of toxic substances, if any, is done correctly (there will be small amounts of toxic substances used in experimental work as in the case of any Agricultural Facility that is conducting some research). In addition, all site plans will be reviewed to insure that proposed facilities, including greenhouses and screenhouses, are properly sited to minimize soil erosion and to avoid any potential contamination of surface and groundwater resources. The NBPGR headquarters construction activities will be monitored by a USAID engineer to ensure that proper environmental safeguards are followed during construction.

VII. CONDITIONS AND COVENANTS

A. Conditions Precedent to Disbursement

1. Conditions Precedent to First Disbursement

7.01 Prior to the first disbursement of funds, or to the issuance of commitment documents with respect thereto, the Grantee shall, except as the Parties may otherwise agree in writing, furnish to A.I.D. in form and substance satisfactory to A.I.D.:

(a) A written opinion of counsel acceptable to A.I.D. that this Agreement has been fully authorized and/or ratified by, and executed on behalf, of the Grantee, and that it constitutes a valid and legally binding obligation of the Grantee in accordance with all of its terms; and

(b) A statement of the name of the person holding or acting in the office of the Grantee specified in Section 8.2, and of any Additional Representatives, together with a specimen signature of each person specified in such statement.

2 Additional Disbursements

7.02 Prior to disbursement of the funds in excess of Seven Hundred and Fifty Thousand U.S. Dollars (\$750,000) which will be disbursed upon satisfaction of the initial Conditions Precedent (CPs) under the Grant, or prior to issuance by A.I.D. of documentation pursuant to which such additional disbursements will be made, the Grantee will, except as the parties may otherwise agree in writing, furnish to A.I.D. in form and substance satisfactory to A.I.D.:

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(a) A management plan, satisfactory to A.I.D., indicating the Administrative Approval or such other GOI approval(s) regarding the establishment and staffing of the Administrative Support Office (ASO) or Project Implementation Unit (PIU), including the appointment of the personnel who will head this office has been completed. This office will work under the direct supervision of the Director, NBPGR and will be professionally staffed so as to support the Project activities adequately. Upon receipt of this information, USAID will review in conjunction with the ASO/PIU, the contracting, payment verification and audit procedures and practices of the NBPGR to comply with its mandate in this regard; and

(b) A letter from the Additional Representative of the implementing agency concurring in the jointly developed final Scope of Work for Management Services contract that will be directly contracted by A.I.D. under the Project.

B. Covenants

7.03 Data Base Information Management Unit

Within 180 days from the date of signing this Agreement, the Grantee will furnish a management plan, satisfactory to A.I.D., for upgrading of the unit within NBPGR which is responsible for the computerized germplasm data base management system so that this unit can become fully functional by the completion of the project.

7.04 U.S. Training Plan

Within 180 days from the date of this Agreement, the NBPGR will provide A.I.D. with a copy of their U.S.-based Training Plan for the life of the project which covers the training requirements in such areas as: Quarantine; Exploration; Evaluation; Exchange and Information Management and other areas related to germplasm preservation.

7.05 Crop Advisory Committees

The NBPGR will confirm to A.I.D. in writing, that it will work closely with the established Crop Advisory Committees concerning the upgrading of germplasm collection.

7.06 Germplasm Collection

The Indian Council for Agricultural Research will assure A.I.D. in writing that they will continue to support and finance the existing germplasm collection activities after the Project is completed.

7.07 Project Evaluation

The parties agree to establish an evaluation program as part of the Project. Except as the Parties otherwise agree in writing, the program will include during the implementation of the project and at one more point thereafter the following:

(a) Evaluation of progress towards attainment of the objectives of the Project;

(b) Identification and evaluation of problem areas or constraints which may inhibit such attainment;

(c) Assessment of how such information may be used to help overcome such problems or constraints; and

(d) Evaluation, to the degree feasible, of the overall development impact of the Project.

VIII. Evaluation Arrangements

8.01 The project will be subject to one Initial Implementation and Planning Review, annual progress reviews, a major mid project evaluation, a probably routine end of project evaluation and an impact evaluation to be conducted 3-5 years after the PACD with mutual consent. The Implementation and Planning Review will take place shortly after all the Agricultural Research Project financed start-up activities have been completed or approximately June 1989. This is described in para 3.13. The first project Evaluation will cover all aspects of the project and will take place at a mutually agreed time after the project is 42 months into implementation, and not later than 54 months unless jointly agreed.

8.02 A Project Evaluation Summary will be provided to AID/W following the completion of the first Project Evaluation. In addition, at the end of the project USAID will conduct a standard End of Project Evaluation and prepare a Project Activity Completion Report (PACR) for transmission to AID/W. USAID will directly contract for any expatriate technical assistance required to conduct these Project Reviews and Evaluations. The costs of these direct USAID contracts will be funded from the project funds as noted in the Evaluation and Monitoring line item of the project budget.

8.03 The Annual reviews and periodic site visits will provide information on the timeliness and value of project inputs (i.e. technical assistance, training, construction, and commodities, etc.) flowing into the project. Also information generated from the Annual Reviews and the other monitoring visits will be used to provide background information for the Mid-Term and End of Project Evaluations and to make other appropriate recommendations to the GOI concerning the management and implementation of the Project.

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8.04 Subject to the availability of funding from other USAID/India sources or from other AID regional sources, the design team recommends that an Impact Evaluation be conducted approximately 3-5 years after the Project Assistance Completion Date. This would focus on the medium and long term impact of the project and provide guidance to Indian administrators and scientists as well as to AID and the donor community.

A. Output and Achievement of Purpose Questions

8.05 Evaluation efforts, inter alia, seek to determine to what extent the strictly quantitative objectives of the project have been met. The impact evaluation will also assess to what extent outputs have led to a strengthened and efficient germplasm collection system in all aspects.

1. Indicators

8.06 Indicators for facilities development, training, technical assistance and purchase of equipment include procurement plans, contracts awarded for services and equipment, and new NBPGR buildings and facilities completed at headquarters and regional stations. Greenhouse constructed, the number of scientists trained in India and the U.S., and the successful completion of training under the ARP program will all be considered in evaluations.

2. Data Collection Methodology

8.07 Data will be available from monitoring reports, the annual review reports, from any earlier project evaluation, and from administrative records maintained by the NBPGR. Data will include such items as funds disbursed, construction underway and completed, equipment purchased, and persons trained. It is particularly important for people conducting the annual reviews to report on measurable accomplishments qualitative and quantitative, so that evaluators will be able to judge project progress and to the extent possible, the impact.

(12) ACTION: AII-3 INFO AMB DCM POL ECON-2 SCI FAS-2 CHRON

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18-JUL-87 TOR: 05:06
CN: 52179
CHRG: AID
DIST: ALT
ADD: 380-513

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E.O. 12356: N/A
TAGS:

SUBJECT: PLANT GENETIC RESOURCES PID (326-2153) - ANPAC
REF: STATE 108210

THE ANPAC MET ON JUNE 18, 1987 TO REVIEW THE SUBJECT
PID. JOEL COFFIN, ST/ACHIEVER, WAS IN ATTENDANCE. THE
FOLLOWING ISSUES AND CONCERNS WERE DISCUSSED:

1. FY 87 VS FY 88 OBLIGATIONS: THE PROJECT WAS LISTED
ON PAGE 31 IN THE USAII/INDIA 1987 ACTION PLAN AS A
PROPOSED FY 88 MFA PROJECT. THE MISSION WAS INSTRUCTED
IN THE INDIA ACTION PLAN REVIEW CABLE, REFTEL NOT TO
FUNI PROPOSED FY 88 PROJECTS UNTIL THE NEW CDSS IS
SUBMITTED AND APPROVED. THE DECISION CABLE ALSO CALLED
FOR AN AGRICULTURAL SECTOR STRATEGY TO BE SUBMITTED TO
AID/W BY SEPTEMBER 30, 1987 AND A RESEARCH AND
TECHNOLOGY DEVELOPMENT STRATEGY BY DECEMBER. THE
MISSION IS PROPOSING TO DEVELOP THE PP IN JULY AND WOULD
LIKE TO OBLIGATE DOLS 1 MILLION FOR THE PROJECT IN FY
87, ASSUMING THE GOI APPROVAL CAN BE OBTAINED IN TIME.

DECISION: THE MISSION CAN PROCEED WITH THE DEVELOPMENT

OF THE PP FOR THIS PROJECT. HOWEVER, APPROVAL OF THE PP
AND AUTORIZATION WILL AWAIT AID/W REVIEW AND APPROVAL
OF THE AGRICULTURAL STRATEGY ASSESSMENT, UNLESS THE
MISSION CAN SHOW COMPELLING JUSTIFICATION FOR MOVING
FORWARD THIS FY AND GIVE ASSURANCES THAT THE GOI'S
APPROVAL CAN BE OBTAINED THIS FY. THIS DECISION IS
BASED ON THE NEED TO COME TO AGREEMENT ON THE OVERALL
LONG-TERM FOCUS OF AID EFFORTS IN THE AGRICULTURAL
SECTOR. WHILE THE SUBJECT PROJECT IS ATTRACTIVE, THERE
SHOULD BE CONSENSUS WITH RESPECT TO ITS FIT WITHIN THE
CADR STRATEGIC CONTEXT. ALSO THE MISSION SHOULD
DISCUSS WITH ICAR THE POSSIBILITY OF DEOBLIGATING FUNDS
ON ANY SUB-PROJECTS WHICH ARE MOVING SLOWLY AND USE
THESE FUNDS FOR PLANT GENETICS.

ANTICIPATED SLOW DISBURSING PROJECT: GIVEN THE
SLOW RATE OF DISBURSEMENT OF THE ON-GOING DOLS 22
MILLION ARP (ONLY DOLS 1.3 MILLION IN ACCRUAL

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RECENTLY OVER THE PAST FOUR YEARS, IT HAS BEEN CALLED
 A QUESTION OF CALIBRATION THAT THE PROPOSED PROJECTS
 BY THE SAME COUNTERPART AGENCY, ICAN, WHICH HAS BEEN
 DIFFICULT TO WORK WITH, WITH LIMITED FUNDS ANY
 STEP THAN ARE, ESPECIALLY SINCE THE PROPOSAL INCLUDES
 A CONSTRUCTION OF STORAGE FACILITIES.

IF THE DIRECTOR GENERAL OF ICAN SEEMS TO HAVE A
 SOCIAL INTEREST IN THIS PROJECT AND CAN BE EXPECTED TO
 BE AT HIGHER PRIORITY THAN OTHER RESEARCH SUBPROJECT
 APPLICANTS FOR AID FUNDING, TO WHAT EXTENT CAN BE
 ENCOURAGED TO ALLEVIATE THE MOST SERIOUS ADMINISTRATIVE
 PROBLEMS THAT PRESENTLY IMPEDS IMPLEMENTATION PROGRESS
 AND HELP AVOID SIMILAR ONES FOR PLANT GENETICS?
 ICAN BE ENCOURAGED TO DELAY IMPLEMENTATION PLANS
 THAT ARE AID PLANT GENETICS THAT WOULD INCLUDE TA,
 TRAINING, AND EVALUATIONS?

DESIGN: WHAT THE MISSION WOULD BE THESE POINTS IMPROVING
 WELFARE OF THE PP.

INSTITUTIONAL ANALYSIS: WHAT ARE THE INSTITUTIONAL
 FACILITIES/WEAKNESSES OF NEPCB, AND HOW WILL THE
 WEAKNESSES BE CORRECTED TO MEET THE OBJECTIVES FOR THIS
 PROJECT?

SYSTEM: THE MISSION SHOULD CONDUCT A THOROUGH
 INSTITUTIONAL ANALYSIS OF THE NEPCB IN THE PP.

CONCERNS: THE PP SHOULD ALSO SEEM TO RESOLVE THE
 FOLLOWING CONCERNS:

NEED FOR AN INITIAL ENVIRONMENTAL EVALUATION:
 DUE TO THE CONSTRUCTION OF STORAGE FACILITIES AND
 DISEASE IMPLICATIONS OF THE QUARANTINE ACTIVITIES,
 PROJECT IS NOT CATEGORICALLY EXCLUDED FROM FEDERAL
 ENVIRONMENTAL ACTION. AN INITIAL ENVIRONMENTAL
 EVALUATION WILL HAVE TO BE COMPLETED.

RECURRENT COSTS: THE PP SHOULD ESTIMATE IN SUITABLE
 ALL THE RECURRENT COSTS ASSOCIATED WITH THE PROGRAM
 DESCRIBE HOW THE PP AND MORE SPECIFICALLY THE
 RELEVANT INSTITUTIONS PROPOSE TO DEAL WITH THEM.
 WILL THE PROGRAM BE SELF-SUSTAINING AT ITS PACE?

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(12) ORIGIN: AID-3 INFO-AMB DCM POL ECON-2 SCI PAS-2 CHRON

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CLASS: UNCLASSIFIED
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DISTR: AID 7
ORGIN: OCR

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Proj. 386-0513

E.O. 12356: N/A
SUBJECT: PLANT GENETIC RESOURCES PROJECT (386-0513)

REF: (A) STATE 010745 (B) 87 STATE 212053

1. THE MISSION IS NOW IN THE FINAL STAGES OF THE DESIGN OF THIS PROJECT. NEGOTIATIONS ARE ABOUT TO COMMENCE WITH THE INDIAN COUNCIL FOR AGRICULTURAL RESEARCH. WE ASSUME THAT MISSION CAN PROCEED WITH PF APPROVAL AND AUTHORIZATION OF PROJECT SINCE PROJECT CLEARLY FITS IN MISSION'S DEVELOPMENT STRATEGY.

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2. DIRECTOR, ANE/TR, AND DIRECTOR, ANE/DP, ARE FULLY FAMILIAR WITH THE PROJECT CONCEPT AND ITS RELATION TO THE STRATEGY.

PRJ

CHRON

3. PLEASE ADVISE. STREEB

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CHRG: AID
DIST: AID
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Proj. 386-0513

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NO. 12356: N/A
TAGS: N/A
SUBJECT: PLANT GENETIC RESOURCES PROJECT (386 - 0513)

REF: NEW DELHI 11541

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LOGICAL FRAMEWORK

NARRATIVE SUMMARY	OBJECTIVELY VERIFIABLE INDICATORS	MEANS OF VERIFICATION	IMPORTANT ASSUMPTIONS
<p>Sector Goal</p> <p>To preserve India's rich sources of biological diversity for use in sustaining advances in agriculture</p>	<p>Measures of Goal Achievement</p> <ul style="list-style-type: none"> - Enhanced and expanded plant genetic resources collected, stored and used. - Expanded use of germplasm by plant breeders to develop improved agricultural varieties 	<ul style="list-style-type: none"> - GOI budget flows for genetic preservation - Requests for plant genetic resources (seeds, clonal material) 	<ul style="list-style-type: none"> - GOI continues to support plant genetic resources as priority activity - System enhancement through PGR will result in improvements in the agricultural and allied sectors.
<p>Project Purpose 1</p> <p>To assist India's efforts to fully develop the physical, administrative and technical resources of NBPGR so that it and the institutions it supports can manage professionally a national system which sustains all aspects of collection, preservation, evaluation and exchange of India's important plant genetic resources</p>	<p>Conditions that will indicate purpose has been achieved.</p> <p>End of project status</p> <ul style="list-style-type: none"> - Headquarters including all 5 divisions functioning effectively - Adequate staffing throughout system. - Regional stations functioning effectively with cold storage facilities and appropriate equipment - Gene bank storage facility operations, housing base collections 	<ul style="list-style-type: none"> - Site visits - Project evaluations, site visits - NBPGR records, site visits, monitoring Reports - Through computerized info system, site visits 	<ul style="list-style-type: none"> - All AID and GOI inputs arrive in timely manner - Construction is of good quality - International relations conducive for PGR exchange and collaborative ventures - GOI continued support through 7th and 8th five year plans.
<p>Corollary Project Purpose</p> <p>To enhance India's regional and global role in plant genetic resource preservation and use</p>	<ul style="list-style-type: none"> - Fully operating program training Asian & S. Asian & international participants leading to regional collaborative initiatives - Free and safe international exchange of germplasm - India playing lead role in plant germplasm conferences and workshops at regional & global level - Strengthened scientific links between U.S. and India 	<ul style="list-style-type: none"> - Site visits, Training center publications - Site visits, NBPGR records -do- - Joint programs in research exploration, training 	<ul style="list-style-type: none"> - India continues to be a center for exchange of germplasm and information concerning germplasm

NARRATIVE SUMMARY	OBJECTIVELY VERIFIABLE INDICATORS	MEANS OF VERIFICATION	IMPORTANT ASSUMPTIONS
Outputs 1. Strengthened NBPGR national/regional network	Magnitude of Outputs - Inventory of T2T completed-working collections completed, 300,000 accessions stored under proper conditions - Adequate staffing in the system - Tissue culture storage techniques significantly improved	- Through computerized into system - Site visits - NBPGR records - Project evaluations - USAID reports	- GOI continued support through 7th and 8th five year plans of recurring and incremental costs - NBPGR and cooperating ICAR institutes adequately staffed. - India continues to support free exchange of germplasm
2. Establish high quality National Gene Bank	- Base collections-500,000 accessions stored in genebank under proper conditions - Base collection storage capacity for 600,000 accessions in place - Plant exploration - and additional 75,000 accessions collected and stored in genebank	-do-	-do-
3. Strengthened NBPGR information system	- Information on DOI or stored accessions in national germplasm data base	-do-	-do-
4. Establish & strengthen quarantine stations for seed examination for pests and pathogens	- 4 stations - Delhi, Hyderabad, Andaman & Nicobar islands, Foothills operational	-do-	-do-
5. Expanded human resources/scientists capable of training NBPGR staff and international participants	- 50 trained scientists training more than 300 Indian locals & other international students	-do-	-do-
6. Strengthened and more productive interaction of India's PGR system with International PGR systems	- Collaborative initiatives in researches, exchanges, exploration and training.	-do-	-do-

Inputs	Implementation Target (Grant Inputs)				
	AID	GOI	TOTAL		
USAID					
- Grant \$13.0 million	2,650	5,400	8,050	- AID invoice/documents	- Project is adequately funded and staffed
- Staff Time	5,000	500	5,500	- On-site verification	- GOI processes "not-manufactured-in India certificate"
	800	100	900	- NBPGR documents	- GOI obtains customs clearance.
	1,200	200	1,400	- PIO/P and USDA/OICD/ITC document	- Consultants available
	1,300	1,400	2,700	- Consultant reports	- GOI's timely processing of plans
	1,800	1,010	2,810		- USAID provides adequate implementation/administrative support.
	<u>13,000</u>	<u>8,660</u>	<u>21,660</u>		

GOI
 - Incremental funds of \$8.66 million
 - Management Assistance
 - Land for Headquarters

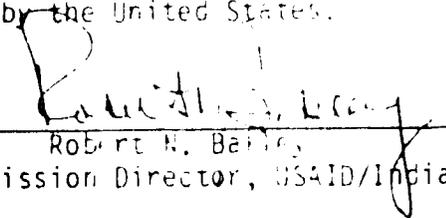
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I N D I A

PLANT GENETIC RESOURCES PROJECT
(386-0513)

Certification Pursuant to Section 611 (e) of
The Foreign Assistance Act of 1961, as Amended

I, Robert N. Bakley, principal officer of the U.S. Agency for International Development in India do hereby certify that in my judgement the Government of India has both the financial capacity and the human resources to carry out, utilize and maintain this project effectively. This judgement is based upon the analysis contained in the Project Paper, as well as the successful maintenance and utilization of projects in India previously financed or assisted by the United States.



Robert N. Bakley
Mission Director, USAID/India

August 30, 1988

Date

PROJECT ANALYSIS

I. Technical Analysis

A. Historical

The NBPGR had its origin in 1946 when a Section of Plant Introduction was established in the then Division of Botany of the Indian Agricultural Research Institute (IARI). It became a full-fledged Division of Plant Introduction at IARI in 1961. This Division was administratively separated as the National Bureau of Plant Introduction (renamed in 1977 as the National Bureau of Plant Genetic Resources, under the direct control of ICAR).

NBPGR's mandate is to: 1) coordinate the country's programs in the collection, evaluation, and preservation of plant germplasm, 2) collect and disseminate germplasm information, 3) conduct research on maintenance methodology, and 4) develop an effective quarantine system for plant germplasm entering or leaving the country. The mandate is broad; the NBPGR's physical, technical and administrative resources need strengthening to build an institution that can effectively collect, evaluate, and conserve India's vast wealth in plant genetic resources. To be effective the institution must among other things interact with a number of other agencies, including those in the private sector that use plant germplasm.

B. Anatomy of a Plant Genetic Resources System

An integrated plant genetic resources system includes the following program functions:

- 1) Acquisition
 - a) collection
 - b) exchange
- 2) Evaluation
- 3) Conservation
- 4) Information Management
- 5) Enhancement
- 6) Training
- 7) Plant Quarantine
- 8) Assessment of Genetic Vulnerability of Crops

- 1) Acquisition
 - a) Collection

The NBPGR, and its predecessor organizations, have an impressive history in plant germplasm exploration, collection, and exchange. Indian scientists, since the last part of the 19th century, have recognized that the country's rich diversity in agro-climatic zones and its very long history of plant selection and crop improvement have endowed the country with a rich heritage of diversity in plant genetic resources.

The native genetic resources of Indian centers of diversity are found in eight phytogeographical/agro-ecological provinces. Here a variable array of biotypes, forms, land-races, and primitive varieties of cereals, millets, legumes, vegetables, fruits, oilseeds, fibers, sugar sources, spices, condiments, and many plants with medicinal properties are found. In addition these same zones support some 320 species that are the wild or weedy relatives of crop plants. The NBPGR publication, Plant Genetic Resources - An Indian Perspective, Paroda, R.S. and R.K. Arora, NBPGR Sci. Monogr. No. 10, 1986, provides details on the genera and species involved and also reports exploration and collection activities for the years 1976-1985.

Indian agriculture, and indeed the world's agriculture, stand to benefit from the germplasm exploration and collection efforts already made within India. To continue this important but far from completed work, the resources of the NBPGR and its collaborators should be increased through this project so that timely rescue and conservation of these genetic resources can be accomplished. This activity must receive the NBPGR's highest priority.

The NBPGR has a 5-year rolling plan for exploration and collection. The project provides vehicles, collecting equipment, and camping gear for extended collecting trips in remote areas. These collecting trips should also be used to obtain more habitat-related data and to evaluate new field collecting technology for clonal materials.

The In Vitro Committee of the IBPGR in publication AGPG: IBPGR/83/108, June, 1984, in the "Potential for Using In Vitro Techniques for Germplasm Collection," makes some very useful recommendations regarding use of in vitro methods for collecting and conserving recalcitrant seeded plants and clonally propagated plants.

The guidelines and references provide the amounts and kinds of propagules to be collected. This publication also identifies researchable problem areas that need to be addressed in the collection and conservation of clonal germplasm.

The use of in vitro techniques in field collecting significantly broadens the plant exploration and collection plans for rescuing endangered germplasm. Because clonal propagules have been difficult to collect and preserve until given proper care in a laboratory, species that must be clonally propagated or which have recalcitrant seed have largely been neglected in collection and conservation activities. The NBPGR Plant Exploration and Collection Division in cooperation with the National Facility for Plant Tissue Culture Repository and the Conservation Division will work on research and application of research results with these important crops.

During the 10-year period of 1976-1985, the NBPGR carried out 106 collecting expeditions in six (6) phyto-geographic regions designed as high priority because of wealth in genetic diversity and endangered species due to shifting land-use patterns. These regional explorations yielded 48,326 accessions. During this same 10-year period, the NBPGR mounted 69 crop-specific explorations that yielded 11,227 accessions in 23 crops and crop groups. This ambitious decade for exploration and collection in India enriched India's genebanks by 59,553 new accessions.

If this level of effort is maintained during the 7 years of this cooperative project, then we would expect a total of about 175 collecting expeditions (25-30 per year), yielding about 60,000 new accessions of species that, most importantly, heretofore have been inadequately explored. This is a worthy goal.

b) Exchange

In the decade 1976-1985, NBPGR had exchange links with about seventy different countries. Over that period those exchange partners sent India 732,990 accessions of germplasm and India sent out 45,399 accessions. This imbalance is significant but does nevertheless reflect an active free exchange program. Through this project, which will permit India to enhance its exploration and collection, its plant quarantine system, and its evaluation of germplasm accessions now in her genetic resources system, it is expected that the exchange function will also be materially enhanced.

2) Germplasm Evaluation

Because of the wide distribution, both geographically and administratively, of the elements of the NBPGR's program, it is difficult to track all evaluation activity. Considerable evaluation is going on but much of it is focused on the immediate objectives of plant breeding projects. These objectives are frequently focused on genes for resistance to insect and disease pests or on adaptation to environments of specific production areas.

These kinds of evaluations must be done, but too often the results are not widely communicated and/or too specific to be of general use by other breeders, domestic or foreign.

Evaluation of germplasm is a never-ending process. The range of possible interactions between genotypes and environments is at this time, to all extents and purposes, infinite. No plant genetic resources system can be expected to do more in the way of germplasm characterization than to provide reliable information on plant morphological features that have a high level of constancy across environmental variables and the general ecogeographic areas of adaptation. As for germplasm evaluation, a genetic resources system must content itself with obtaining reliable data on a crop-specific set of characteristics that is the most useful to the

most breeders. This information will help a breeder select accessions of promise for his breeding program. He can then focus on the in-depth, specific evaluations for his particular breeding objectives.

Under the project the NBPGR will set up a Crop Advisory Committee (CAC) for each crop or crop group for which there are active breeding programs. These CACs would assist in identifying germplasm needs that could be met through exploration and/or exchange, descriptors or characteristics that should be evaluated, and deciding who among the breeders could participate in the evaluation process and at what cost.

Also under the project the NBPGR, with advice from the CACs, will organize a 5-year rolling plan for evaluation of germplasm accessions of each crop and reporting of results on a timely basis. These will provide the means for tracking progress and identifying future needs for staffing, equipment, and training.

It is evident that a stepped-up program of germplasm evaluation will require additional tillage and planting equipment, pollination control supplies, small plot harvesters, seed cleaning equipment, and additional technicians and laborers.

No plant genetic resources system is apt to have a sufficient budget to permit evaluation of germplasm of all crops simultaneously. Priorities will have to be set which will be the basis for scheduling sequential evaluation research of a few crops at a time. When evaluation has been completed on one set of crops, the funds would be rolled-over on another set of crops, leaving some funds behind for evaluation of new accessions as they come into the working collection.

3) Germplasm Conservation

Of all the functions that comprise a plant genetic resources system, conservation is often the weakest link. This situation is usually not the fault of scientists and managers in germplasm conservation posts but rather a matter of budgets. Seed and clonal germplasm conservation facilities and equipment have high initial costs. Operations and maintenance costs are also high in comparison with those of other functions in the germplasm system.

While some of these costs may be avoided or reduced through prudent management decisions and actions, the savings will not be large if safety of the germplasm remains the primary objective.

Consolidation of facilities, equipment and staff appears to offer the most hope for effecting significant cost reductions. There is no priori requirement (unless it is an administrative one) that active collections be located at a station or stations where breeding research on that crop is being done. Breeders are usually very busy with their own research and often are not interested in getting involved in germplasm evaluation and conservation matters even though their knowledge of the biology of the crop would be valuable to both functional areas.

Aggregating working collections of a crop or crop group could require a full-time, well trained curator rather than several part-time curators and could reduce the number of sets of seed storage units and back-up generators. Equipment such as seed dryers, seed germination cabinets, seed cleaners and counters could be materially reduced along with equipment maintenance costs. All of this implies more efficient, careful control of collections and greater security of valuable germplasm.

The possible additional costs of shipping requested seed samples to breeders from these consolidated collections is estimated to be much less than that of equipping and maintaining an excessive number of active or working gene banks collections.

The NBPGR has plans to begin aggregating some of the working collections to achieve better coordination and reduce conservation costs. Such consolidation will be preceded by inventories of the collections involved and an assessment of quantity and quality of seed in each accession. Those accessions having ample seed of good germination levels will be divided to provide a sample for the base collection at New Delhi, if needed.

The Director, NBPGR, has plans in hand for sending a team consisting of an engineer and a gene bank manager to each location to assist in the assembly and operation of key seed storage units. This foresighted planning is commendable and should minimize difficulties in putting the new units into effective use.

There is no question about the need for adequate, reliable seed storage facilities at locations responsible for working on base collections of seed-propagated crops. The needed size of such modules and the size of stand-by generators to insure continuous operation of the modules must be carefully reexamined before the project actually gets underway and in the light of prepared aggregation of collections.

Germplasm collections are classified under two categories according to their current status in a plant genetic resources system. Those accessions that are readily available for use by plant breeders or other users of germplasm are maintained in "active" or "working" collections. An active collection is similar to a checking account in a bank - it is available for withdrawal as needed. The other category of collections is called a base collection. A base collection is similar to a savings account in a bank. These "funds" stay in the bank and are withdrawn only to start an active collection or to replenish an accession that has become exhausted to a level where it is no longer representative of the original accession in terms of genetic composition. Breeders draw upon active collections for their germplasm needs. Active collections draw upon base collections and new acquisitions to have germplasm of current use to breeders.

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Active collections are maintained in seed storage facilities where the recommended storage environment is 5°C and 30% (or lower) relative humidity. Seed to be placed in an active collection should be dried to 5% moisture, then hermetically sealed in vapor-proof foil bags. This storage environment will permit retention of viability levels in excess of 80% for 15-20 years for most seeds sown as field crops. This preservation mode is called medium-term storage.

Base collections of seed consist of accessions that have an initial germination rate of 90% or higher, seed moisture of 5-7% and 500g. or more of seed. The seed is stored in vapor-proof foil bags, hermetically sealed and stored at -20°C. This storage environment should permit most seed to be stored for 50-100 years without significant loss of viability. This preservation mode is called long-term storage.

Research and pilot studies are in progress in the United States to evaluate and test assumptions regarding life span and genetic integrity of seed of many species subjected to liquid nitrogen storage for varying periods of time. Research also is evaluating the use of a number of different cryoprotectants to reduce damage to the seed during the immersion process. Costs involved with this storage mode are being documented, but more experience is needed before this type of system is recommended for general use. The NBPGR, under this project, will undertake research to evaluate seed storage in liquid nitrogen as an alternative for India to environmentally controlled seed storage modules of the conventional type.

Clonal germplasm is also maintained in active or working collections. These can take the form of clonal repositories (also called field gene banks) where a number of individuals of each accession are maintained in orchards established in agro-ecological habitats to which the species are well adapted. Many germplasm biologists consider these to be active collections only and not qualified to be called base collections. Or, for some crops, the maintenance mode may be storage of roots, rhizomes, tubers, corms or bulbs at temperatures maintained above freezing (5°C to 10°C) with the humidity controlled to prevent desiccation or rotting.

Recent and on-going research has demonstrated that clonal germplasm, of at least some crops, can be stored in active collections in the form of leaf tissue, stem cuttings, callous tissue, pseudo embryos, and meristems. Too, research now suggests that some clonal germplasm can be conserved in vitro under cryopreservation. This latter preservation mode may permit its recognition as meeting all requirements of base collections.

Under this project NBPGR will undertake research to evaluate the feasibility level and technology needed to conserve clonal germplasm in a cryopreservation mode.

Conservation biology as it relates to seed and clonal germplasm still requires a great deal of research, but because conservation is costly, it attracts the attention of budget-conscious lawmakers and

administrators. However, research into all aspects of germplasm conservation is needed if costs are to be minimized while safety and genetic integrity of these irreplaceable resources is improved. Security of the germplasm must be the first consideration. We cannot risk the loss of genetic diversity, especially when we know so little about the nature and extent of that diversity. This paradox can only be mitigated through an efficient, integrated national plant genetic resources system that defines and emphasizes program priorities, protocols and practices that work to assure safety of genetic resources at least cost. This project on plant genetic resources will materially assist India in developing such an integrated national system. Necessary facilities and equipment for germplasm conservation and research on improved methods of conservation are many and costly. Conventional seed storage modules and back-up generators to insure their continuous operation cost \$60,000 to \$100,000 per set, depending on size of the storage module.

In addition, seed germination chambers, seed drying rooms, continuous recording temperature/humidity sensors, microscopes, electronic seed moisture analyzers, stainless steel cryopreservation tanks, etc., are all essential to safe, efficient operation of seed conservation facilities.

Research on conservation of clonal germplasm also requires sophisticated facilities and equipment. Environmentally controlled greenhouses and growth chambers, cryopreservation tanks, low temperature microtomes, microscopes, precision weighing devices, transfer chambers, and ultracentrifuges are all expensive and all essential.

4) Information Management

Information management is the "central nervous system" of a plant genetic resources system. It is the principal communication link among all participants in the system. Information management must be staffed with information specialists who also know the capabilities of computer hardware and software and the compatibilities or non-compatibilities among them. The objective is, of course, to have compatible hardware and software throughout the system.

A computerized information system must be programmed to accommodate data bases in the following fields:

- taxonomy and nomenclature
- association of identifier numbers where more than one accessioning system has been in use
- passport data
- characterization and evaluation descriptors, rating scales, and data
- location in the system
- maintenance data and schedules
- user requests and response records
- inventory of quantity and quality of seed in each accession

- germination testing history and schedules
- regeneration schedules
- patterns of use of accessions

Information management must be designed and controlled from Bureau headquarters. If outlying stations are permitted to design and implement their own systems, they will surely not be inter-compatible to a desirable degree. NBPGR should plan its data management system for germplasm in such a way as to link into the global germplasm information network.

Under the project information management will be given division status, if possible. An information management division would have line responsibility for seeing that the information needs of all NBPGR units, including management, were being met in a timely, effective manner and in accordance with Bureau policies and priorities.

Before the project officially begins USAID/India will provide training funds for two NBPGR staff members to spend four months together at the Germplasm Resources Information Network (GRIN) headquarters at Beltsville, Maryland, and some time at several remote sites in the GRIN system to gain instruction and hands-on experience in a national information management system with a central data-base management group. These trainees would then be expected to train information specialists in the NBPGR network.

Several months later a GRIN headquarters staff person will spend 6-8 weeks in the NBPGR helping to modify a GRIN-type system to fit India's requirements.

Meanwhile, USAID/India and NBPGR staff should be assessing the availability in India of computer hardware/software packages and maintenance contracts.

5) Germplasm Enhancement

This function involves cytogenetic/genetic research on moving desirable genetic traits from exotic germplasm into improved lines having good agronomic characteristics. Some prefer to call this activity "pre-breeding." The objective is to provide breeders with germplasm pools that give them new sources of genes and combinations of genes that will permit them to achieve the phenotypic expressions needed to meet their breeding objectives and at the same time contribute to reduction of genetic vulnerability of the crop to biotic and abiotic stresses that may characterize large, uniform production areas where monoculture is the rule.

This research opportunity is usually well received in departments of botany, genetics or plant breeding in agricultural universities. Carefully chosen projects in germplasm enhancement can be attractive subjects for M.S. and Ph.D. thesis.

While this function facilitates the use of genetic diversity in breeding programs and will ultimately become more and more essential in plant genetic resources programs, it can be deferred until necessary funding is available through the GOI budget process. It should be given high priority in future budget requests of the NBPGR.

6) Training

Germplasm biology and management of germplasm functions are not subjects generally available through college curricula. Specialized training, in addition to basic education in the biological sciences, is needed for most scientists and technicians seeking careers in a modern, integrated plant genetic resources system.

Training in biological and computer laboratories is abundantly available and can have direct application in genetic resources programs. However, training opportunities are very limited for the field aspects of exploration/collection, evaluation, and conservation.

Countries such as India that are endowed with rich sources of plant genetic resources distributed over ecogeographically diverse areas are in an enviable position to provide training in those field aspects of germplasm biology. The fundamentals of in situ conservation, evolution gardens, and in-depth ecogeographic studies are yet to be articulated through any training courses.

Under the project the NBPGR will develop training courses emphasizing, but not restricted to, field oriented aspects of plant genetic resources work and implement these plans through an international training center (ITC) at NBPGR headquarters in New Delhi. It is envisioned that such a training center would be largely self-supporting through tuition fees, sponsorships, and grants-in-aid. Consideration should also be given to establishing graduate degree programs at IARI in cooperation with the NBPGR.

Training facilities would require a lecture room equipped with audio-visual aids and one or more demonstration laboratories; field exploration and collecting would require such equipment as jeeps, collecting equipment and supplies, camping equipment, cameras, binoculars, and plant presses.

For students attending the ITC to take full advantage of their limited time in New Delhi, it is recommended that a small hostel, accommodating up to 35 students, be constructed near NBPGR headquarters on the IARI campus at Pusa. This would also reduce the need for high per diem allowances while students are in Delhi.

Training in field exploration/collection could start within two years. Other courses could be added as planning and demand dictate.

7) Plant Quarantine

Plant germplasm is widely exchanged among countries and all countries benefit from such exchanges in terms of crop improvements leading to remarkable increases in food production. But exchanges between genebanks also increase the risk of exchanging pathogens, weeds, and insects. So that germplasm exchanges can continue uninterrupted - and even be expanded - all donor and receiver countries must institute safeguards against sending or receiving infected or infested germplasm samples. Effective, non-destructive measures are available for greatly reducing this risk while improving the survival rate of germplasm in the quarantine process.

To improve quarantine services and safeguards, research is needed on: reliable methods for detection of infected or infested germplasm accessions; safe, rapid, and effective methods of destroying pathogens and insects in all life-cycle stages, viruses latent and expressed, and plant nematodes in plant material or in accompanying soil or packaging; and research on improved technology for rescuing the germplasm involved and getting it to the requesting scientist as quickly as possible.

Such research requires modern, specialized equipment such as environment-controlled glasshouses, screenhouses and growth chambers, soil sterilizers, fumigation tanks, soft X-ray equipment for non-destructive examination of seed and other plant parts, heat therapy equipment, pesticide applicators and safety equipment, and post-entry quarantine greenhouses and nurseries.

Quarantine scientists and technicians require specialized training in identification of native plant pathogens, insects, nematodes, viruses, weeds and these same categories of organisms that are not known to occur in their country but are known to be destructive of crop health and yields elsewhere. They also have to become familiar with known, effective controls and eradication methods for these potential invaders.

8) Assessment of Genetic Vulnerability of Crops

When more and more plant breeders use the same basic germplasm in developing new varieties of a given crop, that crop in a given production area can become uniformly vulnerable to attacks by disease and insect pests. This provides a situation conducive to rapid development of such pests to an epidemic level. The varieties may also be rather uniformly susceptible to abiotic stresses such as drought, temperature extremes, soil pH, and aluminum toxicity.

If, however, farmers in a given production area grow a number of equally productive but differing varieties, the various gene combinations will confer resistance to the same common pathogens, insects, nematodes, and viruses. The region as a whole will not then suffer devastating, epidemic-level losses. Teams of knowledgeable crop breeders or crop

advisory committees should periodically review the varietal makeup of a crop in a production area of a uniform crop ecology to assess the genetic vulnerability of that crop to insects and diseases known to occur in the area and to have the potential for epidemic-level spread.

The NBPGR is aware of the need for periodic assessment of genetic vulnerability in at least selected major crops.

II. Financial Analysis

USAID funds are never directly disbursed to the executing agency. The executing agency usually will set budgets, then spend rupees according to the levels established in the Five Year Plan. The executing agency then submits reimbursement vouchers to USAID, which in turn reimburses the Department of Economic Affairs of the Ministry of Finance.

The National Bureau for Plant Genetics Resources derives its planned budget allocations through the ICAR's plan submission to the Government of India's Planning Commission. The Government of India finances all activities of ICAR through 1) outright grants-in-aid and 2) receipts of the Agricultural Products Cess Fund. In order to give the ICAR a degree of operational flexibility and speed in project implementation, aside from line item budget allotments the GOI also allots a fairly substantial lump sum grant to the Council every year. The Council can use this "lump sum" for new or expanded programs. The Council can also economize on certain items and reappropriate funds for other purposes within its charter, as long as the total outlays do not exceed the approved outlays in any Five Year Plan.

A. USAID/NBPGR Plant Genetics Resources Project under India's Seventh Five Year Plan (1985-1990)

The timing of this project is excellent because it coincides with the GOI's mid-term review of the Seventh Five Year Plan. The financial projections in this project require higher levels of rupee participation by the ICAR. Consequently, ICAR will have the opportunity to account for the higher outlays needed during this review period.

The Plant Genetics Resources project, which will be administered by the NBPGR, is one of 194 schemes funded by ICAR under the Seventh Five Year Plan. The GOI project documents call for "the strengthening of the activities of the National Bureau of Plant Genetic Resources relating to collection, maintenance, documentation, utilization and conservation of germplasm resources." The total projected funding levels proposed to carry out the scheme during the Seventh Plan are as follows:

	Rupees in Lakhs	
A. Recurring Expenditures:	Plan	Non Plan
a. Pay Allowances	101.88	270.00
b. T.A.	5.00	5.00
c. Contingency	80.00	95.00
Total (A)	<u>186.88</u>	<u>370.00</u>

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B. Non-Recurring

a. Equipment	71.94	-
b. Works	166.00	-
c. Land	-	-
d. Vehicles	20.50	-
e. Library Books	4.00	-
f. Livestock	-	-
g. Others	-	-
Total (B)	<u>262.44</u>	<u>-</u>
TOTAL (A&B)	449.32	370.00

The actual approved Seventh Five Year Plan level was set at Rs. 394 lakhs (39,400,000) or about U.S.\$ 3,127,000 for the five year period. The total sanctioned level for the year 1987-1988 is Rs. 926,900. The shortfall occurring between the proposed budget and the actual sanctioned budget can be made up through foreign aid grants, and this is encouraged.

B. The Plant Genetics Resources Project under the Eighth Five Year Plan (1990-1995)

Toward the end of the second implementation year of the PGRP, the NBPGR will be required to begin extensive planning for the Eighth Five Year Plan. This presents a good opportunity to commit the ICAR to the expenditures required for the five remaining years of the PGRP. As projected in the implementation plan, the Eighth Plan will coincide with the full-scale construction of the central gene bank and the drawing together of a national germplasm system after relatively high levels of equipment and manpower training have entered the system. The result will be higher demands for new levels of recurring expenditures to add to the present ones.

Projected resources required under the Eighth Plan are indicated on the financial tables in section 3.0.

C. Budgeting Procedures for Institutes and Universities Other Than the NBPGR

Much of the activity during the course of this project will involve upgrading and consolidating some 121 regionally located germplasm collections scattered throughout India in various agricultural institutes and universities. The NBPGR's role among these ICAR and non-ICAR institutions is to coordinate this task. In some cases, it does not have direct responsibility or control over these collections or institutes. The work in each existing collection will require operating funds; it is therefore imperative that the following procedures be followed to ensure adequate funds to carry out this germplasm work in institutes outside the NBPGR network.

1) For ICAR Institutes:

ICAR, through guidelines issued by the NBPGR, should instruct all of their germplasm-holding institutes to include working capital in their

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annual budgetary submissions to carry out the germplasm consolidation work. The budgetary submission should account for adequately trained staffing to carry out such work or for covering NBPGR training costs in Delhi.

2) For Non-ICAR Institutes:

The ICAR Director-General should establish the same budgeting procedures with the heads of these institutes.

3) NBPGR should also include in its annual budgetary submission a line item for a technical assistance fund. This fund should enable NBPGR to assist technically these other institutes in setting up storage facilities and in evaluating their present germplasm holdings. The fund should be flexible enough to allow the NBPGR director to absorb some of the operating costs relating to the germplasm activities should an emergency or unforeseen costs arise.

D. Financial Management

The NBPGR will establish a full project management unit responsible for the bulk of the financial planning. A senior manager will report directly to the NBPGR Director, and under this manager will be an accountant and a bookkeeper. Critical to this planning is the timely submission of the yearly budgets that take into account the additional infusion of the USAID project inputs. Other planning functions linked to this project are: 1) planning for the higher spending levels that will be required in the Eighth Five Year Plan to satisfy the increased operating and staffing costs of a fully operational national germplasm system; 2) planning for costs such as customs duties and inland transportation for the equipment of U.S. origin; 3) processing USAID reimbursement vouchers and accounting documents; 4) securing waivers (Not-Made-In-India certificates and duty-free status for scientific equipment); and 5) operating expenditure feedback to the NBPGR Director.

E. Audit Procedures

NBPGR will implement the project under the overall guidance and supervision of ICAR, a semi-autonomous research institution established by the Government of India. The annual budgets of ICAR as well as its various satellite institutions, including the NBPGR, are part of the GOI plan and budget processes. They are subject to the contracting, payment verification, and audit procedures and guidelines prescribed by the Government of India for such institutions. As is repeatedly asserted in USAID's submissions of 'Mission Financing Policy and Procedures,' USAID has reasonable assurance, based on its thirty-odd years' experience, that the GOI and its institutions have the necessary financial and management capability to implement projects.

ICAR has been actively involved in the implementation of various USAID projects and is currently carrying out several USAID-financed development activities under the Agricultural Research Project (665-0470). Although USAID has had no association with the NBPGR, the

fact that the project will be initiated and implemented through and under the broad supervision and guidance of ICAR is enough assurance of a smooth operation. Project reimbursements, as usual, will be made to the Ministry of Finance, Government of India, which reviews and endorses ICAR/NBPGR vouchers for reimbursement. ICAR and NBPGR are both subject to the normal GOI audit processes. This project, like all other USAID projects, will have the standard audit provision that will allow the USAID inspector general to exercise his right to audit the project operations, but no separate funds are being earmarked for non-federal audit purposes.

Methods of Implementation and Financing

<u>Method of Implementation</u>	<u>Method of Financing</u>	<u>Approximate Amount</u> (U.S. \$000)
Construction - HC local contracts	HC Reimbursement	\$2,650
Equipment - HC local contracts	HC Reimbursement	3,000
USAID contracts/POs	Direct Pay/L. Com.	2,000
		<u>5,000</u>
Training - PIO/Ps HC local contracts	Direct Pay HC Reimbursement	700 100
		<u>800</u>
TA - Short-Term Consultants	Direct Pay	700
Collaborative Research	Direct Pay HC Reimbursement	400 100
		<u>500</u>
Evaluation/Monitoring	Direct Pay	250
Project Implementation and Administrative Support	Direct Pay	1300
Contingency & Inflation	1,800
	TOTAL	<u>13,000</u>

III. Economic Analysis

The project does not have a predictable investment-return cycle. Given its nature, it is not possible ex ante to quantify its economic benefits. The benefits of germplasm collection are directly manifested in varietal improvement - in the development of crop varieties with desirable characteristics such as high yield, resistance to moisture stress and pests and diseases. As these varieties are increasingly used, the benefits pass on to farmers and consumers. Broadly speaking, the larger the collection of germplasm, the greater the chance that

economic gains will be substantial. But there is no certainty that the collection, however large, would contain the germplasm that would lead to successful synthesization into superior varieties. Ex ante assessment of benefits from projects with uncertain outcomes such as this can be made only on a priori grounds. Such qualitative assessments are made on the basis of evidence of role played in the past by germplasm collections in crop improvement. Some such estimates have shown that as much as 50% of the increase in yields are due directly to genetic improvement.

Exotic germplasm has received widespread attention in recent years for its role in setting off the Green Revolution in India. The development of short-stemmed wheat varieties from the dwarfing gene of Norin 10 has been well documented as has the development of dwarf rice IR-8 at the International Rice Research Institute. Their introduction in India in the mid-sixties led immediately to agricultural growth and modernization. However, indigenous germplasm has played an equally important role in India by providing suitable material for crossing and developing a large number of popular high-yielding varieties. Rice improvement programs in India, for instance, employed hundreds of indigenous varieties in crosses with the dwarfs TN-1 and IR-8 to produce selections, such as Jaya, with high yield potential.

Because of their narrow genetic base, the new varieties of cereals tend to be increasingly vulnerable to pests and diseases. The strategy needed to tackle this ever present risk of crop disaster involves breeding varieties with genes for resistance taken from wild relatives of these crops and their traditional cultivars. This is essentially a strategy of risk insurance and requires an adequate stock of germplasm. The economic value of such a strategy only becomes obvious during times of crop disaster and emergency, and the payoffs are often very great. The importance of preserving genetic diversity and expanding the available stock of indigenous germplasm for this purpose is demonstrated by the case of the Indian pearl millet breeding program in the early seventies after the popular varieties became susceptible to mildew and ergot. Back crossing with Indian sources, Indian scientists were able to develop varieties with good resistance to both diseases.

Substantial gains can be realized directly from germplasm collections; however, it is not clear what part of the benefit is attributable to an investment in germplasm conservation. It is simply a given that germplasm is an essential and integral component of agricultural research and development, and a sustainable agricultural system cannot exist without it.

The project's economic justification is the same set of considerations that justify investment in agricultural research. Briefly, these are: 1) Organized agricultural research is an important part of the process of modernizing agriculture throughout the world; it results in crop improvement and in the increase in the production of food and fibre. 2) Its benefits flow to the farmers initially in the form of reduced per-unit-costs of production and greater income; but benefits

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ultimately move to the consumers in the form of lower real prices of agricultural products. 3) Agricultural research has proved to be highly productive, instances of failure notwithstanding. The rates of return on investment in agricultural research, as a number of ex post studies have shown, have been greater than the normal rates of return from investment in many physical capital projects. This has been established for developed countries. Some studies indicate that the rates of return from investments in agricultural research are even higher in developing countries, suggesting an under-investment in this area. Estimates for India show rates of return varying between 40 and 70 percent (R.E. Evensen and Dayanath Jha). Widening the Indian research base by enhanced collection of germplasm and other related activities would ensure that these rates of return are sustained over time.

The benefits of this project will extend beyond India's frontiers to the international research centers around the world and to other countries through free germplasm exchanges. The National Bureau of Plant Genetics Resources has so far received germplasm from about seventy-five countries over the last ten years; it has also provided germplasm to about fifty-two countries including the developed countries of Canada, United States, United Kingdom, West Germany, France, Japan, Sweden, Switzerland, and Denmark. The use of Indian germplasm for crop improvement and in risk reduction is well known.

IV. Social Soundness Analysis

The benefits accruing from the Plant Genetics Resources Project can be analyzed in terms of various segments of the population, in terms of the short - and long-term benefits, and in terms of various structural levels: individual, group, institutional, and the population at large.

A. Benefits to the Population at Large

The demands placed on the Indian agricultural sector by the food requirements of an already large and rapidly growing population are well known. This project, by preserving the existing diversity of germplasm and facilitating new germplasm acquisitions, will result in plant varieties with higher yield and greater pest resistance. Thus, the project will contribute not only to a greater quantity and variety of food supply for India as a whole but to a reduced vulnerability of that supply to dissemination by disease, insect pests, or environmental crises. Thus, the ultimate beneficiaries are the consumers of India who will profit from improved crop varieties through larger supplies of locally produced food that is free from disease and pests and with even improved nutritional value and quality.

B. Benefits to the Farmers

To the extent to which the project leads to higher yielding and more disease-resistant varieties, it will improve the well-being of the agricultural producers.*/ One of the objectives of germplasm research is the tailoring of new crop varieties to fit a multitude of different environments. As this goal is achieved, farmers throughout India will be increasingly able to maximize production, given their specific geographic location and size of holding. In addition, increasing yields provides greater employment opportunities for the rural populations.

As farmers adopt new, high-yield varieties, traditional varieties are discarded and often lost. Hence, another emphasis of this project is to salvage traditional plant genetic resources as these varieties may have many genetic characteristics that will be of use to future breeding programs.

C. Benefits to Indian Professionals and Institutions

The most direct beneficiaries of this project will be the agricultural scientists in India and their institutions, both public and private, who are qualified for and interested in acquiring and using new germplasm to improve plants. Many cooperating institutions and scientists will participate in the proposed germplasm network.

India's capability in collecting and evaluating its genetic resources will thereby be strengthened, and Indian professionals will acquire the knowledge to perform quality research in this field independently.

D. Benefits to U.S. Institutions and to Indo-US Relationships

U.S. institutions and their researchers also benefit from field work opportunities and germplasm evaluations carried out by the NBPGR. Linkages will be established between U.S. and Indian scientists and such linkages are expected to continue far beyond the project period.

The project also establishes mechanisms for collaborative research between high-level U.S. and Indian scientists and thus is highly consistent with Mission strategy to focus on science and technology development projects as opposed to resource transfer projects. The GOI supports this project in a similar vein.

*/ Change of this sort tends to increase the range of crop options available to the individual farmer.

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E. Benefits to Women

In India women carry out the bulk of the agricultural tasks. To the extent that high-yielding varieties and pest-resistant crops make a woman's work more productive, these developments lead to increased well-being of her household.

The resources of women in research science in India will be drawn upon and broadened through this program. The participation of women in the scientific community varies from country to country. Women in science will contribute by participating in this new program as research scientists, laboratory managers, and technicians. Presently, the NBPGR employs four women technicians and 16 professional female staff members. They will contribute their scientific expertise and technical skill as well as their understanding of India's problems. The project will also promote the development and growth of the pool of women in science through the various exchange and training aspects of the program components.

V. Administrative Analysis

A. Legal Status

The NBPGR is a constituent body of the ICAR, an autonomous agency established by the Royal Commission on Agriculture in 1929 as a registered society having its own rules and by-laws. In 1965, ICAR was reorganized to become the central body for coordinating, directing, and promoting all agricultural research and education in India. It has a governing body or council whose president is the Minister of Agriculture. The chairman of the council is the Director General of ICAR. He also serves as the Secretary of the Department of Agricultural Research and Education of the Ministry of Agriculture, thus providing a direct linkage to the ministry. Through a series of committees, ICAR maintains linkages with state institutions and universities. Policies, programs, and budgetary matters must be reviewed and approved by the Council of ICAR. This system has enabled the Government of India to plan highly coordinated and integrated national agricultural research strategies.

B. Financial Status

The amount of the Sixth 5 year Plan budget that was actually utilized was approximately Rs. 300 lakhs as shown in the accompanying table, less than half of the sanctioned level. The proposal submitted for the Seventh Plan (1985-1990) totals Rs. 1,019.23 lakhs, of which Rs. 200 lakhs were provisionally designated for construction of the National Repository. According to information available, the actual NBPGR allocation for the period totals approximately Rs. 400 lakhs. Approximately half of the approved amount is for non-recurring expenditure. The increase in recurring costs up to the end of the Seventh Plan will accommodate a part of the anticipated increase in staff costs associated with the project.

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Sl. No.	Head	VI Plan Actuals		VII Plan Requirement		
		Plan	Non-Plan	Plan	Non-Plan	Total
1.	Pay and Allowances	29.55	132.21	101.88	270.00	371.88
2.	T.A.	2.15	1.41	5.00	5.00	10.00
3.	Recurring Cost	53.33	21.88	80.00	95.00	175.00
4.	<u>Non-Recurring</u>					
	a. Works	29.18	-	166.00	-	166.00
	b. Land	0.10	-	-	-	-
	c. Equipment	20.36	0.31	71.94	-	71.94
	d. Vehicles	9.99	0.01	20.50	-	20.50
	e. Library Books	2.07	0.28	4.00	-	4.00
	f. Livestock	0.06	-	-	-	-
	g. Others	3.77	0.17	-	-	-
	TOTAL	150.56	156.27	449.32	370.00	819.32

Assistance for the establishment of National Repository facilities

	200.00	200.00
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The NBPGR has not yet been authorized the Rs. 200 lakhs for capital costs during the present 5 year plan; however, USAID's stated contribution to this building project is expected to leverage a greater amount toward the building.

Yearly Plan

Sl. No.	Head	Actual 1984-85	Proposed outlay for VII Plan				Total
			1985-85	1986-87	1987-88	1988-89	
<u>I. Main Institute</u>							
1.	Pay and Allowance	1.65	9.65	21.09	23.54	24.66	80.59
2.	T.A.	0.70	0.80	0.90	1.00	1.10	4.50
3.	Recurring Cost	15.00	12.00	12.00	13.00	13.00	65.00
4.	<u>Non-Recurring</u>						
	a. Works	21.00	45.00	40.00	40.00	20.00	166.00
	b. Equipment	19.15	15.26	18.00	18.00	-	70.41
	c. Vehicle	2.50	8.00	-	-	-	10.50
	d. Land	-	-	-	-	-	-
	e. Others (Books & Furniture)	-	.60	.70	.80	.90	3.00
	TOTAL	60.00	91.31	92.69	96.34	59.66	400.00
<u>II. Assistance for the Establishment of National Repository Facilities</u>							
		-	100.00	100.00	-	-	200.00

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C. Organizational Pattern

The National Bureau on Plant Genetic Resources is an entity that operates under the Crop Sciences Division of the Indian Council for Agricultural Research. The Director of the NBPGR is in charge of administration and research management and reports to the Director General of ICAR through the Crop Sciences Deputy Director General. A National Policy and Planning Committee on Genetic Resources under the chairmanship of the Director General of ICAR provides guidelines and establishes priorities related to the national agricultural objectives. The NBPGR operates through five basic divisions, namely: 1) germplasm exchange; 2) plant quarantine; 3) plant exploration and collection; 4) germplasm evaluation; and 5) germplasm conservation. In addition, there are three attached national programs: The National Facility for Plant Tissue Culture Repository; Medicinal and Aromatic Plants; and Underutilized Plants.

Administratively, the NBPGR operates as a self-contained unit. Its headquarters is on the campus of the ICAR's Indian Agricultural Research Institute (IARI) at Pusa, New Delhi. The division directors and program staff of the NBPGR, except those located at the regional stations, are also at the Pusa facility. Also, the NBPGR has its own administrative offices including personnel, budget, and records.

The NBPGR, by virtue of the fact that it has been assigned responsibility for the national plant genetic resource system, has authority and responsibility to coordinate and supervise the programs of all institutions where germplasm collections are maintained. There are over 121 active collections held. These locations belong to three types of institutions: first are those locations directly in the NBPGR structure; second are those within the ICAR (i.e., the All-India Coordinated Crop programs); and third are a number of universities and other institutions where plant breeding, plant genetic, or germplasm work take place.

ICAR makes provisions in the budgets of those institutions to support the germplasm work for which they have been assigned and have agreed to assume responsibility. The NBPGR may provide certain specific assistance for such items as equipment, or consultation, but these institutions are responsible to the NBPGR for the proper care of the germplasm with which they have been entrusted. The NBPGR is in the process of having all of these collections rejuvenated and having duplicate fresh material sent to the base storage center for long-term storage (thus the urgency to complete that facility).

Furthermore, the NBPGR is gradually implementing a process for the concentration of working collections both within each plant species and also among plant species. This will, in the future, assure the proper care of plant germplasm. To further strengthen that process, the NBPGR will undertake a series of training programs to upgrade its own staff and those of the affiliated institutions of the system.

D. Delegation of Authority

The NBPGR has been given the responsibility and authority by the ICAR to coordinate, supervise, and implement actions relating to all matters on plant germplasm management for the GOI. This authority is exercised through the Director General and the council of ICAR. The Director of the NBPGR and his staff supervise, conduct, and coordinate all activities related to germplasm acquisition, exchange, collection, evaluation, preservation, quarantine, and data management. The five division directors of the NBPGR provide guidance in their respective areas to all affiliated institutions, as well as oversee the work in these areas in the NBPGR.

There are no superfluous lines of authority. Each division director manages his program and reports directly to the Director of the NBPGR. A management committee periodically meets to review program directions and accomplishments and provides input to the functioning of the Bureau. Similarly, the Director of the NBPGR has ready access to the Director General of ICAR.

The NBPGR interacts with a number of programs of other ICAR institutes. These relationships are established by definition of the NBPGR mandate, which is to coordinate all activities relating to plant genetic resources at the national and international level. These interagency programs are working well. The NBPGR has full authority to implement its programs, and this capability has been important in implementing the NBPGR mandate.

E. Management Capability

The accomplishments of the NBPGR during the past two years under the leadership of its Director have been impressive. Each of the locations visited exhibited considerable activity in building and ground maintenance, laboratory organization, field plot activity and there was general enthusiasm about the NBPGR. Staff are highly motivated by the Director, who has gained the respect of his colleagues through his management style and his obvious leadership capability. Facilities at headquarters have been visibly improved with the build-up of storage facilities, labs, equipment, etc. Old buildings have been remodelled to accommodate offices and laboratories; the field station facilities have become operational for the conduct of evaluation and quarantine activities; seed materials have been assembled, and data processing has improved. Excellent relations have been established with other crops programs at the national level and with international agencies.

Evidence of the growing role of the Indian NBPGR in international affairs is exemplified in the following points:

- 1) The International Board on Plant Genetics Resources has determined to locate their representative for the South Asia region in India (at NBPGR).

2) NBPGR (India) has been designated by the IBPGR to be responsible for the global base collection for seventeen plant species and for the back-up collections of four species.

3) India has become a major resource in germplasm conservation, exchange, research, and training for other countries of the region, especially the SAARC nations.

4) Staff of the NBPGR participate more frequently in international seminars and in training programs as instructors.

5) The Director is a member of a U.S. National Research Council, Board on Agriculture study group on Managing Global Genetic Resources.

F. Staffing

1) Actual Staffing:

Scientific staff positions will be increased and levelled off at 137 within the course of the project. The total number of staff will be adequate to carry out the NBPGR programs, if the sanctioned positions are filled during the term of the project. The Director is adding professional staff within his authorized levels only as such staff can be effectively used. The quality of the staff is generally high, including a considerable number of advance degree holders and a goodly (+ 17%) percentage of young professional women. The design team also recommends that the technician/scientist ratio be increased from the present level of approximately .08 to 1.8 - 2.0.

Actual Staffing Pattern at NBPGR

Division	Ph.D	M.S.	B.S.	Technicians
Administration	1	-	-	1
Exchange	2	4	-	3
Exploration	4	8	-	3
Evaluation	17	24	-	11
Quarantine	10	7	-	7
Conservation	2	4	-	2
Tissue Culture	6	3	-	1
Medicinal Plants	1	-	-	-
Under Util. Plants	1	-	-	-
Guar	-	1	-	-
Totals	44	51		28

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2. Additional Vacant Sanctioned Posts:

Forty-two additional posts at the scientist level (Ph.D and M.S.) and 18 technician posts have been sanctioned during the current five year plan and are expected to be filled.

<u>Division</u>	<u>Scientists</u>	<u>Technicians</u>
Exchange	Nil	1
Exploration	11	-
Evaluation	9	3
Quarantine	5	2
Conservation	3	-
Tissue Culture	11	11
Medicinal Plants	-	-
Under Util. Plants	-	-
Guar	3	1
Total	42	18

G. Training Needs

The project does not envision training at the postgraduate level. Indian institutions provide excellent post graduate training at the Masters and Ph.D. level. However, specialized training and experience on the job for professionals working in areas directly related to germplasm conservation - i.e., collection, evaluation, preservation, quarantine, etc., is needed, and the project will provide such training.

Related to staffing and training is the matter of consultancies. The project does not envision large components of consultancies; rather a small number of specialists in very defined areas is called for. To carry out cooperative US/India projects, a modest number of individuals is proposed for clearly defined activities. This will strengthen US/India collaboration, a feature clearly desired by Indian scientists and their U.S. counterparts. The project emphatically does not suggest the need for technical assistance staff. It would be a mistake to have any long-term (one year or more) foreign experts on assignment to the NBPGR under this project.

H. Purchasing

The NBPGR will establish an administrative unit whose primary function will be the operation and fiscalization of accounts, purchasing, inventory, and related activities relevant to the project. The initiation of purchasing procedures will follow the guidelines established for USAID/GOI projects (See Annex I). The NBPGR will initiate purchase requests in accordance with lists and priorities established in the project document. All purchased items will enter the Stores section for appropriate entering in inventory and then be dispatched to the responsible scientist in the NBPGR system.

VI. Construction and Engineering Analysis:

An important component of this project is USAID's contribution to the construction of the NBPGR central headquarters and the base collection gene bank. The NBPGR has already worked with the Central Public Works Department of the GOI to draw up preliminary design plans in order to seek a re-zoning of the land site from agricultural use to administrative building use. This rezoning has since been authorized by the local authorities and NBPGR can now go ahead with construction of the headquarter genebank building.

The NBPGR has hired services of the CPWD which will be responsible for design, cost estimate, detailed building plans, preparation of bid documents including specification, evaluating the bid documents, construction supervision, reviewing the contractor's bills and recommending the payments etc. However, early implementation funds will be used to support visits by U.S. scientists and engineers/architects familiar with gene bank constructions. They will assist NBPGR scientists and CPWD engineers/architects in developing the basic designs criteria and building plans and specifications for the specialized/scientific elements of the buildings. After CPWD finalizes the building plans, specifications and cost estimates in consultation with US A&E firm consultants; these will be reviewed and approved by USAID.

After the detailed design and plans have been completed, the CPWD will invite bids. Bidding and construction procedures will follow the standard and well established procedures and practices of the CPWD. Bids are invited from all those contractors registered with the CPWD and are based on established, standard CPWD schedules on specifications and rates. The Tender Committee of the CPWD reviews the bids and the lowest responsive bidders are awarded the contract. If all bids are too high, the CPWD reserves the right to reject all the bids and repeat the bidding process. Construction supervision will also be carried out by the CPWD engineers.

Working closely with the CPWD, USAID engineer will make field visits to ensure that the construction is being carried out in accordance with the agreed design and specifications and to ensure the quality of work. The A&E firm consultants will also provide periodic assistance in monitoring the project as and when required by USAID.

A. Construction Cost Estimates of the NBPGR Master Plan

The preliminary construction cost estimates were drawn up by the USAID engineer in conjunction with the CPWD (see Attachment A for details). The total cost is currently estimated at \$7.35 million, including liberal inflation adjustments, and is solely based on the preliminary design plans of area use submitted to and approved by the Delhi Development Authority. The gene bank building will be constructed on a 10 acre piece of land on the PUSA campus of IARI.

USAID will jointly finance the headquarters and gene bank with the GOI. This construction will also include the international training center facilities and lecture halls.

ATTACHMENT A

ILLUSTRATIVE COST ESTIMATE AND AREAS PROPOSED FOR CONSTRUCTION

PLANT GENETIC RESOURCES PROJECT

Sl. No.	Description	Total Area in sq. meters	Cost per sq. meter Rs.	Total cost Rs.
1.	Main PGR (Air Conditioned)	9,000	5,625	50,625,000
2.	Other Miscellaneous Works (at lump sum rate)			
a.	Electrical Substation and equipment	0	0	1,500,000
b.	D. G. Set (2 Nos.)	0	0	1,000,000
c.	Gas Plant, Compressed Air Plant and Piping	0	0	1,600,000
d.	H. T. Service Connection and Special Power Requirement	0	0	1,000,000
e.	Lifts (2 Nos.)	0	0	1,200,000
f.	Compound Lighting	0	0	200,000
g.	Compound Wall (540 meters x 1 1/2' wide x 10' high)	540	4,000	2,160,000
	Sub-total			<u>59,285,000</u>
	Add Physical Contingency @ 15%			8,892,750
	TOTAL CONSTRUCTION COST			<u>68,177,750</u>
	ADD INFLATION 40% FOR FOUR YEARS			27,271,100
				<u>95,448,850</u>
				=====

or \$ 7.35 million
(at Rs. 13=\$1)

VII. Environmental Analysis

A. Background

The PGR PID stated that, in USAID's opinion, the project qualified for categorical exclusion from further environmental action in accordance with USAID's environmental procedures set forth in 22 CFR 216.2 (c) (i) (ii) and 216.2 (c) (2) (ii). In the rationale for this opinion it was pointed out that the project would help preserve India's plant genetic resources and significantly enhance environmental protection through preservation of important wild and cultivated species. AID/W in 87 State 212053 (PID Review) informed USAID that an initial environmental evaluation would be required to discuss the possible movement of pests and pathogens which can occur in germplasm exchanges and to address environmental concerns regarding the proposed genebank and headquarters facility construction.

2. Pest and Pathogen Movement

USAID requested USDA/APHIS to assess the environmental risk (i.e. movement of pests and pathogens) associated with the PGRP. APHIS concluded that the intended equipment purchases, short-term technical assistance and consultancies, projections for construction of greenhouse and screenhouse facilities, and plans for training of Plant Quarantine Division personnel indicates the thrust of the program will not increase but significantly reduce the risk of pest and pathogen entry into India and thus contribute to enhanced environmental protection and preservation of biological diversity. These conclusions were based on a review by APHIS of the proposed activities for construction, equipment purchases, staffing, research, training, and short-term technical assistance. A comparison was made with the proposed activities in India and comparable activities conducted by APHIS personnel at the Plant Quarantine Facility (postentry greenhouse quarantine) and Plant Germplasm Quarantine Center at Beltsville, Maryland.

The USDA/APHIS report also made the following general comments and observations:

"Pests can move or be moved, along natural or manmade pathways from areas where they are known to occur to areas where they are not known to occur. Governments establish quarantine services and take regulatory actions to block the entry of exotic pests, or to reduce the risk that such pests will enter along manmade pathways and subsequently become established. Manmade pathways for the entry of articles that might be infected, infested, or contaminated with exotic pests include baggage, mail, cargo, common carriers such as airplanes, ships, vehicles, and smuggling. The importation of both nonagricultural and agricultural items present an opportunity for the entry of pests but, the risks are highest with agricultural items. Among agricultural items, the importation of plant propagative material presents the highest risk because pests are not only moved in association with their hosts but both are protected from adverse environmental stresses during the journey

along the manmade pathway. When compared to commercial and private importations of plant propagative material, importation of germplasm constitutes only a very small portion of the total.

The Directorate of Plant Protection, Quarantine, and Storage has the responsibility in India for protecting agriculture and the environment from the entry, or for reducing the risk of entry of hazardous exotic plant pests. Many of the exotic pest hazards are defined in the quarantine rules, regulations, guidelines, and regulatory actions (including safeguards) promulgated or implemented by the Directorate.

The Directorate has delegated to the Plant Quarantine division of the NBPGR the function of providing quarantine services and safeguards for the import or export of all plant germplasm. For germplasm exports, NBPGR issues phytosanitary certificates in accordance with the standards set by the International Plant Protection Convention and the quarantine requirements of the importing country. For germplasm imports, NBPGR follows the rules and regulations of the Government of India and guidelines developed in cooperation with the Directorate.

Germplasm of crop and wild species can be grouped into risk categories such as low, medium, or high risk. The importation of plant propagative material of most species is considered as low-to-medium risk in the quarantine regulations of India. The risk associated with the importation of low risk germplasm can be reduced by inspection and treatment procedures. Consequently, for those species, NBPGR processes germplasm importation by inspection and treatment. Similarly, the Directorate processes commercial quantities imported for planting by farmers, growers, and gardeners. However, inspection and treatment are not usually adequate safeguards for the importation of high-risk crop species. Therefore, the regulations of India (as do those of most countries) prohibit commercial or private importation but allow high risk germplasm to enter through NBPGR under safeguards specified by the Directorate and/or NBPGR. It is these safeguards (e.g. modern sensitive pest detection techniques, postentry quarantine in glasshouses or screenhouses) that will be strengthening the project.

B. Construction of Storage Facilities

The ICAR has provided the NBPGR land on the premises of the IARI for construction of a new NBPGR headquarters including base seed storage facilities. The land is currently used for field research. Early generation and advanced lines of various crops are grown on this land during the cropping seasons; during the off season the land is fallow. The land has been set aside for development as part of the IARI master plan. Potential negative environmental impact, although not anticipated, will be assessed during planning and monitored during construction of these facilities.

PLANT GENETICS RESOURCES PROJECT EQUIPMENT LIST

Sl. No.	ITEM	UNITS	APPROX. COST US \$	TOTAL COST
1	Vehicles			
	a. Jeep for exploration	6	10,000	60,000 (LC)
	b. Utility Van	1	9,000	9,000 (LC)
	c. Mini-bus (25 seator Evaluation Dir	1	25,000	25,000 (LC)
2	Exploration kit	9	1,000	9,000
3	Stereobinocular microscope	16	2,000	32,000
4	Movie video camera with accessories with VCR/TV	1	5,000	5,000
5	Seed storage rooms to be operated at a temp. of -20 C (10 rooms 20'x100')	10	50,000	500,000
6	Infrastructure for module shelves / suitable shelving structure	10 units	10,000	100,000
7	Emergency back-up generators 25 KVA, 65 KVA, 135 KVA	6 3 1	10,000 16,000 25,000	60,000 48,000 25,000
8	Controlled temperature (15 - 20 C) humidity (15 -20% equipment for seed drying and packaging (15' x 20')	2	25,000	50,000
9	Temperature controlled walk-in germination rooms (10' x 12') one each for 20,25,30 C and alternating 20-30 c	3	10,000	30,000
10	Seed germinators (cabinet type)	21	2,000	42,000
11	Microbalance (0.1 mg accuracy)	1	7,500	7,500
12	Mettler Analytical balance 0.1 mg. accuracy	5	1,875	9,375
13	a. Top pan balances 0.1 g accuracy b. Mettler	9	1,500	13,500

Sl. No.	ITEM	UNITS	APPROX. COST US \$	TOTAL COST
14	Moisture determination balance	2	2,000	4,000
15	Soft X-Ray machine, film reader and film processor	1	10,000	10,000
16	High temperature drying oven	8	1,000	8,000
17	Thermogradient plate with water bath	2	11,000	22,000
18	Electronic seed counters	8	3,000	24,000
19	a Ultra cold freezer (-75 c) b Deep freezer (-20 c)	1 4	7,000 1,000	7,000 4,000
20	Seed blower	10	2,000	20,000
21	Seedburo minivac small lot thresher and cleaner	19	750	14,250
22	Hygrothermograph	10	500	5,000
23	Microcomputers with printer, hard disc and softwares	20	6,000	120,000
24	Bar coding and reader	1	1,000	1,000
25	Videoscope	1	6,000	6,000
26	Seed packet sealing machine	8	900	7,200
27	Vaccum head seed planter	6	1,500	9,000
28	Humidity guides	20	16	320
29	PIX Box Image processor - analyser	1	6,000	6,000
30	Accelerated aging cabinets	4	4,000	16,000
31	Automatic seed analyser	1	10,000	10,000
32	Microwave oven	7	500	3,500
33	Ro-tap testing seive shaker	1	2,000	2,000

Sl. No.	ITEM	UNITS	APPROX. COST US \$	TOTAL COST
53	Serological Lab. equipment	4	20,000	80,000
54	Soil Sterilizer	4	10,000	40,000
55	a. Plant propagation ventilated insect proof glass house (30'x40' with propagation equip like misters watering device etc. (cost of material)	4	10,000	40,000
	b. Growth chamber	3	10,000	30,000
56	a. Screen House (25' x75') with 40 mesh alluminium screen and corrugated fibre glass material	6	15,000	90,000
	b. Screen house (30' x 60') locally made	3	12,000	36,000
57	Quarantine glass house (10' x15') with climate control and phyto-sanitary features	30	8,000	240,000
58	Virus indexing glass house (10' x 30')	5	15,000	75,000
59	Glass house (30' x 60') with climate control	4	25,000	100,000
60	a. Glass house (30'x60') locally made for evaluation work	2	25,000	50,000
	b. Polyhouse (30' x60')	2	10,000	20,000
61	Heat chamber for thermotherapy	2	20,000	40,000
62	Differential thermal analyser	1	23,260	23,260
63	Cryenco liquid nitrogen containers			
	a) large size	3	6,000	18,000
	b) small portable	2	1,975	3,950
64	Cytrophotometer with accessories	1	60,000	60,000
65	Cold room (4 c) small	1	23,650	23,650
66	Amino acid analyser	1	20,000	20,000
67	Percival incubator LV. model	1	12,500	12,500

Sl. No.	ITEM	UNITS	APPROX. COST US \$	TOTAL COST
68	Edgegard hood laeminar flow cabinet	1	9,842	9,842
69	Tissue culture room (small unit)	1	19,685	19,685
70	Polytron microgrinder	1	10,000	10,000
71	Buchi waterbath rota evaporator	1	11,810	11,810
72	Gyrotary Shaker G-2 Table top model	1	10,000	10,000
73	Mettler balance (0.001 mg. and .000 mg)	1	3,500	3,500
74	Gallon kemp orbital incubator	1	15,000	15,000
75	IEC Centre N refrigerated Centrifuge	1	23,650	23,650
76	Fischer vers bath	1	10,000	10,000
77	Stereoc zoom microscope	1	7,000	7,000
78	Microtome (Low temp.)	1	10,000	10,000
79	Portable UV Lamp long and shortwave	1	10,000	10,000
80	Media dispensing units	3	3,000	9,000
81	Lyophilizer	3	6,000	18,000
82	Small mill/grinder	1	10,000	10,000
83	Chromatographic chamber (all glass) set of six	6	1,000	6,000
84	Micropipets (all sizes) 1 set	1 set	4,000	4,000
85	Microcomputers with accessories	1	5,000	5,000
86	Camera Nikon 35 mm SLR with zoom and wide angle lenses accessories plus	14	1,000	14,000
87	Electronic typewriter with facility for memory	1	1,500	1,500
88	Rain shelter,	2	15,000	30,000

Sl. No.	ITEM	UNITS	APPROX. COST US \$	TOTAL COST
89	Dehumidifier	4	6,000	24,000
90	Refrigerated type airconditioner	5	2,000	10,000
91	Leaf area meter	3	2,000	6,000
92	Medium term storage modules			
	a. Medium term storage module (large)	2	50,000	100,000
	b. Back-up generator for large modules	2	16,000	32,000
	c. Medium term storage modules (small) (30,000 accessions)	7	30,000	210,000
	d. Back-up generators for small storage modules	7	10,000	70,000
92	Rotary evaporator	2	5,000	10,000
93	PH Meter	8	300	2,400
94	Colour graphic plotter	1	2,000	2,000
95	Software	1	2,000	2,000
96	Uninterrupted power supply system 5KVA for the computer system	1	20,000	20,000
97	Rotovator	3	2,000	6,000
98	Rolling cultivator	9	500	4,500
99	Tractor			
	Medium Size	1	10,000	10,000 (LC)
	Small Size	2	3,000	6,000 (LC)
100	Rototiller	2	600	1,200
101	Nursery or test plot thresher	9	2,700	24,300
102	Hand held planter	24	60	1,440
103	Bundle thresher	7	2,000	14,000
104	Tractor mounted sprayer	3	2,000	6,000
105	Trolley mounted sprayer	8	1,000	8,000
106	Seedburo M2 BC Cleaner	7	2,000	14,000

Sl. No.	ITEM	UNITS	APPROX. COST US \$	TOTAL COST
107	Precision garden seeder (seedburo) model 1000 B	7	100	700
108	Garden cultivator (Seedburo model 6000 B)	8	750	6,000
109	Air blast seed cleaner	2	600	1,200
110	MSA Camp II Pesticide respirator	16	25	400
111	Cage material for pollination control (Nylon material from georgia)	200 cages	300	60,000
112	Programme freezing controller cryomed model 1010 A with microcomputer	1	78,750	78,750
113	Off-set printer	1	6,000	6,000
114	Distilled water maker	1	2,950	2,950
115	Mist chamber, CTCRI, Trivandrum	2	2,000	4,000 (LC)
116	Maintenance Workshop			
	Battery charger			400
	Portable drill machine			80
	Benchvise			8,000
	Power Press			12,000
	Milling Machine			12,000
	Shaper Machine			3,000
	Rolling Machine			12,000
	Lathe Machine			10,000
	GRAND TOTAL			4,019,292

NOTE:

Total equipment funding level of \$5,000,000 (per table 1, page 17) includes provision for additional equipment consultants may suggest during preproject activities and Phase I and II implementation.

TECHNICAL ASSISTANCE (SHORT-TERM)

Sl. No.	Short Term Consultants	Person months						
		APR	88	89	90	91	92	93
1	TISSUE CULTURE							
	Cryopreservation		1					
	Tissue Culture	1	1					
	Biosystematics		1					
2	GENE/PLASM EXCHANGE							
	Plant Introduction Officer		1					
3	CONSERVATION							
	Gene-bank Management		1	1				
	Refrigeration Engineer	1						
4	QUARANTINE							
	Greenhouse/civil engineer	1		1		1	1	
	Plant quarantine expert		1	1	1			
5	EXPLORATION		1					
6	DATA/INFO. MANAGEMENT	1	2					
7	EQUIPMENT CONSULTANT	1						
8	CONSULTING ARCHITECT ENGINEERS FOR BUILDING		3	3	3	3		
9	MISCELLANEOUS		2	2	2	2	2	
TOTAL PERSON/MONTHS		5	14	8	6	6	3	

TOTALS:

APT = 5 @ 12,000 = \$ 60,000

PGRP = 37 @

12,000

=

\$ 444,000

NBPGR/US TRAINING PROGRAM

TRAINEES	TRAINING MONTHS					\$ 000 COST
	1988	1989	1990	1991	1992	
A. Quarantine Training						
2 -	Virus Indexing Serology	5	5			
1 -	Seed borne bacterial detection and serology			2		2
1 -	Nematology, regulatory taxonomy, survey methodology	2				2
2 -	Entomology, taxonomy detection		3		3	
1 -	Pesticide application and safety	3				
2 -	Taxonomic mycology, methods treatment and detection	3		3	3	
	- Advanced program Mgt. for pest analysis, biological decision making, germplasm quarantine operation					
3	(pathologist, entomologist nematologist)	3		3	3	
1 -	U.S. Sugarcane Quarantine facility (SEI, consultants) Sr. Scientists)		1			
13		16	9	8	9	4

Total Trainees: $13 \times 2,500 = 32,500$

Training months: $46 \times 3,800 = 174,800$

207,300

207.3

TRAINEES

TRAINING MONTHS \$ 000
 1988 1989 1990 1991 1992 COST

B. Tissue Culture

1	- Cryopreservation	2			
2	- In Vitro culture	3	3		
	- Bioseotanus (Cyto- genetical and Biochem aspects)				
1	- University of Illinois		3		
1	- Cryobiology Cornell University			3	
1	- Biotechnology (Isozyme, and enzyme restriction, lVA/RNA cloning recumbenant DNA technology, gene transfer) Michigan State		3		
1	- Crop evolution and use of wild species Iowa State			3	
<hr/>		<hr/>		<hr/>	
7		5	9	6	

Total 8 trainees
 / x rt @ 2500 = 17,500
 22.5 t/π x 3800 = 76,000

93,500

93.5

C. Exploration (Technique)
 Taxonomic training

<hr/>		<hr/>		<hr/>	
3		1	1	1	
	3 x rt @ 2500 =	7,500			
	3 x 3800 =	11,400			
	<hr/>	<hr/>			
	16,900				

16.9

TRAINEES

T R A I N I N G M O N T H S \$00
 1988 1989 1990 1991 1992 COS

D. Evaluation Training

2	- Small green cereals: (wheat barley, rice, oats, rye, triticale)	(ST&T)	1	6		
2	- Pulses (beans, peas, lentils, chick peas)	(ST)	1		3	
2	- Temperate to sub tropical Tubers (potato, sweet potato yams, cassava)	(ST&T)		1	6	
1	- Vegetable Root Crops (carrots, turnips, beet radishes)	(T)			3	
1	- Brassica Vegetable, 1 Broccoli, Cauliflower, cabbages)	(T)	4.5			
1	- Large Cereals (maize, sorghum, sweet sorghum, millets)	(T)	6			
2	- Temperate tree fruit crops (apples, pears, peaches, almonds, apricots, plums etc.)	(T)	4.5	4.5		
1	- Vine Crops/Forage Crops	(T)	3			
2	- Oilseed Crops	(T)	3			3
1	- Peanuts	(T)			4.5	
1	- Cucurbits (cucumbers, melons, squashes, gourds)	(T)	3			
1	- Chemical evaluation	(T)	3			
2	- Disease & Pest evaluation	(T)		3	3	

19	Total Eval. Trainees = 19		29.0	14.5	19.5	3

Training to be - 3 months (T)
 Study Tour - 1 month (ST)
 Total Evaluation Trainees = 19
 Total Trainees: 19 x 2,500 = 47,500
 Training months: 66 x 3,800 = 250,800
 Total Evaluation Training 298,300

(1) COUNTRY CHECKLIST

Listed below are statutory criteria applicable generally to FAA funds, and criteria applicable to individual fund sources: Development Assistance and Economic Support Fund.

A. GENERAL CRITERIA FOR COUNTRY ELIGIBILITY

1. FAA Sec. 491 (a) (1) (A), FY 1967 No.
Continuing Resolution Sec
ECR Has it been determined or certified to the Congress by the President that the government of the recipient country has failed to take

adequate measures or steps to prevent narcotic and psychotropic drugs or other controlled substances (as listed in the schedules in section 202 of the Comprehensive Drug Abuse and Prevention Control Act of 1971) which are cultivated, produced or processed illicitly, in whole or in part, in such country or transported through such country, from being sold illegally within the jurisdiction of such country to United States Government personnel or their dependents or from entering the United States unlawfully?

2. FAA Sec. 451 (f) (4) . Has the President determined that the recipient country has not taken adequate steps to prevent (a) the processing.

in whole or in part, in such country of narcotic and psychotropic drugs or other controlled substances, (b) the transportation through such country of narcotic and psychotropic drugs or other controlled substances, and (c) the use of such country as a refuge for illegal drug traffickers?

3. FAA Sec. 620 (c). If assistance is to a government, is the government liable as debtor or unconditional guarantor of any debt to a U.S. citizen for goods or services furnished or ordered where (a) such citizen has exhausted available legal remedies and (b) the debt is not denied or contested by such government? No.
4. FAA Sec. 620 (e) (1). If assistance is to a government, has it (including government agencies or subdivisions) No.

taken any action which has the effect of nationalizing, expropriating, or otherwise seizing ownership or control of property of U.S. citizens or entities beneficially owned by them without taking steps to discharge its obligations toward such citizens or entities?

5. FAA Sec. 620 (a), 620 (f), 620 (D); FY 1985 Continuing Resolution Sec. 512 and 513.

Is recipient country a Communist country? If so, has the President determined that the assistance to the country is important to the national interests of the United States? Will assistance be provided to Angola, Cambodia, Cuba, Laos, Syria, Vietnam, Libya, or South Yemen? Will assistance be provided to Afghanistan or Mozambique without a waiver?

No. No assistance will be provided to these countries.

6. FAA Sec. 620 (j). Has the country permitted, or failed to take adequate measures to prevent, the damage or destruction, by mob action of U.S. property? No. 71
7. FAA Sec. 620 (l). Has the country failed to enter into an agreement with OPEC? N/A
8. FAA Sec. 620 (o); Fishermen's Protective Act of 1967, as amended, Sec. 5. (a) Has the country seized, or imposed any penalty or sanction against, any U.S. fishing activities in international waters? (a) No.
- (b) If so, has any deduction required by the Fisherman's Protective Act been made? (b) N/A
9. FAA Sec. 620 (q); FY 1985 Continuing Resolution Sec. 518. (a) Has the government of (a) No.
- (b) No. (b) No.

recipient country been in default for more than six months on interest or principal of any AID loan to the country? (b) Has the country been in default for more than one year on interest or principal on any U.S. loan under a program for which the appropriation bill (or continuing resolution) appropriates funds?

10. FAA Sec. 621 (s). If

N/A.

contemplated assistance is development loan or from Economic Support Fund, has the Administrator taken into account the amount of foreign exchange or other resources which the country has spent on military equipment?

(Reference may be made to the annual ~~report~~ taking

into Consideration" memo:

"Yes, taken into account by the Administrator at time of approval of Agency OYB."

This approval by the Administrator of the Operational Year Budget can be the basis for an affirmative answer during the fiscal year unless significant changes in circumstances occur.)

11. FAA Sec. 620 (t). Has the country severed diplomatic relations with the United States? If so, have they been resumed and have new bilateral assistance agreements been negotiated and entered into since such resumption?

12. FAA Sec. 620 (u) What is the payment status of the country's U.N. obligations?

India has made its Annual Payment to meet its U.N. obligations.

If the country is in arrears
were such arrearages taken
into account by the AID
Administrator in determining
the current AID Operational
Year Budget? (Reference may
be made to the Taking into
Consideration memo.)

13. FAA Sec. 620A; FY 1985 Contin- (a) No
uing Resolution Sec. (b) No

521. Has the President
determined that the country
(a) grants sanctuary from
prosecution to any individual
or group which has committed
an act of international
terrorism? Has the
government of the recipient
country aided or abetted, by
granting sanctuary from
prosecution to, any
individual or group which has
committed or is being sought

by any other government for
prosecution for any war crime
or act of international
terrorism?

14. ISDCA of 1985 Sec. 552 (b). No.

Has the Secretary of State
determined that the country
is a high terrorist threat
country after the Secretary
of Transportation has
determined, pursuant to
section 1115 (e) (2) of the
Federal Aviation Act of 1958,
that an airport in the
country does not maintain and
administer effective security
measures?

15. FAA Sec. 666. No.

Does the country object, on
the basis of race, religion,
national origin or sex, to
the presence of any officer
or employee of the U.S. who

is present in such country to carry out economic development programs under the FAA?

16. FAA Sec. 669, 670. Has the country, after August 3, 1977, delivered or received nuclear enrichment or reprocessing equipment, materials, or technology, without specified arrangements or safeguards? Has it transferred a nuclear explosive device to a non-nuclear weapon state, or if such a state, either received or detonated a nuclear explosive device? (FAA Sec. 620 E permits a special waiver of Sec. 669 for Pakistan).

~~17. FAA Sec. 670. If the country is a non nuclear weapon~~ N/A

state, has it, on or after August 8, 1985, exported illegally (or attempted to export illegally) from the United States any material, equipment, or technology which would contribute significantly to the ability of such country to manufacture a nuclear explosive device?

18. ISDCA of 1981 Sec. 72C. Was N/A
the country represented at the Meeting of Ministers of Foreign Affairs and Heads of Delegations of the Non-Aligned Countries to the 36th General Assembly of the U.N. of Sept. 25 and 26, 1981, and failed to disassociate itself from the communique issued? If so, has the President taken it into account? (Reference may be made to the Taking into Consideration memo.)

19. FY 1985 Continuing

No.

Resolution. If assistance is from the population functional account, does the country (or organization) include as part of its population planning programs involuntary abortion?

20. FY 1985 Continuing Resolution Sec. No.

530. Has the recipient country been determined by the President to have engaged in a consistent pattern of opposition to the foreign policy of the United States?

B. FUNDING SOURCE CRITERIA FOR
COUNTRY ELIGIBILITY

1. Development Assistance
Country Criteria

FAA Sec. 116. Has the No.
Department of State determined
that this government has
engaged in a consistent
pattern of gross violations
of internationally recognized
human rights? If so, can it
be demonstrated that
contemplated assistance will
directly benefit the needy?

2. Economic Support Fund
Country Criteria

N/A

FAA Sec. 505 E. Has it been
determined that the country
has engaged in a consistent
pattern of gross violations
of internationally recognized
human rights? If so, has the

country made such significant
improvements in its human
rights record that furnishing
such assistance is in the
national interest?

3M (2) PROJECT CHECKLIST

Listed below are statutory criteria applicable to projects. This section is divided into two parts. Part A includes criteria applicable to all projects. Part B applies to projects funded from specific sources only: B.1. applies to all projects funded with Development Assistance loans, and B.3. applies to projects funded from ESF.

CROSS REFERENCES: IS COUNTRY CHECKLIST

UP TO DATE? HAS

STANDARD ITEM

CHECKLIST BEEN

REVIEWED FOR THIS

PROJECT?

A. GENERAL CRITERIA FOR PROJECT

1. FY 1985 Continuing Resolution

Sec. 525; FAA Sec. 634 A.

Describe how authorizing and appropriations committees of Senate and House have been or will be notified concerning the project.

A Congressional Notification will be forwarded to Congress prior to obligation of the subject project.

2. FAA Sec. 611 (a) (1). Prior

Yes.

to obligation in excess of \$500,000 will there be (a) engineering, financial or other plans necessary to carry out the assistance and (b) a reasonably firm estimate of the cost to the U.S. of the assistance?

3. FAA Sec. 611 (a) (2).

N/A

further legislative action is required within recipient country, what is basis for reasonable expectation that

such action will be completed
in time to permit orderly
accomplishment of purpose of
the assistance?

4. FAA Sec. 611 (b); FY 1985 N/A

Continuing Resolutin Sec.

501. If for water or water
related land resource
construction, has project met
the principles, standards,
and procedures established
pursuant to the Water
Resources Planning Act (42
U.S.C. 1962, et seq.)? (See
AID Handbook 3 for new
guidelines.)

5. FAA Sec 611 (e). If project Yes.

is capital assistance (e.g.,
construction), and all U.S.
assistance for it will exceed
\$1 million, has Mission
Director certified and
Regional Assistant
Administrator taken into

consideration the country's
capability effectively to
maintain and utilize the
project?

- | | |
|--|--|
| 6. <u>FAA Sec. 209.</u> Is project
susceptible to execution as
part of regional or
multilateral project? If so,
why is project not so
executed? Information and
conclusion whether assistance
will encourage regional
development programs. | No. |
| 7. <u>FAA Sec. 601 (a).</u> Information and
conclusions whether projects will
encourage efforts of the country
to: (a) increase the flow of
international trade; (b) foster
private initiative and competition;
and (c) encourage development and
use of cooperatives, and credit
unions, and savings and loan
associations; (d) discourage | (a) N/A
(b) Yes, in providing
germplasm to private sector
(c) N/A
(d) N/A
(e) Yes, especially
agricultural research
and crop improvement
(f) N/A |

monopolistic practices; (e)

improve technical efficiency of industry, agriculture and commerce; and (f) strengthen free labor unions.

8. FAA Sec. 601 (b). Information and conclusions on how project will encourage U.S. private trade and investment abroad and encourage private U.S. participation in foreign assistance programs (including use of private trade channels and the services of U.S. private enterprise).
- Free availability of germplasm will encourage U.S. private sector to develop activities in crop improvement both in India and the U.S.
9. FAA Sec 612(b), 636(h);
FY 1965 Continuing Resolution
Sec. 507 . Describe steps taken to assure that, to the maximum extent possible, the country is contributing local currencies to meet the cost of contractual and other services, and foreign currencies owned by the U.S. are utilized in lieu of dollars.
- The GOI will finance 50 to 55 percent of all project costs including local currencies for contractual and other services.

10. FAA Sec. 612 (d) . Does the U.S. own excess foreign currency of the country and, if so, what arrangements have been made for its release?

Yes, such funds will not be used to finance project related costs but will be used for other appropriate jointly agreed purposes.

11. FAA Sec. 601 (e). Will the project utilize competitive selection procedures for the awarding of contracts, except where applicable procurement rules allow otherwise?

Yes.

12. FY 1985 Continuing Resolution Sec. 522. If assistance is for the production of any commodity for export, is the commodity likely to be in surplus on world markets at the time the resulting productive capacity becomes operative, and is such assistance likely to cause substantial injury to U.S. producers of the same, similar or competing commodity?

N/A.

13. FAA 118 (c) and (d). Does Yes.

the project comply with
the environmental procedures set
forth in AID Regulation 16.

Does the project or program
take into consideration the
problem of the destruction of
tropical forests?

14. FAA 121 (d). If a Sahel N/A.

Project, has a determination
been made that the host
government has an adequate
system for accounting for and
controlling receipt and
expenditure of project funds
(dollars or local currency
generated therefrom)?

15. FY 1985 Continuing Resolution No.

Sec. 536. Is disbursement of
the assistance conditioned
solely on the basis of the
policies of any multilateral
institution?

16. ISDA of 1986 Sec. 810. For

development assistance projects, how much of the funds will be available only for activities of economically and socially disadvantaged enterprises, historically black colleges and universities, and private and voluntary organizations which are controlled by individuals who are black Americans, Hispanic Americans, or Native Americans, or who are economically or socially disadvantaged (including women)?

Contracts for goods and services will be awarded on a competitive basis to the maximum extent practicable. Such organizations and individuals will be encouraged to participate.

B. FUNDING CRITERIA FOR PROJECT

1. Development Assistance Project

Criteria

a. FAA Sec. 102 (a), 111, 113, 281 (a). Extent to which activity will (a) effectively involve the poor in develop-

(a) The project will assist in the development of improved agricultural crops which will increase

ment, by extending access to economy at local level. —

increasing labor-intensive production and the use of appropriate technology, spreading investment out from cities to small towns and rural areas, and insuring wide participation of the poor in the benefits of development on a sustained basis, using the appropriate U.S. institutions;

(b) help develop cooperatives, especially by technical assistance, to assist rural and urban poor to help themselves toward better life, and otherwise encourage democratic private and local governmental institutions; (c) support the self-help efforts of developing countries;

(d) promote the participation of women in the national economies of developing countries and the improvement of women's status;

(e) utilize and encourage regional cooperation by developing countries?

the access of the poor to the local economy. U.S. Land Grant universities and USDA will be heavily involved in the project.

(b) Not applicable.

(c) This project entirely supports Indian self-help in agricultural development.

(d) See Social Analysis in the Project Paper.

(e) Not applicable.

b. FAA Sec. 103, 103 A, 104,

Yes.

105, 106. Does the project

fit the criteria for the type
of funds (functional account)
being used?

c. FAA Sec. 107. Is emphasis

Yes, especially regarding
agricultural inputs.

on use of appropriate
technology (relatively smaller,
cost-saving, labor-using
technologies that are generally
most appropriate for the
small farms, small businesses,
and small incomes of the poor)?

c. FAA Sec. 110 (a). Will the

Yes.

recipient country provide
at least 25% of the costs
of the program, project,
or activity with respect
to which the assistance is
to be furnished (or is the
latter cost-sharing
requirement being waived
for a "relatively least
developed country")?

e. FAA Sec. 122 (b). Does the activity give reasonable promise of contributing to the development of economic resources, or to the increase of productive capacities and self-sustaining economic growth?

Yes.

f. FAA Sec. 128 (b). If the activity attempts to increase the institutional capabilities of private organizations or the government of the country, or if it attempts to stimulate scientific and technological research, has it been designed and will it be monitored to ensure that the ultimate beneficiaries are the poor majority?

Yes.

9. FAA Sec. 287 (b). Describe extent to which program recognizes the particular needs, desires, and capacities of the people of the country; utilizes the country's intellectual resources to encourage institutional development; and supports civil education and training in skills required for effective participation in governmental processes essential to self-government.

The project addresses the need for increased food production and will support research in particular problem areas of plant genetic resource preservation and safe exchange. Institutional development will be fostered insofar as the implementing agency, the Indian Council for Agricultural Research, and its institutions, will acquire a strengthened capacity to design and execute an effective plant genetic resources system.

2. Development Assistance Project:

Criteria (Loans Only)

a. FAA Sec. 122 (b).

Information and conclusion on capacity of the country to repay the loan, at a reasonable rate of interest.

N/A

b. FAA Sec. 620 (d). If

N/A.

assistance is for any
productive enterprise which
will compete with U.S.
enterprises, is there an
agreement by the recipient
country to prevent export to
the U.S. of more than 20% of
the enterprise's annual
production during the life of
the loan?

3. Economic Support Fund Project
Criteria

a. FAA Sec. 531 (a). Will this
assistance promote economic
and political stability? To
the maximum extent feasible,
is this assistance consistent
with the policy directions,
purposes, and programs of
part I of the FAA?

N/A

b. FAA Sec. 531 (c). 2011

N/A

assistance under this chapter
be used for military, or
paramilitary activities?

c. ISDCA of 1985 Sec. 207.

N/A

Will ESF funds be used to
finance the construction of or
the operation or maintenance
of, or the supplying of fuel
for, a nuclear facility? If
so, has the President
certified that such a country
is a party to the Treaty on
the Non-Proliferation of
Nuclear Weapons or the Treaty
for the Prohibition of Nuclear
Weapons in Latin America (the
"Treaty of Tlatelolco"),
cooperates fully with the
IAEA, and pursues
nonproliferation policies
consistent with those of the
United States?

d. FAA Sec. 609. If commodities are to be granted so that sale proceeds will accrue to the recipient country, have Special Account (counterpart) arrangements been made? N/A



United States
Department of
Agriculture

Animal &
Plant Health
Inspection
Service

ANNEX I

American Embassy
Plant Protection & Quarantine
Area Office
New Delhi - 110021 (India)
Phone : 609908
Grams : AMEMBASSY

DATE : March 25, 1988

REPLY TO

ATTN OF: Dr. Leland D. White

SUBJECT: Indian Germplasm Facility - Environmental Analysis

TO: Graham Thompson, AID/PRJ
W/295D

I am enclosing remarks from our Biological Assessment Support Staff (BASS) dated March 1, 1988 on subject matter.

In addition to their summary statement, I have highlighted those points in their "general comments" which I feel you should consider in preparing your final document.

After you have reviewed and considered their comments, I will be pleased to provide additional assistance as appropriate.

Enclosed also are the project documents you loaned me on Peru, Nepal and Sri Lanka.


Leland D. White
APHIS Area Director

Encl: As above



United States
Department of
Agriculture

Animal and
Plant Health
Inspection
Service

Room 634, Federal Building
Hyattsville, Maryland 20782

APL:IS/11w Delhi Area Office
 AID No. 22-182
 Dispatch No.
 22 MAR 1988
 Ref. IRD Memo No.
 Ref. Work Directive No.
 Date MAR 16 1988



Indian Germplasm Facility

To Darcy Axe, Chief Operations Officer
Export Coordination Operations

Reference is made to your request (Speed Memo dated March 4, 1988, subject: Indian Germplasm Facility) for an evaluation of the quarantine aspects of the USAID Project Paper "India Genetic Resources Project" which was transmitted to you by Leland White (Memo dated February 22, 1988).

Dr. White requested comments on the following AID concerns related to paragraph 5.43 in the report: (1) the environmental risks of the project, and (2) the adequacy of the planned activities to deal with each environmental risk. In addition, he requested comments on: (3) other quarantine elements in the document such as the examples he identified by paragraph number. (Items (1) and (2) are also discussed in Annex D, Page 52.) The following comments are submitted for these three items.

SUMMARY: The Biological Assessment Support Staff (BASS) has concluded that the environmental risk singled out by AID reviewers and referred to by Dr. White can be adequately handled by strengthening the Plant Quarantine Division, NBPGR according to the project proposal. This conclusion was based on a review of the proposed activities for construction, equipment purchases, staffing, research, training, and short-term technical assistance. A comparison was made with the proposed activities in India and comparable activities conducted by BASS personnel at the PPQ Plant Quarantine Facility (postentry greenhouse quarantine) and Plant Germplasm Quarantine Center at Beltsville, Maryland.

General comments: Pests can move, or be moved, along natural or manmade pathways from areas where they are known to occur to areas where they are not known to occur. Governments establish quarantine services and take regulatory actions to block the entry of exotic pests, or to reduce the risk that such pests will enter along manmade pathways and subsequently become established. Manmade pathways for the entry of articles that might be infected, infested, or contaminated with exotic pests include baggage, mail, cargo, common carriers such as airplanes, ships, vehicles, and smuggling. The importation of both nonagricultural and agricultural items as cargo or in small quantities present an opportunity for the entry of pests--but, the risks are highest with agricultural items. Among agricultural items, the importation of plant propagative material presents the highest risk because pests are not only moved in association with their hosts but both are protected from adverse environmental stresses during the journey along the manmade pathway. When compared to commercial and private importations of plant propagative material, importation of germplasm constitutes only a very small portion of the total.



The Directorate of Plant Protection, Quarantine, and Storage has the responsibility in India for protecting agriculture and the environment from the entry, or for reducing the risk of entry, of hazardous exotic plant pests. Many of the exotic pest hazards are defined in the quarantine rules, regulations, guidelines, and regulatory actions (including safeguards) promulgated or implemented by the Directorate.

The Directorate has delegated to the Plant Quarantine Division of the National Bureau of Plant Genetic Resources (NPBGR) the function of providing quarantine services and safeguards for the import and export of all plant germplasm. For germplasm exports, NPBGR issues phytosanitary certificates in accordance with the standards set by the International Plant Protection Convention and the quarantine requirements of the importing country. For germplasm imports, NPBGR follows the rules and regulations of the Government of India and guidelines developed in cooperation with the Directorate.

Germplasm of crop and wild species can be grouped into risk categories such as low, medium, or high risk. The importation of plant propagative material of most species is considered as low-to-medium risk in the quarantine regulations of India. The risk associated with the importation of low risk germplasm can be reduced by inspection and treatment procedures. Consequently, for those species, NPBGR processes germplasm importations by inspection and treatment. Similarly, the Directorate processes commercial quantities imported for planting by farmers, growers, and gardeners. However, inspection and treatment are not usually adequate safeguards for the importation of high-risk crop species. Therefore, the regulations of India (as do those of most countries) prohibit commercial or private importation but allow high-risk germplasm to enter through NPBGR under safeguards specified by the Directorate and/or NPBGR. It is these safeguards (e. g. modern sensitive pest detection techniques, postentry quarantine in glasshouses or screenhouses) that require strengthening under the project.

(1) and (2) Paragraph 5.43, Environmental Risks.

The statement that gave rise to the environmental concerns of AID is as follows: "Exchange of seed and plant parts involves the potential risk of introducing plant pests and pathogens into countries or regions where they had previously not existed."

The concern about the adequacy of the planned activities to deal with the AID identified risk is addressed in the same paragraph by the following sentences: "One of the purposes of the project is to strengthen significantly the plant quarantine capabilities of the NPBGR," and "Thus, a strengthening of the NPBGR plant quarantine capabilities as envisioned in the project should help protect India's flora and plant habitats".

The ability of a government agency to process high risk germplasm depends on the training and expertise of the staff as well as the safeguarding features of its facilities, equipment, and procedures. Since the Project Paper under review does not spell out the procedures, it would be difficult for PPQ-APHIS and AID reviewers (not concerned directly with the project) to determine the adequacy of the planned activities to meet the environmental risk mentioned in paragraph 5.43. However, it is likely that the topic was considered and

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addressed by the first design team. The planned activities call for the strengthening of the Plant Quarantine Division in providing quarantine services that will lower the risk of introducing exotic pests on imported germplasm-particularly high-risk germplasm.

Notwithstanding, the lists of intended equipment purchases, short-term technical assistance and consultancies, projections for construction of greenhouse and screenhouse facilities, and plans for training of Plant Quarantine Division personnel can show the thrust of the program. These items indirectly measure the adequacy of the program activities and procedures and to what extent and direction the Plant Quarantine Division is to be strengthened.

The BASS conclusion stated earlier was based on the following project plan funding proposals:

QUARANTINE GREENHOUSE AND SCREENHOUSE FACILITIES CONSTRUCTION:

1. Page 8, e
2. Table I, Page 17
3. Table II, Page 19
4. Table III, page 29a

TRAINING

1. Page 12. A course (in India) will outline new techniques for testing vegetatively propagated materials for pests.
2. Annex D, Page 20, Identification, control, and eradication of potential invaders.
3. Annex G. Thirteen trainees for 46 person-months over 5 years. (Virus indexing; seedborne bacterial detection; serology; taxonomy and detection of insects, nematodes, and fungi; pesticide application and safety; sugarcane quarantine; and advanced program management for germplasm quarantine operation, pest risk analysis, and biological decision making, and germplasm quarantine operation.

CONSULTANCIES OR SHORT-TERM TECHNICAL ASSISTANCE IN PLANT QUARANTINE

1. Page 13, (iv)
2. Annex F, Greenhouse engineer (4 person-months in 5 years)
Plant Quarantine Expert (3 person-months over 3 years)

STAFFING: The present quarantine staff of 17 scientists (10 Ph.D and 7 M.S.) and 7 technicians (Annex D, page 44) will be increased by 5 scientists and 2 technicians (Annex D, Page 45). After, the greenhouses are operational and seed health testing expanded, it may be necessary to increase the number of technicians in order to maintain the safeguards.

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RESEARCH TO SUPPORT REGULATORY ACTIVITIES

1. Annex D, Page 20

EQUIPMENT: ANNEX E

(Note: The list contains 116 entries, but one page with entries 34 through 53 is missing from the copy reviewed by BASS). The following items of equipment support the safeguarding activities (i.e. protecting the environment by preventing the escape of hazardous pest that might be present with imported or exported germplasm).

53. Serological laboratory equipment
54. Soil sterilizer
- 55a. Plant propagation greenhouse, insect proof
- 55b. Plant growth chambers
- 56a. Screenhouses, 25 x 7' (6)
- 56b. Screenhouses, 30 x 60 (3)
57. Quarantine greenhouses with climate control and phytosanitary features (30)
58. Virus Indexing Glasshouses (5)
61. Heat chamber for chemotherapy (2)

It is likely that the missing page with items 34-52 contains some other items for use in quarantine since the missing numbers occur just before items 53-61 which represent quarantine equipment. BASS assumes that autoclaves, laminar flow hoods, and fumigation equipment (chambers and accessories) either appear on the missing page or will be purchased outside of the project funding. If ultracentrifuges are not listed on the missing page, they should be included in the project. This equipment is essential for virus characterization and identification as well as for making antisera used in serological testing.

(3) Other Quarantine Elements Identified by Dr. White Page 5, 3a: Refers to collections of germplasm already in India in storage or in the field. The word "dispersed" which could be used in a regulatory sense to mean dispersal of organisms appears to be used in this report to mean "relocated of germplasm". Page 7, 5b: See above comments under (1) and (2). Page 7, 5b: It is our understanding that NBPGR exports of germplasm to other germplasm systems will be accompanied by a phytosanitary certificate issued under the standards of the International Plant Protection Convention. Page 8, b: See above comments under (1) and (2). Page 10, 1.18: See above comments under construction and equipment Page 12, 1.20: See above comments under (1) and (2) as well as training.

Pages 13-14, 1.24: See above comments under (1) and (2). Germplasm enters in accordance with the quarantine regulations of India as enforced by NBPGR.

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