３．ミニッツ（合同評価報告書を含む）

Minutes of Discussion on the Final Evaluation for the Genetic Resources Preservation and Research Laboratory Project (A/C) in the Islamic Republic of Pakistan

From May 28, 2003 to June 4, 2003 the Japan International Cooperation Agency (hereinafter referred to as "JICA") organized and dispatched the Project Evaluation Team (hereinafter referred to as "the Team"), headed by Ms. NOGUCHI Kyoka, to Pakistan.

The Joint Evaluation Committee consists of four (4) members from the Team and three (3) members from the Pakistan side. It was jointly organized for the purpose of conducting the final evaluation and preparing necessary recommendations for the the Genetic Resources Preservation and Research Laboratory Project (A/C) in Pakistan (hereinafter referred to as "the Project").

After intensive analytical study on activities and achievements of the Project, the Joint Evaluation Committee prepared the Joint Evaluation Report (hereinafter referred to as "the Report") and presented it to the respective governments.

Both the authorities discussed the major issues pointed out in the Report, and agreed to recommend to the respective governments the matters attached.

Islamabad, June 4, 2003

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Senior Deputy Resident Representative
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Dr. N. I. Hashmi
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ATTACHMENT

1. The Joint Evaluation Committee has presented the Report to the respective governments.

2. Both the authorities have accepted the Report and taken notes of the recommendations aimed at successfully sustaining and extending the achievement of the Project.

3. The Pakistani side has requested further Japanese assistance to organize the Third Country Training Course in the region (Central Asian Stetes, Affanistan, Iran and Pakistan) in future, utilizing their facilities and human resources capabilities. The Japanese side has agreed to convey their request to the Japanese Government.

Joint Evaluation Report of the Genetic Resources Preservation and Research Laboratory Project (A/C) in Pakistan

Islamabad, June 3, 2003

Japan - Pakistan Joint Evaluation Committee

The Joint Evaluation Committee (hereinafter referred to as "the Committee") was jointly organized by the Japan International Cooperation Agency (hereinafter referred to as "JICA") and authorities concerned of Pakistan for the purposes of conducting final evaluation and for the preparation of necessary recommendations for the Genetic Resources Preservation and Research Laboratory Project (A/C) (hereinafter referred to as "the Project").

This Joint Evaluation Report (hereinafter referred to as "the Report") has been prepared with the cooperation of Ministry of Food, Agriculture and Livestock (hereinafter referred to as "MINFAL"), Pakistan Agricultural Research Council (hereinafter referred to as "PARC"), National Agricultural Research Centre (hereinafter referred to as "NARC"), Plant Genetic Research Programme (hereinafter referred to as "PGRP"), Economic Affairs Division (hereinafter referred to as "EAD"), Japanese Embassy in Pakistan and JICA Pakistan office.

The Committee conducted a joint evaluation in the form of interviews, field surveys and discussions. As a result of these discussions, the Committee agreed to present the Report to the respective governments.

Here, the members of the Committee put their signatures as an agreement of the Report contents.

野口京香

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Abbreviation List

ABP	Agricultural Biotechnology Program
A/C	After Care
ASO	Assistance Scientific Officer
AVR	Automatic Voltage Regulator
CBD	Convention on Biological Diversity
CGIAR	Concentrated Group of International Agricultural Research
C/Ps	Counterparts
EAD	Economic Affairs Division
GRPRL	Genetic Resources Preservation and Research Laboratory
IAB&GR	Institute of Agricultural Biotechnology and Genetic Resources
IPGRI	International Plant Genetic Resources Institute
JICA	Japan International Cooperation Agency
NARC	National Agricultural Research Centre
NCP	National Commodity Program
NIAS	National Institute of Agrobiological Sciences
ODA	Official Development Assistance
PARC	Pakistan Agricultural Research Council
PGRI	Plant Genetic Resources Institute
PDME	Project Design Matrix for Evaluation
PGRP	Plant Genetic Resources Program
SDS-PAGE	Sodium Dodecyl Sulfate-Polyacrylamyde Gel Electrophoresis
SO	Scientific Officer
SSO	Senior Scientific Officer

1. Evaluation of the Project

1-1 Objectives of the Evaluation

(1) To review the degree of achievement of Input, Output, Project Purpose, in comparison with the Minutes of Discussions (M/D) and Project Design Matrix (PDM) (concluded May 16, 2001).

(2) To evaluate the Project in terms of the five evaluation criteria (Relevance, Effectiveness, Efficiency, Impact and Sustainability).

(3) To make recommendations regarding the measures to be taken for improvement of the Project, as well as to draw the lessons for the improvement in planning and implementation of similar technical cooperation projects.

1-2 Methodology of the Evaluation

The evaluation study was conducted by the Evaluation Team composed of the Japanese Project Evaluation Team (hereinafter referred to as Japanese Team) and Pakistan Evaluation Team (hereinafter referred to as PakistaniTeam).

(1) Analysis was made according to the indicators in the PDME attached in ANNEX- I

(2) The degree of achievement of the Project Plan, attached in ANNEX-III, was assessed.

(3) Analysis was conducted by using the five evaluation criteria described below.

(a) Relevance

Relevance refers to the validity of the Project purpose and the overall goal in connection with the development policy of Pakistan as well as the needs of beneficiaries.

(b) Effectiveness

Effectiveness refers to the extent to which the expected benefits of the Project have been achieved as planned, and examines if the benefit was brought about as a result of the Project (not of external factors).

(c) Efficiency

Efficiency refers to the productivity of the implementation process, examining if the inputs of the Project was efficiently converted into the outputs.

(d) Impact

Impact refers to direct and indirect, positive and negative impacts caused by implementing the Project, including the extent to which the overall goal has been attained.

(e) Sustainability

Sustainability refers to the extent to which the Project can be further developed by Pakistan, and the benefits generated by the Project can be sustained under national policies, technology, systems, and financial state.

1-3 Members of the Evaluation Team

(1) The Japanese Team

Name	Assignment	Occupation
Ms. NOGUCHI Kyoka	Team Leader	Deputy Director, Livestock and Horticulture Division, Agricultural Development Cooperation Department, Japan International Cooperation Agency (JICA)
Dr. EBANA Kaoru	Plant Genetic Resources Management	Senior Researcher, Laboratory of Plant Genetic Resources, Genebank, National Institute of Agrobiological Sciences
Ms. SHEIKH Mimi	Evaluation Analysis	Research staff, International Development Center of Japan
Mr. NAKAHORI Hiroaki	Planning Evaluation	Staff, Livestock and Horticulture Div., Agricultural Development Cooperation Dept., JICA

(2) The Pakistani Team

Name	Assignment	Occupation
Dr. N. I. Hashmi	Leader / Plant Genetic Resources Management	Director General, National Agricultural Research Centre (NARC)
Ms. Shahida Jamil	Evaluation Analysis	Director (Planning), Pakistan Agricultural Research Council (PARC)
Mr. Kamran Ahmad	Planning Evaluation	Section Officer (JPN-1), Economic Affairs Division (EAD)

1-4 Schedule of the Evaluation

The Evaluation Team spent eight (8) days from May 28 to June 4, 2003 in Islamabad, and carried out the following activities:

(1) Reviewing the Project activities through technical presentations by counterpart personnel of the Project;

(2) Interviewing to a JICA expert, counterpart personnel, and related government officials; and

(3) Analyzing observations and findings during the meetings and field study for the Evaluation.

Schedule of the Evaluation

28/ May	Wed	Formulation of the Joint Evaluation Team Confirmation of the evaluation methods
29/ May	Thu	C/P's presentation about progress on PGRP activities
30/ May	Fri	Additional interview on PGRP activities Move to Faisalabad from Islamabad
31/ May	Sat	Visit Faisalabad University of Agriculture, Nuclear Institute for Agriculture and Biology, Ayubu Agricultural Research Institute Move to Islamabad from Faisalabad
1/ June	Sun	Team meeting of Japanese side
2/ June	Mon	Joint Evaluation Team Meeting Preparation of the draft evaluation report Discussion on the results of the evaluation
3/ June	Tue	Joint Evaluation Team Meeting Discussion on the results of the evaluation Sign the joint evaluation report
4/June	Wed	Exchange signature on the minutes

※ Counterparts (C/Ps) mean that PGRP staff members who are involved in the Project.

※ One of the evaluation members conducted the interviews of a JICA expert, counterpart personnel, and related government officials from 26 May to 27.

2. Outline of the Project

2-1 Background of the Project

The Genetic Resources Preservation and Research Laboratory Project in the Islamic Republic of Pakistan, a project-type technical cooperation implemented for five-years from June 1, 1993 to May 31, 1998, was designed to contribute to crop improvement in Pakistan by all forms of research on crop genetic resources, particularly cereals and pulses, including collection, evaluation, preservation, data management, and distribution. The project followed construction of a research institute and installation of equipment by grant aid of Government of Japan. It involved various forms of research, including exploration and collection, seed health, preservation, multiplication, evaluation, and data management, with the genetic resources collected in the genebank being used as breeding material. The project thereby helped researchers of different fields to improve their research abilities.

Upon completion of the project, the Pakistanis conducted researches on a self-help basis and collected plant genetic resources for breeding purposes. However, there were still many shortcomings in how the genebank was organized, and certain technologies failed to take root because of failure to compile the various manuals and plans necessary for systematic operation

of the genebank, lack of coordination between different departments, and changes in research staff. Moreover, the research facilities needed upgrading, since the equipment installed by the grant aid was becoming increasingly antiquated and experienced malfunctions due to voltage fluctuations and the like.

Therefore, in line with the project's goal of contributing to crop improvement by bolstering the research activities of the Plant Genetic Resources Institute (PGRI), an after-care cooperation project was needed to fuel further gains in research capacity, improve the research environment by repairing and upgrading equipment, and better organize the genebank's operations.

A reorganization of the research institutions took place in the middle of the Project. Due to this event, PGRI was newly named as Plant Genetic Resources Program (PGRP).

2-2 Summary of the Project

(1) Overall Goal

New high yielding varieties with insect and/or disease resistance and stress tolerance are developed in order to increase crop production in Pakistan.

(2) The Project purpose:

Activities of PGRP are strengthened in order to serve crop breeders and researchers in Pakistan.

(3) The outputs of the Project:

(a) More Plant genetic resources are collected and conserved in the genebank.

(b) Useful characters are evaluated by agronomical and bio-chemical analysis.

(c) More genetic resources are multiplied for conservation and distribution.

(d) Data management system is improved.

(e) "Plant Genetic Resources Management Manuals" are published.

(f) Coordination with national breeders and researchers is strengthened.

(g) PGRP activities are improved.

3. Achievement of the Project

3-1 Achievements of the Input

Inputs from the Japanese side were: (details are shown in Annex II -1～II -4)

(1) Long-term expert:

One expert was dispatched.

(2) Short-term experts.

Three experts were already dispatched and one more expert is planned to be dispatched in June 2003.

(3) Counterpart training in Japan

Three counterparts were accepted for training in Japan and two more counterparts are planned to be accepted before the end of the Project.

(4) Equipment donation

AVR and other equipment, etc.

Inputs from the Pakistan side were: (details are shown in Annex II-5 and II -6)

(1) Counterpart personnel necessary for the Project

There were twenty scientific officers at the beginning of the Project, however, as of May 2003 there were seventeen.

(2) Budget allocated for the Project

A building, facilities, and also experimental fields including greenhouses for the Project. Two office rooms for the experts and one vehicle were provided.

(3) Operating Costs

Expenses on operational cost such as staff salaries, utilities expenses, research expenses, and others were provided.

3-2 Achievements of the Project Output

Refer to Annex III.

3-3 Achievements of the Activities

Refer to Annex IV

4. Results of the Evaluation with Five Criteria

4-1 Relevance

The results confirm that the overall goal and the objectives of the Project are relevant in accordance with Pakistan's National Development Plan, the Biological Diversity policy of Pakistan, interests of the Project's beneficiaries, and aid policy of the Government of Japan at the time of terminal evaluation.

(1) National Development Plan

According to "Ten Year Perspective Development Plan 2001-11" published in September 2001, the agriculture sector is considered as a mainstay of Pakistan's economy, which accounts for 25% of GDP, 46% of national employment, and 60% of export earnings. It further states that the development of the agriculture sector can lead to a reduction in poverty and contribute to the development of the national economy. For the development of the agriculture sector, crop breeding using conventional and biotechnological techniques are promoted in order to increase crop yield. PGRP is the nation's only genebank which collects, evaluates, conserves, and distributes germplasm of important crops with a view to utilizing it for the development of new crop varieties.

Furthermore, the government of Pakistan became a member of the Convention on Biological Diversity (CBD) in 1994 promising the protection of the biological heritage for conservation and sustainable use of biodiversity. PGRP as Pakistan's only genebank plays an important role in conserving the nation's valuable germplasm.

(2) Interests of Beneficiaries

The requests for germplasm from crop breeders and researchers have increased due to the Project. The crop breeders and researchers have been expecting further institutional development of PGRP so that new varieties can be developed to meet their needs.

(3) Aid Policy of Japan

As for Japan, assisting in agricultural development is one of the components of its ODA Country Program for Pakistan. The Project is also a part of the Improvement and Extension of Agriculture Technology Program stated in the JICA's Country Assistance Plan for Pakistan.

4-2 Effectiveness

The Project purpose of strengthening the activities of PGRP in order to serve crop breeders and researchers in Pakistan has mostly been achieved. One of the most important achievements of the Project is that the fundamental concept of plant germplasm conservation is shared by all staff of PGRP. With the introduction of new arrangements of organizing

germplasm into active and base collection by a Japanese expert, germplasm is now stored more systematically and securely.

During the Project, a total of 2,294 accessions have been distributed within and outside Pakistan accounting for a 16% increase as compared to the number prior to the Project. The quality of germplasm stored in PGRP has also improved as a result of outputs achieved by the Project activities. As of March 2003, 81% of preserved germplasm is available to be distributed to crop breeders and researchers. Major contributions of each output to achieve the Project purpose are described below:

Output 1: More Plant genetic resources have been collected and conserved in the genebank.

(1) A total of 1,702 additional germplasm accessions were preserved in the genebank of PGRP.

(2) A new exploration plan based on the priority given by Pakistan's agricultural development plan was prepared.

Output 2: Useful characters have been evaluated by agronomical and bio-chemical analyses.

(1) An evaluation plan was prepared. In the plan, evaluation of cereals, pulses, and newly collected germplasm were given higher priority. Besides characterization, cereals and pulses are being given higher priority for biochemical analyses.

(2) Agronomic and biochemical characterizations were carried out. A total of 1,306 germplasm samples were characterized. This shows a 12% increase in number during the Project.

(3) Several disease resistant, high yielding, and high quality accessions, especially for the legumes, have been identified.

(4) A total of 779 germplasm samples were evaluated by SDS-PAGE for legumes and cereals.

(5) The technique for cryopreservation has been transferred from a Japanese expert to the scientists of the In-vitro conservation laboratory.

Output 3: More genetic resources have been multiplied for conservation and distribution.

(1) A new multiplication plan of PGRP has been prepared. In the genebank, about 100g seed for base collection and 200-500g seed for active collection have been conserved.

(2) A total of 4,931 germplasm accessions were multiplied during the Project. This shows a 33% increase as compared to the number prior to the Project.

Output 4: Data management system has been improved.

(1) One server and seven computer terminals have been installed along with software for data management during the Project.

(2) The total number of data entry was increased by 15%

(3) Passport data were prepared to be used by crop breeders and researchers through PARC's Web site.

(4) A germplasm catalogue was revised and will be published by the end of the Project.

Output 5: "Plant Genetic Resources Management Manuals" were published.

(1) A brochure and annual report of PGRP were published.

(2) A total of 6 germplasm management manuals and 5 publications related with laboratory activities were published.

Output 6: Coordination with national breeders and researchers has been strengthened.

(1) During the project, PGRP organized 2 seminars and visited 28 agricultural research institutes and universities to further introduce the activities of PGRP to national breeders and researchers.

(2) During the Project, the brochure and annual report of PGRP as well as passport and characterization catalogues were distributed to the related institutions.

Output 7: PGRP activities have been improved.

As a result of the outputs achieved above, activities of PGRP have been improved. Additional achievements of the Project are expected with the provision of delayed inputs.

4-3 Efficiency

The dispatch of Japanese short-term experts and counterpart trainings in Japan were delayed due to the Afghan war and security problems. As a result, the exploration activities and seminars were undertaken later than originally planned. One Japanese short-term expert will be dispatched and two persons will attend the counterpart trainings in Japan before the end of the Project.

As for the equipment inputs, the delivery of the AVR which was planned to be provided by the Japan side has been delayed. Because of the unstable power supply condition in Pakistan, additional studies to solve technical problems for setting up the AVR were conducted by the Japan side. Some of the equipment are still not in use due to the absence of AVR and its allied equipment. Absence of the AVR often caused the malfunctioning of some of the equipment, however, up to now, PGRP has managed it without critical disturbances to the Project activities. To fully utilize all the equipment provided in the laboratories, and also to avoid a future disaster which may cause loss of valuable germplasm stored in PGRP, the immediate supply of AVR is necessary.

Assistance for local cost of the project by both Japan side and Pakistan side were more or less on time and sufficient in amount and helped smooth implementation of the Project.

It was also found that the monthly meetings held during the Project increased the cooperation between the Japanese expert and the Pakistan team and among researchers of PGRP.

4-4 Impact

As a result of the Project in collaboration with other research institutes outside PGRP such as Coordinated Programs on Legumes, Rice, and Oilseed, several disease resistant, high yielding, and high quality accessions, especially for the legumes, have been identified. Although it may take some time to further develop new varieties (generally 7-8 years in Japan), the identified valuable accessions are expected to bring positive impact to crop production in Pakistan in the near future.

Many university students working for their graduate programs have been utilizing the laboratories of PGRP. The positive impact of training these young scientists who may become crop breeders and collaborate with PGRP in the future is more or less foreseeable.

4-5 Sustainability

The results confirm that the Project is sustainable in view of the future prospects of PGRP financial, institutional, and technical capabilities.

(1) Financial Sustainability

The financial prospect for the next 5 years of PGRP after the completion of Project is positive. The budget allocated for the operating cost of PGRP has steadily increased since 1998. The research funds provided by the Agricultural Linkages Program (ALP) are also available for next several years.

Research Funds (Rs. in million)

Name of Project	Amount
Medicinal Plants*1	1.495
ALP I*2	0.925
ALP II*2	0.611
ALP III*2	0.719
Vegetable Germplasm Collection	0.104
Total	3.854

*1 For 5 years from 2002 *2 For 3 years from 2002

(2) Institutional Sustainability

A reorganization of the research institutes took place in the middle of the Project period. PGRP merged with IAB and formed IAB&GR. For the time being, functions and activities of PGRP have remained the same. The monthly meetings initiated with the Project to monitor the progress of PGRP activities and to exchange information among laboratories are expected to be continued after the end of Project.

(3) Technical Sustainability

Although some staff who participated in the Project moved from PGRP, the turnover rate of staff during the Project period was 15%. It is also found that the Project has improved the technical level of PGRP scientists and they are highly motivated to continue their Project activities even after the Project. Furthermore, the laboratory manuals produced during the Project can be used as a tool to import techniques and knowledge necessary for the staff to deal with the laboratory activities. These will help to maintain the level of technical know-how provided by the Project in the future.

(4) Operational Sustainability

Currently only one data-management staff is available in PGRP. The placement of a system engineer with database development, operational, and maintenance skills will be indispensable for PGRP to further develop the characterization database in the future.

5. Conclusion

The Evaluation Team has concluded that the Project achieved the original goal to strengthen activities of PGRP in order to serve crop breeders and researchers in Pakistan at all levels in the Project area. Also the Evaluation Team has observed its high relevancy, prospect of positive impacts, efficiency, and sustainability of the Project based on the discussions with concerned officials, counterparts, and crop breeding research institutions. Therefore, it is justified that the Project be completed as planned in the M/D (concluded May 16, 2001).

6. Recommendations

The Evaluation Committee recommends the following for PGRP to further increase the level of the Project achievements and to enhance its role as the nation's only genebank:

1. Expand the information services of PGRP to the crop breeders and researchers in Pakistan.

The following actions should be taken by PGRP in order to better serve the crop breeders and researchers in Pakistan:

(1) Create an independent Website of PGRP and develop a user-friendly germplasm search system by increasing the item of search criteria on the Website.
(2) Constantly update the catalogue of passport data as well as the characterization data on both in-print and on the Website.
(3) Employ a permanent system engineer or outsource the work in order to implement the above stated tasks efficiently.

2. Strengthen the cooperation with agriculture research institutions in Pakistan.

PGRP should strengthen the relationship with the National Commodity Programmes (the NCP) and share the information of the germplasm obtained by the NCP from CGIAR Centres and other international sources.

3. Allocate necessary operational budget for the Plant Genetic Resources Preservation.

It is essential that PGRP continuously maintains its activities in order to contribute to a development of new varieties to increase and sustain the crop production in Pakistan. Although there is no apparent financial problem in PGRP at present, securing the long term financial resources for the operation of the Plant Genetic Resources Preservation are an essential issue for maintaining the sustainability of PGRP.

4. Promote awareness on PGRP in the country.

PGRP needs to further promote its activities in the country. Periodical seminars for its stakeholders and collaboration with NARC's training courses related to crop improvement are recommended.

5. Keep maintaining the internal meetings to strengthen the linkage among the laboratories.

Continuing the monthly meetings held during the Project is recommended to further strengthen the linkage and better communication among the laboratories in PGRP.

6. Improve the base collection.

It is needed for PGRP to increase the numbers and quantity of germplasm in the base collection to ensure security of the germplasm preservation.

7. Ensure sustainability of researchers working in PGRP.

It is expected that the researchers who received technical trainings during the Project continue their research activities and remain with PGRP even after the end of the Project.

- LIST OF ANNEX -

Annex- Ⅰ : Project Design Matrix for Evaluation (PDME)

Annex- Ⅱ : Achievements of Input

Ⅱ -1 List of Japanese Experts

Ⅱ -2 List of Counterpart Personnel

Ⅱ -3 Training of Counterpart Personnel in Japan

Ⅱ -4 List of Equipment

Ⅱ -5 Input of Local Cost by Japanese Side

Ⅱ -6 Budget Allocated for the Project by the Pakistan Side

Annex- Ⅲ : Achievement of Project Output

Annex-Ⅳ: Achievement of Activities

Annex- Ⅴ: Organizational Chart

Annex-Ⅵ: List of Publications

Annex-Ⅶ: List of Germplasm Distribution within Pakistan

Annex-I: Project Design Matrix for Evaluation (PDME)

Project Name: Aftercare Technical Cooperation for the Genetic Resources Preservation and Research Laboratory Project.
Target Group: Crop breeders and Researchers in Pakistan
Duration: 2001.8.6— 2003.8.5

2003.5.28

Narrative Summary of the Project	Indicators	Means of Verification	Important Assumptions
Overall Goal New high yielding varieties with insect and/or disease resistance and stress tolerance are developed in order to increase crop production in Pakistan	New varieties are developed utilizing PGRP germplasm.	Report by PARC	Activities of PGRP are being further strengthened and extended with the support of the Pakistani Government
Project Purpose Activities of PGRP are strengthened in order to serve crop breeders and researchers in Pakistan.	1. Number of germplasm distribution is increased 15% at the end of the project. 2. 80% of preserved germplasm is available for crop breeders and researchers at the end of the project.	1. PGRP annual report 2. PGRP annual report	Breeders use germplasm conserved at PGRP
Outputs 1. More plant genetic resources are collected and conserved in the genebank. 2. Useful characters are evaluated by agronomical and bio-chemical analyses. 3. More genetic resources are multiplied for conservation and distribution. 4. Data management system is improved. 5. "Plant Genetic Resources Management Manual" is published. 6. Coordination with national breeders and researchers is strengthened. 7. PGRP activities are improved.	1. 80% of stored germplasm is preserved in base collection at the end of the project. 2. Total number of evaluated accessions are increased by 15% at the end of the project. 3. Total number of multiplied accessions are increased by 10% at the end of the project. 4. Total amount of data entry are increased by 5% at the end of the project. 5. PGRP's routinely well managed. 6. 2 meetings are organized by the end of the project. 7. Outputs 1.—4. are realized.	1. Report of seed preservation lab 2. Report of germplasm evaluation lab 3. Report of germplasm evaluation lab 4. Report of documentation lab 5. PGRP annual report 6. PGRP annual report 7. PGRP annual report	PGRP's role is recognized by related organizations.

Activities	Inputs		
	Japanese side	Pakistani side	
1-1 Plan for exploration and introduction. 1-2 Explore more areas to collect and conserve germplasm. 1-3 Introduce useful germplasm from abroad. 1-4 Establish systematic storage and its management. 1-5 Identify seed-born diseases of germplasm. 1-6 Preserve vegetatively propagated crops in liquid nitrogen. 2-1 Plan for germplasm evaluation. 2-2 Evaluate germplasm according to priority. 3-1 Plan for germplasm multiplication. 3-2 Multiply germplasm. 4-1 Install new computers and software. 4-2 Construct database for germplasm management. 4-3 Publish catalogues. 5-1 Plan for "Manual" publication. 5-2 Prepare and publish "Manual" 6-1 Organize meetings with national breeders and researchers. 7-1 Repair or replace machinery and equipment	1. Dispatch of one long - term expert 2. Dispatch of short - term experts 3. C/P training in Japan 4. Provision of the Equipment	1. Provision of building and facilities 2. Assignment of counterpart personnel 3. Allocation of local project cost	Trained counterpart personnel and technical staffs work at PGRP Appropriate budget is secured

Annex-Ⅱ: Achievements of Input

Annex-Ⅱ-1 List of Japanese Experts

Name	Field	Period
Dr. Junji Takahashi	Genetic Resources Management	2001.8.6~2003.8.5
Dr. Koichi Kadowaki	DNA Marker Technology	2002.12.3~2002.12.21
Dr. Takao Niino	Cryopreservation	2003.2.15~2003.3.12
Dr. Masaru Takeya	Data Management	2003.3.4~2003.3.19
Dr. Hisatoshi Kaku (Scheduled)	Identification of Bacteria	2003.6.9~2003.7.6

Annex- Ⅱ -2 List of Counterpart Personnel

	Name	Position or Field	Period	Remarks
1	Dr. Rashid Anwar	D.D.G	*	
2	Dr. Zahoor Ahmed	Program Leader	*	
3	Dr. Naeemullaha	Seed Health	*	
4	Dr. Zafar Riaz	Seed Health	Till 2002.3.31	Resigned
5	Mr. Sadiq Bhatti	Exploration	Till 2002.5.31	Retired
6	Mr. Muhamad Arif	Exploration	*	
7	Dr.Shahid Masood	Germplasm Evaluation		2003.4-2004.2 (Japan)
8	Dr. Abdul Ghafoor	Germplasm Evaluation	*	
9	Dr. Ashiq Rabbani	Germplasm Evaluation		2002.4-2003.4 (Japan)
10	Mr. Asif Javaid	Germplasm Evaluation	*	
11	Mr.Muhamad Afzal	Seed Preservation	*	
12	Dr. Shahzed Naseem	Seed Preservation	*	
13	Mr. Shakeel Ahmed	Seed Preservation	*	
14	Dr. Mustafa Sajid	In-vitro Preservation	*	
15	Dr. Sadar uddin	In-vitro Preservation	*	
16	Mr. Muhammad Ishtiaq	In-vitro Preservation	*	
17	Mrs. Abida Akhtar	In-vitro Preservation	Study Abroad	Resigned
18	Mr. Abdul Qayyum	Documentation	*	
19	Miss.Nayyar Kazmi	Documentation	Till 2001.12.31	On leave
20	Dr. Zabta Shinwari	Herbarium	Till 2002.6.30	On deputation

*=Assigned during the Project period

Annex- Ⅱ -3 Training of Counterpart Personnel in Japan

Name	Period	Field	Training Institute	Position
Mr.Muhammad Rashid	2002.3.26-4.13	Maintenance of Equipment	Various Makers	Technical Assistant
Mr. Abdul Qayyum	2002.10.1-12.22	Data Management	NIAS*	Lab. In-charge
Dr. Mustafa Shajid	2002.10.15-12.27	Cryopreservation	NARO**	Lab. In-charge
Dr. B. Soomro (Scheduled)		Genetic Resources Preservation System	NIAS	Chairman, PARC
Dr. Rashid Anwar (Scheduled)		Genetic Resources Preservation System & Fruit Field Genebank	NIAS	D.D.G, IABGR

* NIAS--- National Institute of Agrobiological Sciences, Japan

**NARO---National Agricultural Research Organization, Japan

Annex-Ⅱ-4 List of Equipment

S. No.	Name of Equipment	Model	Make	Quantity	Unit Price in Yen	Total Price in Yen	Lab./Stock Entry Page #	Location	Operational/ not operational	Reasons for not operational
1.1	**Gel Documentation System**	FA500	Aisan TATEL	1 Set	1,148,900	1,148,900	09	Eval.Lab.	OPERATIONAL	
1.2	Spare parts of Discharge tube			2 Set	6,200	12,400	"	"		
1.3	Roll papers for printer			2 Set	19,100	38,200	"	"		
2.1	**pH Meter**			1 Set	287,200	287,200	10	"	OPERATIONAL	
2.2	Spare pH multiple glass electrode			1 PC	26,600	26,600	"	"		
2.3	Potassium chloride solution (500 ml)			1 Set	2,100	2,100	"	"		
2.4	pH 4.01 Standard powder			8 Set	2,100	16,800	"	"		
2.5	Printer papers (5 rolls)			2 Set	5,300	10,600	"	"		
3.1	**High Speed Refrigerated Centrifuge**	MX300	TOMY	1 Set	691,500	691,500	11	"		
3.2	Angle rotor			1 PC	127,700	127,700	"	"		
3.3	Rotor rack (2.2ml x 24 pcs)			1 Set	42,600	42,600	"	"		
3.4	Rotor rack (PCR 8 tube x 8 unit)			1 Set	42,600	42,600	"	"		
3.5	Rotor rack (for 50ml x 4 or 15ml x 4)			1 Set	74,500	74,500	"	"		
3.6	Centrifuge tube (PP 1.5ml/ 1000 pcs)			5 Set	6,900	34,500	"	"		
3.7	Centrifuge tube (PP 0.2ml 8 tubes/125 units)			10 Set	14,9000	149,000	"	"		
3.8	Centrifuge tube cover (for PP0.2ml 8 tubes/125 units)			10 Set	3,200	32,000	"	"		
3.9	Centrifugal tube (PP50ml/ 500 pcs with screw cover)			5 Set	29,800	149,000	"	"		

S. No.	Name of Equipment	Model	Make	Quantity	Unit Price in Yen	Total Price in Yen	Lab./Stock Entry Page #	Location	Operational/ not operational	Reasons for not operational
4. Migration Chamber										
4.1	AE-6530M	AE6530M	ATTD	4 Set	37,200	148,800	"	"	NOT OPERATIONAL	
4.2	AE-8450 Power unit			4 PCS	136,200	544,800	"	Eval.Lab.	Operational	
4.3	AE-6401 Miniscrub Kit (for 2 sheets) 1mm			40 Set	11,900	476,000	"	"	"	
4.4	P/N 6530A Upper chamber (with seal packing electrode)			8 Set	19,100	152,800	"	"	"	
5. Micro Pipet(Constitution)										
5.1	NPX-100			2 Set	18,600	37,200	13	"	Operational	
5.2	Consumable PMT-SE (1000 pcs)			2 Set	4,300	8,600	"	"	"	
5.3	NPX-200			2 Set	18,600	37,200	14	"	"	
5.4	Consumable PMT-SE (1000 pcs)			2 Set	4,300	8,600	"	"	"	
5.5	NPX-1000			2 Set	18,600	37,200	15	"	"	
5.6	Consumable PMT-L (1000 pcs)			2 Set	4,300	8,600	"	"	"	
5.7	NPX-10			2 Set	18,600	37,200	16	"	"	
5.8	Consumable PMT-SS (1000 pcs)			2 Set	4,500	9,000	"	"	"	
5.9	NPX-5000			2 Set	18,600	37,200	17	"	"	
5.10	Consumable PMT-X (1000 pcs)			2 Set	3,500	7,000	"	"	"	
6.	**Aspirator (AS-01)**	AS-01	AS ONE	1 Set	48,900	48,900	06	Seed Pres.	"	
7.	**Conductivity Meter**	B-173	HORIBA	1 Set	19,900	19,900	11	"	- do -	
8.	**O_2 Oxygen Detector**	LC750F	TORAY	1 Set	595,700	595,700	16	"	- do -	

S. No.	Name of Equipment	Model	Make	Quantity	Unit Price in Yen	Total Price in Yen	Lab./Stock Entry Page #	Location	Operational/ not operational	Reasons for not operational
9.1	**CO_2 Sensor**	CD602 B	Flow System	1 Set	255,300	255,300	07	"	- do -	
9.2	Calibration gas 1 (Zero span gas, N_2 UN 1066 CLASS 2.2)			5 PCS	12,800	64,000	1	"	- do -	
9.3	Calibration gas 2 (Span gas, CO_2 UN 1013 CLASS 2.2)			5 PCS	12,800	64,000	2	"	- do -	
9.4	Filter for spare probe (10 pcs)			3 Set	6,400	19,200	3	"	- do -	
10.1	**Dehumidifier (SGP-600-2E) Main unit**	S6P 600-2E	SEIBU GIKEN	1 Set	1,270,700	1,270,700	10	Gene Bank	Operational	
10-2	Spare parts			1 Set	40,400	40,400	-	"	-	
11.	**Plastic Bottle(1200 pcs/set)**			1 Set	638,300	638,300	4	"	OK	
12.	**Aluminium Bag Laminate Zip (6400 sheets)**			1 Set	223,400	223,400	5	"	OK	
13.	**Aluminium Bag ALF Laminate Zip (5000 sheets)**			1 Set	223,400	223,400	6	"	OK	
14.1	**MO Drive**[Constitution] MOX-SX640/UN Main unit	MOX-S X640/UW	Japan	1 Set	55,300	55,300	(9)	DML		
14.2	Step down trans (100VA)	DP-100	Japan	1 PC	4,300	4,300	(9)	"		
15.	**Scanner**	N1240U		1 Set	60,000	60,000	(5)	"		
16.	**Tubing Pums**	(TPC-7)	Sibata	1 Set	72,300	72,300	13	In-Vitro	Operational	
17	**Sprayer**	MHD-17	MARU-YAMA	1 Set	29,800	29,800		SHL	"	
18-1	**Chipper**	(CP-300JCA)	Yamamo to	1 Set	776,600	776,600	12	In-Vitro	"	
18-2	Spare parts	"	"	1 PC	77,700	77,700	"	"	"	

S. No.	Name of Equipment	Model	Make	Quantity	Unit Price in Yen	Total Price in Yen	Lab./Stock Entry Page #	Location	Operational/ not operational	Reasons for not operational
19. Bioreactor System										
19-1	1603-T1352 Main unit	(BMJ-42G)	Sibata	1 Set	679,800	679,800	7	In-Vitro	"	
19-2	1603-T52 Bio controller	(BCM-1)	"	1 PC	1,203,200	1,203,200	7	"	"	
19-3	Surge tank (6L)	1607-6000	"	2 PCS	35,100	70,200	7	"	"	
19-4	2 Tubs Pumps	1603-T53 (HBP-2)	"	1 PC	244,700	244,700	7	"	"	
19-5	pH Sensor	7052-0512	"	1 PC	48,900	48,900	7	"	"	
19-6	pH Sensor Connection Cable	7052-0520	"	1 PC	8,500	8,500	7	"	"	
19-7	DO Sensor (with connection cable)	7052-0622	"	1 PC	172,300	172,300	7	"	"	
19.8	(LLS-1) Deforming sensor	7052-T801	"	1 PC	85,100	85,100	7	"	"	
19.9	HAU-1 Airation unit		"	1 PC	244,700	244,700	7	In-Vitro	"	
19.10	5111-301 Low constant temperature bath (with trans)	(CW-301)	"	1 PC	340,400	340,400	7	"	"	
19.11	Sterlized joint (2mm)		"	1 PC	34,000	34,000	7	"	"	
19.12	Sterilized joint (6mm)		"	1 PC	34,000	34,000	7	"	"	
20.1	**Electric Conductivity Meter**	CM20J	TOA-DKK	1 Set	148,900	148,900	8	"	"	
20.2	C-50101 B Soaking standard electric conductivity cell		"	1 PC	26,600	26,600	8	"	"	
21.1	**pH Meters**	8050-52 (PPT-100M)	Sibata	1 Set	98,900	98,900	9	"	"	
21.2	Immersion multiple glass electrode	8050-0111(PT-102)	"	1PC	22,300	22,300	9	"	"	
22.	**Water Distilling apparatus**									
22.1	WA570 Main unit	WA570	Yamato	1Set	581,900	581,900	6	SHL	Operational	
22.2	Water supply hose (with connection unit) 2m	"	"	1 PC	12,800	12,800	"	"	"	

S. No.	Name of Equipment	Model	Make	Quantity	Unit Price in Yen	Total Price in Yen	Lab./Stock Entry Page #	Location	Operational/ not operational	Reasons for not operational
22.3	Drain hose (3m)	"	"	1 PC	2,700	2,700	"	"	"	
22.4	Cleaner (1kg)	"	"	1 PC	2,300	2,300	"	"	"	
22.5	40L tank unit tank	"	"	1 PC	21,300	21, 300	"	"	"	
22.6	Water supply unit	"	"	1 PC	21,300	21,300	"	"	"	
22.7	Column	"	"	1 PC	47,900	47,900	"	"	"	
22.8	Ion exchange resin cartridge	"	"	5 PCS	19,100	95 ,500	"	"	"	
22.9	Raw water filer	"	"	10 PCS	1,900	19,000	"	"	"	
22.10	Membrane filter	"	"	10 Set	24,500	245,000	"	"	"	
22.11	Cleaner (1kg)	"	"	10 Set	2.300	23.000	"	"	"	
23.1	**Conductivity Metre** 712 type	712 TYPE		1 Set	344,700	344,700	12	"	"	
23.2	Conductivity cell C=0.8Pt100			1 PC	59,600	59,600	"	"	"	
24.	**Spare parts of Hot Plate** P/No.130 heter			1 PC	48,900	48,900		Eval. Lab.		
25.	**Spare parts for Autoclave**									
25.1	P/No.SM22022141 Pipe heter			1 PC	5,900	5,900	Entry Page	Eval. Lab.		
25.2	P/No.1160076001 Temperature detecting sensor			1 PC	14,900	14,900		"		
26.	**Spare parts for Auto Still** P.No.2410016001 Bobbin heter			1 PC	9,000	9,000		"		
27.	**Spare Parts of Auto Still (Constitution)**									
27.1	P/No.2530370193 heter			1 PC	17,000	17,000		Eval. Lab.		
27.2	P/No.2040030003 Float switch			1 PC	6,900	6,900		"		
27.3	P/No.9020036001 Raw water filter			4 PCS	1,900	7,600		"		
27.4	P.No.9020046001 Pure water filter			4 PCS	26.600	106,400		"		

S. No.	Name of Equipment	Model	Make	Quantity	Unit Price in Yen	Total Price in Yen	Lab./Stock Entry Page #	Location	Operational/ not operational	Reasons for not operational
28	**Spare Parts (Constitution)**									
28.1	SDV-FH7 Voltage sensor			4 PCS	24,500	98,000	17	Gene Bank	OK	
28.2	SDC2000DC01A003TI Humidity controller			8 PCS	121,300	970,400	18	"	OK	
28.3	SDC2006DF01A000TI Temperature controller			8 PCS	104,300	834,400	19	"	OK	
28.4	MY4N200V4C Control relay			36PCS	1,600	57,600	20	"	OK	
28.5	Illuminating lamp SL-18V2W			100 PCS	300	30,000	7	"	OK	
29.	**Spare parts, Vacuum Sealer** 300R35 heter (100mm, 20/pcs/set)			1 Set	9,400	9,400		"		
30.1	**Spare parts pH meter** ADV-200 AC Adopter	ASV-200		2 PAC	17,000	34,000	9	In-Vitro	Operational	
30.2	GST-5421C Electrode	GST		2 PAC	22,300	44,600	9	"	"	
31.	**Spare parts, pH meter** 511080 (Old No.39848) Electrode	511080		1 PC	31,900	31,900	9	"	"	
32.	**Spare parts, Clean Bench** HEPA filter for PCV1913BN	PCV1913 BN		4 PCS	50,400	201,600	10	In-Vitro	"	
33.	**Spare parts, Clean Bench** HEPA filter for PCV843BN	PCV843 BN		4 PCS	63,300	253,200	10	"	"	
34.	**Spare parts, Autoclave** HL36AE heter	HL36AB		1 PC	16,000	16,000	11	"	"	
35.	**Spare parts, Table top Centrifuge** S304763B (2 pcs/set) Carbon brush	SLT5B		2 PCS	1,600	3,200	7	SHL	Operational	
36.	**Spare parts for Water Bath**									
36.1	P/No.2140116005 Motor	BT 47	Yamato	2 PCS	18,100	36,200	8	SHL	Operational	
36.2	P/No.1160076025 Platinum resistance bulb	BT 47	Yamato	2 PCS	19,100	38,200		"		

S. No.	Name of Equipment	Model	Make	Quantity	Unit Price in Yen	Total Price in Yen	Lab./Stock Entry Page #	Location	Operational/ not operational	Reasons for not operational
36.3	P/No.1012206001 Temperature controller	BT 47	Yamato	2 PCS	62,800	125,600		"		
36.4	P/No.2211310110 Pipe heter	BT 47	Yamato	2 PCS	6,400	12,800		"		
37.	**Spare parts for Auto Still**									
37.1	P/No.302003008 Magnet valve	WA 33	Yamato	2 PCS	8,000	16,000	9	SHL	Operational	
37.2	P/No.2410016001 Bobbin heter	WA 33	Yamato	8 PCS	9,000	72,000	"	"	"	
37.3	P/No.2530440151 Heter pipe	WA 33	Yamato	4 PCS	29,800	119,200	"	"	"	
37.4	P/No.2530030215 Condenser	WA 33	Yamato	6 PCS	25,500	153,000	"	"	"	
37.5	P/No.90200966001 Pure water filter	WA 33	Yamato	24 PCS	24,500	588,000	"	"	"	
37.6	P/No.2530030418 Leak detector	WA 33	Yamato	4 PCS	1,500	6,000	"	"	"	
37.7	P/No.000811 Ion exchanger	WA 33	Yamato	12 PCS	19,100	229,200	"	"	"	
37.8	P/No.9020036001 Raw water filter	WA 33	Yamato	12 PCS	1,900	22,800	"	"	"	
37.9	P/No.8190010001 Cleaner (1 kg/pack)	WA 33	Yamato	24 PAC	2,300	55,200	"	"	9	
38.	**Spare parts, Homogenizer** Control board for LSG	LH.21	Yamato	1 PCS	57,400	57,400	10	SHL	Operational	
39	**Spare parts Table Top Centrifuge**									
39.1	S302613 Heater (4)	SCP 85 G	HITACHI KOKI	2 PCS	58.500	117,000	11	SHL	Operational	
39.2	S301762 Noise filter (B)	SCP 85 G	HITACHI KOKI	2 PCS	17,000	34,000	"	"	"	
39.3	464021 Micro switch	SCP 85 G	HITACHI KOKI	4 PCS	900	3,600	"	"	"	

S. No.	Name of Equipment	Model	Make	Quantity	Unit Price in Yen	Total Price in Yen	Lab./Stock Entry Page #	Location	Operational/ not operational	Reasons for not operational
39.4	465307 Soleniod	SCP 85 G	HITACHI KOKI	2 PCS	5,300	10,600	"	"	"	
39.5	S404325 sensor assy	SCP 85 G	HITACHI KOKI	1 PC	44,700	44,700	"	"	"	
39.6	S302356B Imbalance sensor assy	SCP 85 G	HITACHI KOKI	2 PCS	22,300	44,600	"	"	"	
39.7	465366 Gasket	SCP 85 G	HITACHI KOKI	12 PCS	900	10,800	"	"	"	
39.8	S 400961A Diffusion pump oil(50ml/can)	SCP 85 G	HITACHI KOKI	8PCS	14,900	119,200	"	"	"	
39.9	3058512 Rotary pump oil (4L/can)	SCP 85 G	HITACHI KOKI	1PC	8,900	8,900	"	"	"	
39.10	S 304117 CPU(PD78C10AGQ-36)	SCP 85 G	HITACHI KOKI	4 PC	3,100	12,400	"	"	"	
39.11	S 301942 C-MOSIC IC PD71054C	SCP 85 G	HITACHI KOKI	1 PC	1,000	1,000	"	"	"	
39.12	S 201723A Drive board		HITACHI KOKI	1 PC	489,400	489,400	"	"	"	
40	**C/RH Data Logger** (SK-L200TH) Main unit	SK-L 200 TH	SATO	8 SET	24,500	196,000		Geen B.		
41	**Uninterrupted Power Supply** (UPS)Smart UPS SUA 1500I	ASO2092 32304/25	Japan	2 SET	196,800	393,600		DML		
42	**Micro Plate Reader** [Constitution]			1 SET	689,400	689,400		SHL		
43	**Tool Set**			1 SET	13,800	13,800	9	Rashid	Not Operational	
44	**Cramp Meter**			1 SET	12,800	12,800	9	"	Operational	

Annex-Ⅱ-5 Input of Local Cost by Japanese Side

Total amount of ¥17,448,000 were provided for smooth running of the Project.

(unit: 1,000yen)

2001	2002	2003	Total
2,996	12,312	2,140	17,448

Annex-Ⅱ-6 Budget Allocated for the Project by the Pakistan Side

The budget necessary for the project was provided as follows (Table 1). The budget for year 2002 is for IABGR which is a new set up after merger of GRPRL and Institute of Agricultural Biotechnology. It includes salary of some staff that earlier used to draw their salary from resources other than GRPRL.

Table 1. Budgets (Rs. Million)

Year	2001	2002
Amount	5.942	12.153 (IABGR)

Some research funds were obtained from different sources (Table 2), these funds enabled smooth functioning of the Project activities.

Table 2. Research Funds (Rs. Millions)

Name of Project	Amount
Medicinal Plants*1	1.495
ALP I*2	0.925
ALP II*2	0.611
ALP III*2	0.719
Vegetable Germplasm Collection	0.104
Total	3.854

*1 For 5 years from 2002 *2 For 3 years from 2002

Annex- III: Achievement of Project Outputs

Narrative Summary of the Project	Indicators	Result
Overall Goal New high yielding varieties with insect and/or disease resistance and stress tolerance are developed in order to increase crop production in Pakistan	New varieties are developed utilizing PGRP germplasm.	As a result of the Project in collaboration with other research institutes outside PGRP such as Coordinator Program on legumes, rice, and oilseed, several disease resistant, high yielding, and high quality accessions, especially for the legumes, have been found.
Project Purpose Activities of PGRP are strengthened in order to serve crop breeders and researchers in Pakistan.	1. Number of germplasm distribution is increased 15% at the end of the project. 2. 80% of preserved germplasm is available to be distributed to crop breeders and researchers at the end of the project.	1. With introduction of new arrangements of germplasm into active and base collection by a Japanese expert, germplasm is now stored more systematically and securely. 2.Number of germplasm distribution is increased by 16%. 3. 81% of preserved germplasm is available to be distributed to crop breeders and researchers to be distributed.
Outputs 1) More plant genetic resources are collected and conserved in the genebank.	80% of stored germplasm is preserved in base collection at the end of the project.	1. A new exploration plan based on the priority given by Pakistan's agricultural development plan was prepared. 2.. 81% of preserved germplasm is available to be distributed to crop breeders and researchers to be distributed.
2) Useful characters are evaluated by agronomical and bio-chemical analyses.	A total number of evaluated accessions is increased by 15% at the end of the project.	A total number of evaluated accessions were increased by a 12%.
3) More genetic resources are multiplied for conservation and distribution.	A total number of multiplied accessions is increased by 10% at the end of the project.	A total number of multiplied accessions were increased by a 33% at the end of the project.
4) Data management system is improved.	A total amount of data entry is increased by 5% at the end of the project.	A total amount of data entry was increased by a 15%
5) "Plant Genetic Resources Management Manual" is published.	PGRP is routinely well managed.	All manuals were published in March 2003 and were distributed to the related research institutes.
6) Coordination with national breeders and researchers is strengthened.	2 meetings are organized by the end of the project.	PGRP organized 2 seminars and visited 28 agricultural research institutes and universities to further introduce the activities of PGRP to national breeders and researchers.
7) PGRP activities are improved.	Outputs 1.~4. are realized.	Outputs 1.~4. were realized.

Annex-IV Achievement of Activities

<table>
<tr><th>Plan</th><th>Result</th></tr>
<tr><td>Activities
1) More plant genetic resources are collected and conserved in the genebank.
1-1 Plan for exploration and introduction.
1-2 Explore more areas to collect and conserve germplasm.
1-3 Introduce useful germplasm from abroad.
1-4 Establish systematic storage and its management.
1-5 Identify seed-born diseases of germplasm.
1-6 Preserve vegetatively propagated crops in liquid nitrogen.</td><td>1-1 The new exploration plan was produced after examining previous explorations and 1,702 genetic resources were collected during the Project.
1-2 5,010crop germplasm conserved in the base collection, agricultural crops 848, medicinal plants 469 and 73 germplasm of grapes were also collected
1-3 101 germplasm samples were introduced during the project period. Bilateral germplasm exchange is being tried by the project so far it is little success was made due to lake of a proper Material Transfer Agreement in some countries. Due to CBD, crop movement of germplasm has been slowed down.
1-4 Crop germplasm stock file is under preparation for database. It will be created by the end of the project period.
1-5 Several pathogenic bacteria from rice and other crop germplasm were isolated. Technical transfer on identification and elimination of bacteria will be done by a short-term expert in June 2003.
1-6 The project introduced a cryopreservation technique, which conserves plant tissues in liquid nitrogen. Basic technique is already transferred during training in Japan and also by a short-term expert in the Project. It needs more experiments for a practical use.</td></tr>
<tr><td>2) Useful characters are evaluated by agronomical and bio-chemical analyses.
2-1 Plan for germplasm evaluation.
2-2 Evaluate germplasm according to priority.</td><td>2-1 The plan was prepared. In the plan, evaluation on cereals and pulses are being given higher priority in the project. New collected material is also given higher priority. Besides characterization, cereals and pulses are being given higher priority for biochemical analysis.
2-2 Based on 2-1, agronomic and biochemical characterizations were carried out. A total of 1,306 germplasm samples were characterized. This shows 13% increase in number during the Project.
<table><tr><th></th><th>Prior to the project</th><th>2001</th><th>2002</th><th>2003</th><th>Total</th></tr><tr><td>Number</td><td>10,184</td><td>154</td><td>652</td><td>500</td><td>11,490</td></tr></table>
A total of 779 germplasm samples were evaluated by SDS-PAGE for soybean, wheat and vigna species. This shows a 60% increase in number during the Project.
<table><tr><th></th><th>Prior to the project</th><th>2001</th><th>2002</th><th>2003</th><th>Total</th></tr><tr><td>Number</td><td>1,284</td><td>161</td><td>150</td><td>468</td><td>2,063</td></tr></table></td></tr>
<tr><td>3) More genetic resources are multiplied for conservation and distribution.
3-1 Plan for germplasm multiplication.
3-2 Multiply germplasm.</td><td>3-1 The plan is prepared. In genebank about 100g seeds for base collection and 200-500g seeds for active collection are conserved.

3-2 A total of 4931 germplasm were multiplied during the Project. This shows a 33% increase as compared to the number prior to the Project.
<table><tr><th></th><th>Prior to the project</th><th>2001</th><th>2002</th><th>2003</th><th>Total</th></tr><tr><td>Number</td><td>14,920</td><td>1,113</td><td>2,930</td><td>888</td><td>19,851</td></tr></table></td></tr>
</table>

4) Data management system is improved. 4-1 Install new computers and software. 4-2 Construct database for germplasm management. 4-3 Publish catalogues.	4-1 One server and seven computer terminals were installed along with software for data management during the Project. 4-2 Passport data and characterization data were entered into a new computer. 4-3 Passport and characterization catalogues are in preparation. They will be published by the end of the Project.
5) "Plant Genetic Resources Management Manual" is published. 5-1 Plan for "Manual" publication. 5-2 Prepare and publish "Manual"	5-1 The following manuals were published along with other materials.

S. No.	Year Printed	Title
1	2002	Plant Genetic Resources Institute (Brochure)
2	2002	Annual Report (1999-2001)
3	2000	Field Collection Manual for Plant Genetic Resources
4	2003	Operation Manual on ÑSeed Preservation Laboratory and GenebankÓ
5	2003	Laboratory Manual on ÑCharacterization and Evaluation of Plant Genetic ResourcesÓ
6	2003	Laboratory Manual on Ñ*In-vitro* ConservationÓ
7	2003	Laboratory Manual on ÑSeed HealthÓ
8	2003	Operation Manual on ÑData Management LaboratoryÓ
9	2003	Introduction to Plant Genetic Resources Assemblage and Conservation
10	2003	Collection of Wild Chickpea (*Cicer* Species) Genetic Diversity in the Northern Mountains of Pakistan
11	2003	Maps of Plant Genetic resources Collected in Pakistan
12	2003	Sustainable Utilization of Plant Genetic Resources for Agricultural Production-Proceedings
13	2003	10 years of GRPRL

6) Coordination with national breeders and researchers is strengthened. 6-1 Organize meetings with national breeders and researchers.	6-1 During the project, 2 seminars were organized and 28 organizations were visited. Seminars

Year	Title of Seminar	Date	Period	No. of Participant	Remarks
2002	Sustainable Utilization of Plant Genetic Resources for Agricultural Production			55	
2003	10 years of PGRI	2003.5.8	1 day	50	One from NIAS

List of Organization Visited

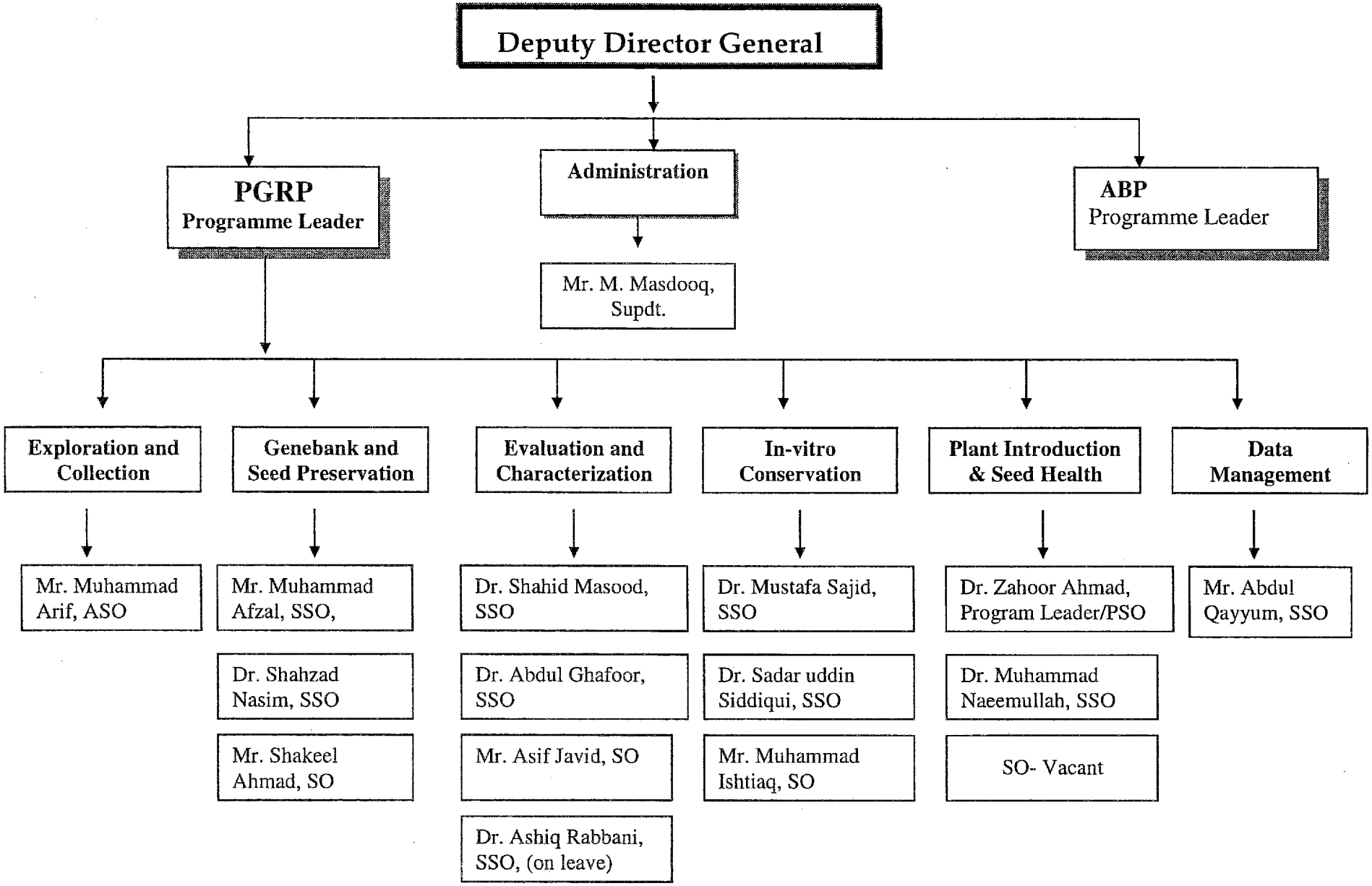
Sr. No.	Month/Year	Organization	Province
1	2002.3	Tropical Agriculture Research Center	Sindh
2	2002.3	Coastal Crop Research Station	Sindh
3	2002.3	Karachi University	Sindh
4	2002.3	Agricultural Research Institute, Tandojam	Sindh
5	2002.3	Sindh Horticulture Research Institute	Sindh
6	2002.3	Agricultural University of Sindh	Sindh
7	2002.3	Nuclear Institute of Agriculture, Tandogam	Sindh
8	2002.3	Sugar Crops Research Institute, Thatta	Sindh
9	2002.8	Cereal Crop Research Institute	NWFP
10	2002.8	World Wildlife Fund	NWFP
11	2002.8	Agricultural University of Peshawar	NWFP
12	2002.8	Agricultural Research Institute, Peshawar	NWFP
13	2002.8	Agricultural Research Station, Tarnab	NWFP
14	2002.9	Nuclear Institute for Agriculture and Biology	Punjab
15	2002.9	Nuclear Institute for Biotechnology and Genetic Engineering	Punjab
16	2002.9	Ayub Agricultural Research Institute	Punjab
17	2002.9	University of Agriculture, Faisalabad	Punjab
18	2002.9	Rice Research Institute, Kala sha kaku	Punjab
19	2002.10	Karakorum Agricultural Research Institute, Juglot	Northern Area
20	2002.10	Agriculture Department, Gilgit	Northern Area
21	2002.10	Twar Fruit Nursery, Skardu	Northern Area
22	2002.10	National Tea Research Institute, Shinkiari	NWFP
23	2002.11	Agriculture, Cooperatives, Food & Fisheries Department	Balochistan
24	2002.11	Agricultural Research Institute, Quetta	Balochistan
25	2002.11	Experimental Fruit Station, Quetta	Balochistan
26	2002.11	Arid Zone research Center, Quetta	Balochistan
27	2003.5	Central Cotton Research Institute	Punjab
28	2003.5	Maize, Millet Research Institue	Punjab

7) PGRP activities are improved.

7-1 Repair or replace machinery and equipment

7-1 Most of the repair and set up of equipment was done except AVR and its allied equipments. Since AVR is not supplied, many equipment are not in use as frequently as expected.

Annex-V: Organizational Chart



Annex-VI: List of Publications

List of Publications From PGRP During 2001-2003

1. Anwar, R., N. Haq and Shahid Masood. 2001. Proceeding on "Medicinal Plants of Pakistan. PASTIC Press, Islamabad pp 1-135.
2. Anwar, R. and S. Masood. 2001. Status of Herbs and other economic plants in Pakistan. Medicinal Plants of Pakistan. Eds R. Anwar, N. Haq and S. .Masood. PASTIC Press, Islamabad. Pp. 49-53.
3. Ghafoor, A., A. Sharif, Z. Ahmad, M.A. Zahid, and M.A. Rabbani. 2001. Genetic diversity in Blackgram (*Vigna mungo* L. Hepper). Field Crops Research, 69: 183-190.
4. Ahmad, Z. and A. Ghafoor. 2001. Resource base and conservation strategies of medicinal and aromatic plants in Pakistan. Paper presented in "Regional workshop on sharing local and national experience in conservation of medicinal plants" at Pokhra, Nepal from 21-23 January, 2001 organized by MAPPA/IDRC.
5. Ahmad, Z. and A. Ghafoor. 2001. Conservation and sustainable utilization of medicinal plants resource base in Hindukush Himalayan region of Pakistan. Paper presented in seminar on "Sustainability of natural resources and agriculture in mountain areas of Pakistan organized by PARC and ICIMOD at Islamabad on April 30, 2001.
6. Ghafoor, A., Z. Ahmad, S.M. Iqbal and Z. Riaz. 2001. Genetic diversity in local collection of *Vigna mungo* (L.) Hepper with relation to geographic pattern. Pakistan Journal of Botany, 33(3): 239-249.
7. Bashir, M., Z. Ahmad and A. Ghafoor. 2001. Pathogenic variability between two isolates of black eye cowpea mosaic potyvirus. Paper presented in third National Conference of Plant Pathology, 1-3 October, 2001, Islamabad. Abstracts pp. 61.
8. Bashir, M., M.S. Iqbal, A. Ghafoor and Z. Ahmad. 2001. Variability in cowpea germplasm for reaction to virus infection under field conditions. Poster presented in 3rd National Conference of Plant Pathology, 1-3 October, 2001, Islamabad. Abstracts pp. 65.
9. Bashir, M., Zahoor A. and A. Ghafoor. 2001. First report of pea seed borne mosaic virus in lathyrus (*Lathyrus sativus*) in Pakistan. Poster presented in 3rd National Conference of Plant Pathology, 1-3 October, 2001, Islamabad. Abstracts pp.66.
10. Bashir, M., Z. Ahmad, T. Iqbal and A. Ghafoor. 2001. Identification of resistance to black eye cowpea mosaic potyvirus. Poster presented in 3rd National Conference of Plant Pathology, 1-3 October, 2001, Islamabad. Abstracts pp. 66.

    Bashir, M, M.S. Iqbal, A. Ghafoor and Z. Ahmad. 2001. First report of cucumber mosaic cucumovirus in Pakistan. Poster presented in 3rd National Conference of Plant Pathology, 1-3 October 2001, Islamabad. Abstracts pp.67.

11. Ahmed, Z. and R. Anwar 2001 Pakistan's National Germplasm System with Emphasis on Acquisition, Evaluation, Access and Exchange. Proceeding of Access to Genetic Resources and Traditional Knowledge: Lesson from South and Southeast Asia. (Edts)Lyle Glowka, Balakishna Pisupati and Sanjiv de Silva. Published by IUCN,Srilanka. pp 89-97.

12. Anwar, R. Significance of wild relatives of crops in agriculture. The News, 8th January, 2001.

13. Anwar, R. and M.A. Rabbani. 2001. Natural occurrence, distribution and uses of Pistacia species in Pakistan. Proceeding on "Towards a comprehensive documentation and use of Pistacia genetic diversity in Central and West Asia, North Afric and Europ" (edts) S. Padulosi and A. Hadj- Hassan. Published by IPGRI, Rome,Italy. pp 45-48.

14. Bashir, M., Z. Ahmad and A. Ghafoor. 2001. Cowpea aphid borne mosaic poty-virus- A Review. International Journal of Pest Management, 48(2): 155-168.

15. Ashraf, M., A.S. Qureshi, A. Ghafoor and N.A. Khan. 2001. Genotype-environment interaction in wheat. Online Journal of Biological Sciences, 1(5): 356-357.

16. Iqbal, S.M., A. Ghafoor, Z. Ahmad and N. Ayub. 2001. Yield performance of promising pea cultivars under natural infection of powdery mildew. Pakistan Journal of Phytopathology, 13(1): 61-63.

17. Ahmad, Z., A. Ghafoor, S.M. Iqbal and M.S. Iqbal. 2001. Yield potential of local and exotic germplasm with special reference to powdery mildew disease in peas [*Pisum sativum* (L.)]. Pakistan Journal of Botany, 33(3): 251-255.

18. Zubair, M. and A. Ghafoor. 2001. Genotype Environment Interaction in Mungbean. Pakistan Journal of Botany, 33(2): 187-190.

19. Javaid, A., S. Masood and N. M. Minhas. 2001. Analysis of combining ability in wheat (*Triticum aestivum* L.) using F2 Generation. Pakistan Journal of Biological Sciences; 4(11): 1303-1305

20. Jatoi, S.A., M. Afzal, S. Nasim and R. Anwar. 2001. Seed deterioration study in pea using accelerated ageing techniques. Pak. J. Bio. Sci., 4(12): 1490-1494.

21. Jatoi, S.A., G.M. Sajid, Hidayat Ullah Suppal, M. S. Baloch, A. Quraishi and R. Anwar. 2001. Differential *in-vitro* response of tomato hybrids against a multitude of hormonal regimes. On-Line J. Bio. Sci., 1(12): 1141-1143.

22. Jatoi, S.A., I. Hussain and Obaid Ullah Sayal. 2001. Influence of N, P and K on yield and yield component of green gram. Sci. Khyber, 14(1): 45-49.

23. Anwar, R. 2002. Plant Genetic Resources for sustained Agri-production. The News, 16th December, 2002.

24. T. Tominaga., K.Niwa, Y. Furata, S. Nasim and R. Anwar. 2002. Germplasm Collection of Tribe Triticeae in Pakistan. J. Trop. Agr., 46: (4) pp 302-306.

25. Ghafoor, A., Z. Ahmad, A.S. Qureshi and M. Bashir. 2002. Genetic relationship in *Vigna mungo* (L.) Hepper and *V. radiata* (L.) R. Wilczek based on morphological traits and SDS-PAGE. Euphytica, 123(3): 367-378.

26. Ahmad Zahoor. 2002. Evening Primrose: a plant to cure many diseases. The News, January 7, 2002.

27. Ahmad Zahoor. 2002. Botanic gardens for education and biodiversity conservation. The News, July 15, 2002, pp.13.

28. Awan, M.R., G. Akbar, D.H. Bokhari and Zahoor Ahmad. 2002. Ethnobotany of Cholistan Desert, Southern Punjab, Pakistan. pp: 77-83. In: Proceedings of the Workshop on "Curriculum Development in applied Ethnobotany. Eds. Z.K. Shinwari; A. Hamilton, and A.A. Khan, WWF, Pakistan.

29. Bashir, M., Z. Ahmad and A. Ghafoor. 2002. Cowpea germplasm evaluation for virus resistance under greenhouse conditions. Asian Journal of Plant Sciences, 5: 585-587.

30. Ashraf, M., A. Ghafoor, N.A. Khan and M. Yousaf. 2002. Path-coefficient in wheat under rainfed conditions. Pakistan Journal of Agricultural Research, 17(1): 1-6.

31. Bashir, M, Z. Ahmad and A. Ghafoor. 2002. Identification of resistance in cowpea against blackeye cowpea mosaic virus. Pakistan Journal of Botany, 34(1): 53-54.

32. Bashir, M., M.S. Iqbal, A. Ghafoor, Z. Ahmad and A.S. Qureshi. 2002. Variability in cowpea germplasm for reaction to virus infection under field conditions. Pakistan Journal of Botany, 34(1): 47-48.

33. Javaid, A., A. Ghafoor and R. Anwar. 2002. Evaluation of local and exotic pea (*Pisum sativum*) germplasm for vegetable and dry grain traits. Pakistan Journal of Botany, 34(4): 419-427.

34. Bashir, M., A. Ghafoor and Z. Ahmad. 2002. Response of cowpea germplasm to virus infection. Pakistan Journal of Agricultural Research, 17(2): 159-162.

35. Iqbal, S.M., C.A. Rauf, N. Ayub and A. Ghafoor. 2002. Morphological characters of chickpea related to resistance against blight. International Journal of Agriculture & Biology, 4(4): 496-499.

36. Ghafoor, A., M. Afzal and R. Anwar. 2002. Diversity in food legumes for sustainable utilization of plant genetic resources. Paper presented in international seminar on "sustainable utilization of plant genetic resources for agricultural production" held from 17-19 December, 2002. PARC/IPGRI/JICA, Islamabad, Pakistan.

37. Afzal, M., A. Ghafoor, S.A Jatoi, S.Fakuoka, K. Okuno and M. Katsuta. 2002. Classification of rice core collection using restriction fragment length polymorphism markers. Paper presented in international seminar on "sustainable utilization of plant genetic resources for agricultural production" held from 17-19 December, 2002. PARC/IPGRI/JICA, Islamabad, Pakistan.

38. Arshad, M., M. Bashir, A.S. Qureshi and A. Ghafoor. 2002. Exploitation of black gram genetic resources for sustainable utioization in variety development process. Paper presented in international seminar on "sustainable utilization of plant genetic resources for agricultural production" held from 17-19 December, 2002. PARC/IPGRI/JICA, Islamabad, Pakistan.

39. Ahmad, Z., M. Bashir. N. Ullaha, M. Sajjad and A. Ghafoor. 2002. Seed borne pathogens in legume and cereal germplasm collection and potential resistance sources. Paper presented in international seminar on "sustainable utilization of plant genetic resources for agricultural production" held from 17-19 December, 2002. PARC/IPGRI/JICA, Islamabad, Pakistan.

40. Javaid, A. and A. Ghafoor. 2002. Genetic diversity for agromorphological traits in Pisum sativum germplasm. Presented at seminar on Sustainable Utilization of Plant Genetic Resources for agricultural production, December 17-19, 2002 organized by PARC/JICA/IPGRI at Plant Genetic Resources Program, NARC, Islamabad, Pakistan.

41. Ghafoor, A., Z. Ahmad, N.I. Hashmi and M. Bashir. 2003. Genetic diversity based on agronomic traits and SDS-PAGE markers in relation to geographic pattern of blackgram [*Vigna mungo* (L.) Hepper]. Journal of Genetics & Breeding, (in press).

42. Iqbal, S.M., A.Bakhsh, A. Ghafoor, N. Ayub and M. Bashir. 2003. Reaction of chickpea genotypes to isolates of *Ascochyta rabiei* (Pass) Lab. Pakistan Journal of Plant Pathology, 2(1): 39-47.

43. Noor, F., M. Ashraf and Ghafoor, A. 2003. Path analysis and relationship among quantitative traits in chickpea (*Cicer arietinum* L.). Pakistan Journal of Biological Sciences, 6(6):551-555.

44. Ahmad Zahoor. 2003. Conservation of Genetic resources For Crop Improvement. The News, March, 31, 2003.

45. Ashraf, M., A.S. Qureshi and A. Ghafoor. 2003. Total wheat DNA variation in to varieties using known primers of genes induced in dehydration and salinity stress. 6(5):437-440.

46. Javaid, A. and A. Ghafoor. 2003. Inter and intra-specific genetic diversity for seed storage proteins in *Medicago* as revealed by SDS-PAGE. Paper presented in the 8th National Meeting of Plant Scientists. February 24-28 2003 organised by Pakistan Botanical Society at University of Karachi, Pakistan.

47. Anwar, R. and M.S. Bhatti. 2003. Plant Genetic Resources Conservation and Documentation of Information. In "Information Handling in Biological Research , Edt. Afzal, Azhar & Nasim, published by Pakistan Scientific and Technological Information Center. pp 65-68.

48. Anwar, R. , S. Masood, M A. khan and S. Nasim. 2003. The High Molecular Weight Glutenin Subunit Composition of Wheat (Triticum aestivum L.) landraces from Pakistan. Pak. J. Bot. (accepted).

49. Jatoi, S.A., M. Afzal, S. Nasim, A. Javaid and R. Anwar. 2003. Genetic diversity in radish germplasm for morphological traits and SDS-PAGE markers (*In press*).

50. Afzal.M., A, Ghafoor, S.A Jatoi, S.Fakuoka, K. Okuno and M. Katsuta. 2003. Classification of Rice Core Collection Using Restriction Fragment Length Polymorphism Markers (*In Press*).

51. Anwar, R., S. Masood, M.A. Khan and S. Nasim. 2003. The high molecular weight glutenin subunit composition of wheat (*Triticum aestivum* L.) landraces from Pakistan. Pak. J. Bot. (Accepted).

Annex-VII: List of Germplasm Distribution within Country

YEAR	NO. OF ACC.	INSTITUTE
1993	140	ENTOMOLOGY RES. LAB., NARC, ISLAMABAD.
		CRP (WHEAT) NARC, ISLAMABAD.
		AGRI. BIOTECH. RES. LAB., FAISALABAD, PUNJAB.
		UNIV. OF AGRI., FAISALABAD, PUNJAB.
		CRP (PULSES) NARC, ISLAMABAD.
1994	337	ENTOMOLOGY RES. LAB., NARC, ISLAMABAD.
		UNIV. OF AGRI., FAISALABAD, PUNJAB.
		CRP (PULSES) NARC, ISLAMABAD.
1995	1375	FODDER RES.INSTITUTE, SARGHODA, PUNJAB.
		AEARI RES. CENTRE TANDOJAM SINDH
		PULSES PROG. DOKRI SIND
		OIL SEED PROG. TANDO JAM SINDH (VIA NODP)
		CRP (MAIZE) NARC ISLAMABAD.
		NWFP AGRI. UNIV. PESHAWAR
1996	398	QUAID-E-AZAM UNIVERSITY ISLAMABAD
		A.Z.R INSTITUTE BHAKKAR
		NIFA,TARNAB, PESHA
1997	1952	PESHAWAR AGRI.UNIVERSITY
		RICE PROGRAMME NARC
		ARID ZONE BAKKHAR
		IPMI NARC
		BARI CHAKWAL
		ARS AMMADWAL KARK
		CRP-PIR SABAK NOSHERA
		WHEAT BOTAMST.ARI-SARIAB QUETTA
		SOIL SALINITY RES. INST. PINDI BHATTIAN
		NIAB FAISALABAD
		AHMAD WALA KARAK
1998	827	AHMAD WALA KARAK
		CENTRAL COTTON RES.INST. MULTAN
		NIAB FAISLABAD
1999	985	BARI INSTIT. CHAKWAL
		NUCULAR INSTITUTE TANDO JAM SINDH
		ARID ZONE BAKKAHAR
2000	970	AGRI. RES. INSTT. YOUSAFWALA SAHIWAL
		BARI INSTIT. CHAKWAL
		NATIONAL INST. FOR BIO-TEC. GENETIC ENG.FAISALAD
		QUAID-I- AZAM UNIVERSITY ISLAMABAD
		WHEAT PROG. NARC
		PESHAWAR UNIV.
		RICE PROGRAMME NARC
2001	321	PINDI BHATTIAN
		RES.INST. TANDOJAM SINDH

		ARI SINDH
		BARI. INT. CHAKWAL
		ARID ZONE AGRI. UNIV. MURREE ROAD RWPD
2002	**1292**	UNIV. OF AGRICULTURE FAISALABAD
		RICE PROGRAMME NARC
		RICE RES.INST. KALA SHAH KAKOO
		AHMAD WALA KARAK
		PULSES PROGRAMME NARC
		BARANI UNIVERSITY RAWALPINDI
		PLANT PATOELOGY DEPARTMENT FAISALABAD
		AGRI. UNIV. FAISALABAD
		VEGETABLE PROGRMME NARC
		PLANT PATHOLOGY DEPARTMENT UNIV. AGRI. FAISALABAD
		OILSEED BOTANIST, RAHIM YAR KHAN
		BARANI. AGRI. RES. STATION JARMA KOHAT
		QUAID-I-AZAM UNIVERSITY
		VEGETABLE PROGRMME NARC
		ENTOMOLOGY RES.STATION KHANPUR
2003	**482**	NUCULAR INSTITUTE TANDO JAM SINDH
		WHEAT PROGRAMME NARC
		AGRICULTURE UNIV. FAISALABAD
		NIAB FAISALABAD
Total	8756	