GLIMPSES
OF
THE RESEARCH AND TRAINING ACTIVITIES

OF

PUNJAB FORESTRY RESEARCH INSTITUTE

FAISALABAD

SAHIBZADA MUHAMMAD HAFEEZ

DIRECTOR

PUNJAB FORESTRY RESEARCH INSTITUTE

FAISALABAD

June, 1994

NGO members (women) attending a training course in social forestry at PFRI

FOREWORD

Punjab Forestry Research Institute Faisalabad was established during 1983-86 under a development project. It started functioning from zero level during July, 1986. The institutional build-up rightly received priority-I and it has successfully been completed.

In addition to institutional development, other main tasks like formulation of research programmes, writing of study plans for individual research projects, layout of experiments, data collection and its analysis was also taken up simultaneously. Inspite of many handicaps, which are generally met in the initial stages of the development of any organization, the achievements made during the first eight years of the Institute are quite impressive.

Glimpses of the research and training activities of the Institute have been briefly given in this report. Twenty special/ inservice training courses were conducted and 240 persons trained in the fields of irrigation management, extension education, computer, etc. Similarly 1123 nominees of the Punjab Forest Department were trained and awarded Diploma-in-Forestry and Certificate-in-Forestry during this period. Seventy-eight research and other projects have been completed and work is going-on on nearly 55 research projects. So far 124 research and review articles, technical notes and reports, position papers, text books/monographs have been written by the Institute.

Monitoring and evaluation of PFRI activities has been a continuous process and summaries of such evaluation reports have been indicated on page 99 - 101 of this booklet. Filling up of many vacant gazetted posts of scientific persons will go a long way in further enhancing the pace of research and training activities.

June, 1994

M. Hafeez Sahibzada
Director

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I - INTRODUCTION

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FAISALABAD

INTRODUCTION

For providing appropriate scientific support to accelerate the developmental activities in the Punjab province, "Punjab Forestry Research Institute" was established under a developmental project, over a period of four years, 1982-86, at a total cost of Rs. 18.35 million. It started functioning during July, 1986. Later-on three more development projects were implemented at a total cost of Rs. 15.76 million for the development of research and training facilities. The Institute is a research and training organization meant to promote sustainability of forests and development of agroforestry systems.

MAIN OBJECTIVES

1. TO IMPROVE THE FOREST WEALTH QUALITATIVELY AND QUANTITATIVELY THROUGH RESEARCH RELEVANT TO THE NEEDS OF FORESTRY IN A SYSTEMATIC AND PLANNED MANNER.

2. TO IMPART TECHNICAL FORESTRY EDUCATION.

3. TO CONDUCT REFRESHER AND SPECIAL COURSES FOR INSERVICE PERSONNEL, FARMERS AND N.G.Os.

BROAD FIELDS OF ACTIVITY OF PFRI

1. TO DEVELOP AGROFORESTRY SYSTEMS FOR THE FARMERS.
2. TO INCREASE YIELD OF WOOD PER UNIT AREA.
3. TO DEVELOP COST-EFFICIENT NURSERY TECHNIQUES.
4. TO STREAMLINE FIELD PLANTING TECHNIQUES.
5. GENETIC IMPROVEMENT OF PRINCIPAL COMMERCIAL TREE SPECIES.
6. IDENTIFICATION OF REQUISITE FOREST MANAGEMENT SYSTEMS.
7. IMPROVING RANGELANDS.
8. IMPROVING SERICULTURAL PRACTICES.
9. CONTROLLING INSECTS OF STANDING TREES AND CONVERTED WO
10. TO DISSEMINATE RESEARCH RESULTS.
11. TO IMPART FORESTRY EDUCATION AT TECHNICAL LEVEL.
12. TO CONDUCT REFRESHER AND SPECIAL COURSES.

ORGANIZATIONAL SET-UP

The Institute is headed by a Director. There are eight(8) branches in it including two forest schools. Each branch is headed by a Senior Research Officer/Principal.

Director
Senior Research Officer (Silviculture)
Senior Research Officer (Forest Management)
Senior Research Officer (Range Management)
Senior Research Officer (Sericulture)
Senior Research Officer (Pest Control)
Senior Research Officer (Extension and Training)
Principal PFS Ghoragali
Principal PFS Bahawalpur

Sanctioned Strength of Research and Teaching Staff

Sl. No.	B.S.No.	No. of sanctioned posts
1.	19	1
2.	18	8
3.	17	20
4.	16	25
5.	5 - 15	111
6.	1 - 4	131
	Total:	296

Strength of Staff on Functional Basis

1.	Scientific staff	=	28
2.	Scientific-cum-Administrative staff	=	5
3.	Technical staff	=	86
4.	Supporting staff	=	182

ORGANIZATIONAL CHART OF PUNJAB FORESTRY RESEARCH INSTITUTE, FAISALABAD

DIRECTOR

- ESTATE OFFICER/RESEARCH OFFICER
- TECHNICAL OFFICER/RESEARCH OFFICER
- LIBRARIAN
- ADMINISTRATIVE OFFICER

- OFFICE SUPERINTENDENT
- CIRCLE HEAD DRAFTSMAN
- OTHER SUPPORTING STAFF

SENIOR RESEARCH OFFICER (Silviculture)	SENIOR RESEARCH OFFICER (Forest Management)	SENIOR RESEARCH OFFICER (Range Management)	SENIOR RESEARCH OFFICER (Sericulture)	SENIOR RESEARCH OFFICER (Pest Control)	SENIOR RESEARCH OFFICER (Forestry Ext. and Training)	PRINCIPAL Punjab Forest School, Ghoragali	PRINCIPAL Punjab Forest School, Bahawalpur
1) Research Officer (Silviculture-1)	1)Research Officer (Biometrics)	1)Research Officer (Range Improvement)	1)Research Officer (Sericulture)	1)Assistant Entomologist (Chichawatni)	1)Research Officer (Extension)	1)Instructor	1)Instructor
2)Research Officer (Silviculture-2)	2)Research Officer (Economics)	2)Research Officer (Range Management)	2)Entomologist (Murree)	2)Assistant Entomologist (Jauharabad)	2)Research Officer (Training)	2)Instructor	2)Instructor
3)Research Officer (Tree Improvement)	3)Research Officer (Statistics)		3)Assistant Entomologist (Murree)			3)Instructor	
4)Research Officer (Agroforestry-1)						4)Instructor	
5)Research Officer (Agroforestry-2)						5)Instructor	
6)Research Officer (Statistical)							
7)Research Officer (Exotics)							
8)Research Officer Bahawalpur (Arid Zone)							
9)Research Officer Ghoragali (Hills & Scrub Zone)							

SENIOR SCIENTISTS OF PFRI

Sl. No.	Name	Designation
1.	Mr. Mohammad Hafeez, B.Sc. (Agri.); B.Sc.Forestry M.Sc. Forestry; Advanced Training in Forestry Research and Agroforestry from Oxford, University of Oxford (U.K), Gold Medalist from Oxford.	Director
2.	Dr. Zafar Iqbal, M.Sc. Agri; M.Sc. Forestry; Ph.D. Forestry.	S.R.O. Forest Management
3.	Rao Khalid Mehmood, M.Sc. Botany; M.Sc. Forestry.	S.R.O. Range Management
4.	Mr. Tariq Mehmood, M.Sc. Forestry, M.Sc. University of Missouri (U.S.A).	S.R.O. Extension & Training
5.	Mian Mohammad Muslim, M.Sc. Botany; Advanced Training in Sericulture from Peoples Republic of Korea.	S.R.O. Sericulture.
6.	Raja Attaullah Khan, M.Sc.(Agri.); M.Sc. Forestry.	S.R.O. Silviculture
7.	Ch. Ghulam Hussain, M.Sc. Agri. (Entomology)	D.F.O. Pest Control
8.	Dr. Muhammad Rafique, M.Sc. Forestry; Ph.D. Forestry.	Principal
9.	Mian Khizar Hayat, B.Sc. Forestry.	Principal

INFRASTRUCTURE DEVELOPED

YEAR OF COMMENCEMENT OF MAIN P.C.I. PROJECT	= 1982-83
YEAR OF COMPLETION OF PROJECT	= 1985-86
TOTAL COST OF THE PROJECT	= 18.35 (Million (Rs.)
ADDITIONAL DEVELOPMENT PROJECTS COMPLETED(3)	= 15.76 " "

OFFICE AND RESIDENTIAL ACCOMMODATION

MAIN ACADEMIC BUILDING (45 ROOMS)	= 20171 sft.
RESEARCH SUB-CENTRE GHORAGALI	= 1700 "
RESEARCH SUB-CENTRE BAHAWALPUR	= 1700 "
FOREST GUEST HOUSE, PFRI.	= 2550 "
RESIDENTIAL BUILDINGS (58 Nos.)	= 46416 "
OFFICERS TRAINING HOSTEL, PFRI.	= 4500 "
TOTAL:	= 74037 "

PHYSICAL FACILITIES AVAILABLE

. PFRI MAIN ACADEMIC COMPLEX

FIELD RESEARCH SUB-CENTRES

- Ghoragali
- Lahore
- Bahawalpur

FIELD RESEARCH STATIONS

- Kharian
- Daphar
- Changa Manga
- Chichawatni
- Khanewal (Pirawala)
- Shorkot

ESEARCH LABORATORIES AT PFRI

- Plant Propagation and Tissue Culture
- Chemical Analysis
- Seed Testing
- Sericulture Research
- Computer Laboratory

EARCH NURSERY AND GREEN HOUSE AT PFRI

) STORAGE

Tree Seed Godown PFRI

Silk Grainage Centre, Murree

. HOSTELS

- Officers' Hostel, PFRI
- Forest Technicians Hostel, Murree
- Forest Technicians Hostel, Bahawalpur

. FORESTRY SCHOOLS

- Punjab Forest School, Ghoragali
- Punjab Forest School, Bahawalpur

. LIBRARIES

- PFRI Library
- PFS Bahawalpur Library
- PFS Ghoragali Library

. PFRI GUEST HOUSE

. RESIDENTIAL BUILDINGS AT PFRI CAMPUS

ANNUAL BUDGET
(Rs.in million)

YEAR	DEVELOPMENT	NON-DEVELOPMENT	TOTAL
1983-84	6.037	-	6.037
1984-85	5.491	-	5.491
1985-86	5.975	-	5.975
1986-87	1.417	2.244	3.661
1987-88	2.907	6.465	9.372
1988-89	2.577	8.473	11.050
1989-90	3.458	8.607	12.065
1990-91	3.109	9.639	12.748
1991-92	2.728	10.236	12.964
1992-93	0.424	10.961	11.385
1993-94	-	13.654	13.654

RESEARCH PROGRAMME

Research programme is problem-oriented and is formulated on the basis of suggestions received from the field officers. Currently work on nearly fifty research projects is going on. Since agroforestry is being practised by the farmers in the Punjab on a large scale, it has become necessary to carry out studies on agroforestry so as to provide basic information to the farmers. Agroforestry is the Priority-I field of research of the Institute.

A programme Committee composed of experienced and senior professionals and others well-versed in plant sciences and related fields fixes priorities for forestry research in the Punjab. The Committee also undertakes review of programmes of research. A Forestry Education Committee reviews the curricula periodically in line with the latest developments in forestry.

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EDUCATION AND TRAINING

Punjab Forestry Research Institute, Faisalabad has developed adequate facilities to impart pre-service education and training in forestry and allied disciplines at sub-professional level. It has also been equipped to organize and conduct inservice training through refresher courses to acquaint the field staff with modern techniques of forestry. The other provinces like Sind and Baluchistan have the opportunity to train lower staff at these schools.

- Pre-service training

  Two regular courses, one for Foresters (Diploma-in-Forestry) of two years duration and the other for the Forest Guards (Certificate-in-Forestry) of one year duration are offerred in the Forest Schools at Ghoragali and Bahawalpur. At present the following two pre-service training courses are being conducted at these schools. Average intake of trainees is 150 per year:

  - Diploma-in-Forestry
  - Certificate-in-Forestry

- Inservice training

  A number of refresher courses, seminars and special courses like extension education, irrigation management and social forestry have been conducted at PFRI and at Forest Schools to refresh the knowledge of field staff and acquaint them with latest forestry techniques.

COLLABORATION WITH OTHER RESEARCH ORGANIZATIONS

There is close collaboration with other research organizations concerned with forestry and ancillary disciplines both at the national and international levels. These include Pakistan Forest Institute, Peshawar; Pakistan Agricultural Research Council; National Agricultural Research Centre; Ayub Agricultural Research Institute; Nuclear Institute for Agriculture and Biology; University of Agriculture, Faisalabad and similar other organizations. USAID, F.A.O., WINROCK INT., F/FRED etc. are providing requisite help for international coordination and linkages. An important forum is provided by the Standing Forestry Research Review Committee of the Government of Pakistan and Farm and Energy Forestry Executive Research Committee which reviews all Forestry research undertaken in Pakistan.

II - INSTITUTIONAL DEVELOPMENT

BASIC ESSENTIAL TASKS AT PFRI

1. PROCUREMENT OF MANPOWER AND ITS TRAINING
2. ARRANGEMENT OF ADDITIONAL SCIENTIFIC AND RESEARCH EQUIPMENT
3. SETTING UP OF RESEARCH LABORATORIES AND LIBRARY
4. FORMULATION OF RESEARCH PROGRAMME
5. WRITING OF STUDY PLANS FOR INDIVIDUAL PROJECTS
6. LANDSCAPING AND BEAUTIFICATION OF PFRI
7. IMPROVEMENT OF FORESTRY EDUCATION AND TRAINING:
    - IMPROVEMENT OF SYLLABII
    - REVISION OF TRAINING SCHEDULE
    - CONDUCTING OF REFRESHER AND SPECIAL COURSES
    - WRITING OF TEXT BOOKS
    - IMPROVEMENT OF PHYSICAL FACILITIES

ACHIEVEMENTS

BASIC ASPECTS

1. A TEAM OF YOUNG SCIENTISTS HAS BEEN PROCURED AND PREPARED WHICH IS THE FIRST REQUISITE FOR UNDERTAKING RESEARCH ON SCIENTIFIC LINES.

2. RESEARCH LABORATORIES FOR SEED TESTING, TISSUE CULTURE, SOIL TESTING AND SERICULTURE HAVE BEEN ESTABLISHED.

3. ADDITIONAL SCIENTIFIC AND RESEARCH EQUIPMENT HAS BEEN ARRANGED UNDER PC.I. PROJECTS AND GOP/USAID FORESTRY PLANNING AND DEVELOPMENT PROJECT.

4. COMPUTER LABORATORY HAS BEEN SET UP.

5. A GOOD LIBRARY HAS BEEN DEVELOPED.

6. RESEARCH PROGRAMME HAS BEEN FORMULATED AND IS UNDER CONTINUOUS REVIEW.

7. STUDY PLANS HAVE BEEN PREPARED FOR ALL THE INDIVIDUAL PROJECTS.

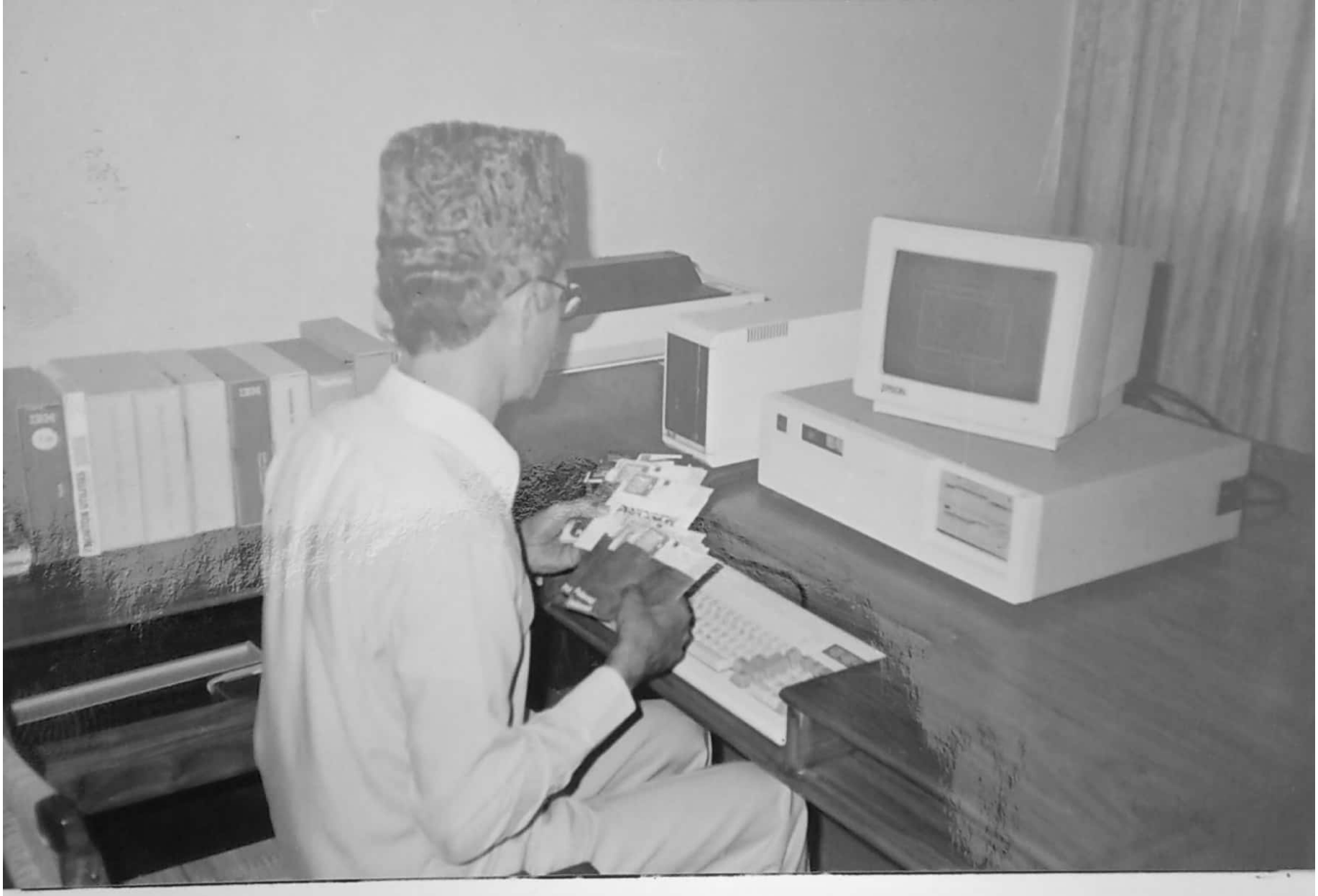
8. DEVELOPMENT OF CAMPUS AND LANDSCAPPING IS UNDER CONTINUOUS IMPROVEMENT.

9. COLLABORATION WITH NATIONAL AND INTERNATIONAL ORGANIZATIONS HAS BEEN ESTABLISHED.

10. CONFERENCE ROOM HAS BEEN PROVIDED WITH LATEST AUDIO-VISUAL AIDS.

11. A GREEN HOUSE HAS BEEN CONSTRUCTED FOR AID IN RESEARCH WORK.

12. SYLLABII FOR FOREST SCHOOLS HAVE BEEN MUCH IMPROVED AND ARE REVIEWED PERIODICALLY.



Use of computer has become a necessity in modern ag

ESTABLISHMENT OF LIBRARY AND RESEARCH LABORATORIES

1. ESTABLISHMENT OF LIBRARY

   i. SDI SERVICE IS BEING OPERATED REGULARLY.

   ii. MORE THAN 40 INTERNATIONAL AND NATIONAL ORGANIZATIONS HAVE BEEN CONTACTED FOR MUTUAL COOPERATION IN THE DEVELOPMENT OF LIBRARY.

   iii. PFRI LIBRARY HAS BECOME MEMBER OF THE BOARD OF SCIENCE AND TECHNOLOGY FOR INTERNATIONAL DEVELOPMENT (BOSTID).

   iv. QUITE A FEW INTERNATIONAL AND NATIONAL SCIENTIFIC JOURNALS ARE BEING PROCURED IN THE LIBRARY FOR THE SCIENTISTS.

2. LOT OF RESEARCH AND SCIENTIFIC EQUIPMENT HAS BEEN PROCURED UNDER PC.I. PROJECTS AND FORESTRY PLANNING AND DEVELOPMENT PROJECT(USAID).

3. SETTING UP OF RESEARCH LABORATORIES

   i. SEED TESTING LABORATORY

   ii. TISSUE CULTURE AND PLANT PROPAGATION LABORATORY

   iii. CHEMICAL ANALYSIS LABORATORY

   iv. SERICULTURE LABORATORY

   v. COMPUTER LABORATORY WITH 3 COMPUTERS AND A LASER JET PRINTER

4. COLLABORATION WITH OTHER RESEARCH ORGANIZATIONS

   i. COLLABORATION WITH OTHER RESEARCH ORGANIZATIONS WITHIN THE COUNTRY LIKE PARC/NARC, P.F.I., AYUB AGRICULTURAL RESEARCH INSTITUTE, NIAB, IWASRI, UNIVERSITY OF AGRICULTURE, FAISALABAD, ETC. HAS BEEN DEVELOPED.

   ii. COLLABORATION OF SOME FOREIGN RESEARCH/DONOR ORGANIZATIONS LIKE F/FRED, USAID, MISSISSIPPI STATE UNIVERSITY, USA IS BEING OBTAINED WHEREAS EFFORTS ARE GOING ON TO DEVELOP SUCH COLLABORATION WITH OTHER FOREIGN AGENCIES ALSO.

MANPOWER DEVELOPMENT

The Institute staff was provided maximum possible number of opportunities for training to improve their working capabilities in various subjects as under:

Sl. No.	Field of Training	Duration	No. of persons trained
1.	Agricultural Research Methodology	6 weeks	1
2.	Extension Education	2 weeks	6
3.	General Computer Training	4 days	4
4.	Watershed Management and Conservation Extension	2 weeks	1
5.	Operational Research and Quantitative Techniques	7 weeks	1
6.	Training of Trainees	8 weeks	1
7.	Training in Tissue Culture	15 weeks	2
8.	Computer Course (SAS) Statistical Analysis System	12 days	1
9.	Research Methodology	4 days	4
10.	Tractor Training Course (PC-SAS)	5 days	1
11.	General Computer Training	5 days	2
12.	Computer Training - Introduction to Different Packages	2 weeks	1

13.	M.Sc. Forestry Course	2 years	2
14.	Special Course in Forestry Research Methods	1 week	20
15.	Range Management and Forage Production	8 weeks	1
16.	Improving your Personal Effectiveness	1 week	1
17.	Training of Trainers	8 weeks	1
18.	Short Course on Scientific Skills, Problem Identification and Research Proposal Preparation.	5 days	1
19.	Agricultural Research Management	2 weeks	2
20.	Computer Training	2 weeks	2
21.	Silkworm Breeding	10 days	5
22.	Computer Training	3 days	7
23.	English Language Course	9 weeks	2
24.	Computer Training	1 week	2
25.	Seed Technology	2 weeks	3
26.	Plant Material Analysis	5 weeks	1
27.	Land Use Planning	12 days	2
28.	Forest and Farm Woodlot Management Planning and Harvest Scheduling	11 days	1

29.	Computer Course on Office Automation	2 weeks	1
30.	Computer Application in the Field of Forestry	9 days	2
31.	Research Planning and Study Plan Preparation	5 days	16
32.	Office Accounts and Procedure	10 days	21
33.	Planning, Execution and Documentation of Research Studies	2 days	22
34.	Basic Training in Sericulture	8 weeks	2
35.	Departmental Training in Sericulture	12 months	5
36.	DATA Base for Micro Computer	2 weeks	1
37.	Library Automation Course	6 weeks	1
38.	Cataloguing and Computerization	8 days	1
39.	Diagnostic Survey and Training Course	4 weeks	1

SEMINARS/CONFERENCES/WORKSHOPS ATTENDED BY PFRI OFFICERS

Sl. No.	NAME OF SEMINAR/WORKSHOP	Period	Country
1.	IUFRO Symposium "Role of Research in Soling Socio-Economic Problems of the Himalayan Region" at P.F.I. Peshawar.	16.10.87 to 21.10.87	Pakistan
2.	International F/FRED Workshop "Multipurpose Tree Species Research for Use on Farms in Arid & Semi-Arid Tropics" at Karachi.	16.11.87 to 19.11.87	Pakistan
3.	International F/FRED Meeting to Make Detailed Designs of and Preparation for Implementing the Net Work Trials" at Kathmandu.	21.3.88 to 25.3.88	Nepal
4.	FAO Regional Workshop "Development of Wastelands for Fuelwood Energy and Rural Needs" at Vadodara, India.	1.11.88 to 9.11.88	India
5.	"Range - Livestock Seminar at Quetta".	21.12.88 to 23.12.88	Pakistan
6.	National Seminar "The Role of Plant Health and Care in Agriculture Production" at UAF.	28.12.88	Pakistan
7.	Forestry Workshop "Network Experiments" at NARC, Islamabad.	22.1.89 to 25.1.89	Pakistan
8.	FAO Regional Seminar "Himalayan Fodder and Grass Land Problems" at PFI, Peshawar.	20.11.89 to 26.11.89	Pakistan
9.	"NATIONAL WORKSHOP ON AGROFORESTRY RESEARCH" PFRI, FAISALABAD.	3.4.89 to 5.4.89	Pakistan

10.	A Seminar "Wood Producers-Users" Arranged by GOP/USAID at Lahore.	12.5.90 to 15.5.90	Pakistan
11.	A Workshop "International and Communication Skills for Professionals in Natural Resources" held at Lahore.	12.5.91 to 16.5.91	Pakistan
12.	A Seminar "International MPTS Arid/Semi-Arid Zone Network Trials" at Kandi, Sri Lanka.	23.9.91 to 27.9.91	Sri Lanka
13.	A Workshop "Tree Production on Waterlogged and Saline/Sodic Lands" at Faisalabad.	8.3.92 to 9.3.92	Pakistan
14.	International Conference on "Innovative Approaches to Utilization of Salt Affected Lands in Agriculture and Forestry", Tandojam, Sindh.	19.3.94 to 20.3.94	Pakistan
15.	SECOND NATIONAL WORKSHOP ON "WOMEN IN FORESTRY IN PAKISTAN", PFI, PESHAWAR.	28.3.94 to 31.3.94	Pakistan
16.	Research Monitoring Workshop, PARB, Lahore, Pakistan.	7.6.94	Pakistan
17.	Research Evaluation Workshop. PARB, Lahore.	8.6.94 to 9.6.94	Pakistan

III - A C H I E V E M E N T S

TRAINING ACHIEVEMENTS
(1985-86 to-date)

I. REGULAR TRAINING

1.	Diploma-in-Forestry Courses	=184	Trainees
2.	Certificate-in-Forestry Cources	=939	"
3.	Sericulture Supervisors	= 6	"
4.	Sericulture Seed Examiners	= 10	"

II. SPECIAL/INSERVICE TRAINING

1.	Number of Courses Conducted	= 20
2.	Number of Persons Trained	= 247

DEVELOPMENT AND IMPROVEMENT OF TRAINING FACILITIES

THIS IMPORTANT SUBJECT WAS GIVEN ITS DUE IMPORTANCE AND FOLLOWING DEVELOPMENTS HAVE BEEN MADE TO IMPROVE THE QUALITY OF EDUCATION AND TRAINING:

1. UP-GRADATION OF TRAINING LEVEL OF FORESTERS AND FOREST GUARDS UPTO DIPLOMA-IN-FORESTRY (2 YEARS) AND CERTIFICATE-IN FORESTRY (ONE YEAR) COURSES RESPECTIVELY.
2. ENHANCEMENT OF BASIC QUALIFICATIONS FOR THE DIPLOMA AND CERTIFICATE COURSES UPTO MATRICULATION (2ND DIVISION) WITH SCIENCE.
3. FRAMING OF RULES AND REGULATIONS FOR THE DIPLOMA AND CERTIFICATE TRAINEES.
4. IMPROVEMENT OF SYLLABI FOR THE DIPLOMA AND CERTIFICATE COURSES IN VIEW OF TODAYS' TECHNICAL AND SOCIAL ECONOMIC REQUIREMENT OF THE SERVICE.
5. SCHEDULE OF TRAINING FOR BOTH THE COURSES HAS BEEN DRASTICALLY REVISED AND MADE PRACTICAL-ORIENTED.
6. SYSTEM OF EXAMINATION HAS BEEN IMPROVED AND CENTRALISED FOR BOTH THE SCHOOLS.
7. ANOTHER SIGNIFICANT ACHIEVEMENT HAS BEEN THE WRITING OF TEXT BOOKS FOR THE FORESTRY SCHOOLS.
8. IMPROVEMENT OF TEACHING FACULTY THROUGH REGULAR TEACHING BY RESEARCH OFFICERS AND SPECIAL LECTURES BY THE DIRECTOR AND OTHER OFFICERS.
9. PRACTICAL FIELD TRAINING DOCUMENTS HAVE BEEN PREPARED AND GOT PRINTED FOR THE JUDICIOUS USE OF FIELD TRAINING TIME IN DIFFERENT ASPECTS OF FORESTRY.

DEVELOPMENT OF PHYSICAL FACILITIES

- RENOVATION OF HOSTEL AT BAHAWALPUR.
- IMPROVEMENT OF WATER SUPPLY THROUGH INSTALLATION OF A TUBEWELL AT BAHAWALPUR.
- IMPROVEMENT OF WATER SUPPLY THROUGH CONSTRUCTION OF A WATER TANK AT GHORAGALI.
- LAYING OUT A NEW SEWERAGE SYSTEM IN FOREST SCHOOL, BAHAWALPUR.
- INSTALLATION OF SUI-GAS IN FOREST SCHOOL, BAHAWALPUR.
- CONSTRUCTION OF THREE RESIDENCES FOR THE INSTRUCTORS AT GHORAGALI.
- CONSTRUCTION OF METALLED ROAD IN FOREST SCHOOL, GHORAGALI.
- PROVISION OF HEATING ARRANGEMENT IN FOREST SCHOOL, GHORAGALI.
- PROCUREMENT OF AUDIO-VISUAL AIDS FOR FOREST SCHOOLS.
- CONSTRUCTION OF OFFICERS HOSTEL FOR INSERVICE TRAINING AT PFRI.
- CONSTRUCTION OF HOSTEL AT GHORAGALI UNDER FPDP/USAID.

REGULAR COURSES

NUMBER OF FORESTERS (DIPLOMA-IN-FORESTRY) TRAINED

YEAR	GHORAGALI	BAHAWALPUR	TOTAL
1985-86	-	9	9
1986-87	-	8	8
1987-88	7	17	24
1988-90	16	-	16
1989-91	26	32	58
1990-92	34	13	47
1992-94	11	-	11
1993-95	11	-	11
TOTAL:	105	79	184

Forest trainees being taught nursery techniques

NUMBER OF FOREST GUARDS (CERTIFICATE-IN-FORESTRY) TRAINED

YEAR	GHORAGALI	BAHAWALPUR	TOTAL
1985-86	-	33	33
1986-87	-	27	27
1987-88	24	21	45
1988-89 (6 months)	94	-	94
1988-89 (One year)	-	46	46
1989-90	28	84	112
1990-91	27	70	97
1991-92	42	63	105
1992-93	47	85	132
1993-94 (Spring)	47	95	142
1993-94 (Autumn)	47	59	106
TOTAL:	356	583	939

TRAINING OF SERICULTURE RESEARCH STAFF

I. SERICULTURE SUPERVISOR:

Sl. No.	DURATION	YEAR	No.
1.	ONE YEAR	1987-88	2
2.	ONE YEAR	1988-89	2
3.	ONE YEAR	1992-93	2

II. SERICULTURE SEED EXAMINER:

Sl. No.	DURATION	YEAR	No.
1.	ONE YEAR	1991-92	5
2.	ONE YEAR	1992-93	5

REFRESHER (INSERVICE TRAINING) COURSES

Sl. No.	Name of Course	Level	No. of trainees	Period	Venue
1.	First Training of Trainers Course in Extension Education	D.F.O/ SDFO	12	30.1.88 to 11.2.88	U.A.F. Faisalabad
2.	Computer Course	S.R.O/ R.O.	4	1.2.88 to 4.2.88	P.F.R.I.
3.	Second Training of Trainers Course in Ext. Education	D.F.O/ SDFO/R.O/ F.R.	10	26.3.88 to 7.4.88	U.A.F. Faisalabad
4.	Ist Course of Irrigation Management	D.F.O/ SDFO	10	9.7.88 to 14.7.88	Chichawatni
5.	2nd Course of Irrigation Management	D.F.O/ SDFO/F.R.	5	6.8.88 to 11.8.88	Changa Manga
6.	Special Course in Forestry Research Methods	S.R.O./R.O/ A.R.O & R.A	21	14.1.89 to 21.1.89	P.F.R.I.
7.	Third Training of Trainers Course in Extension Education	S.D.F.O/F.R.	16	25.2.89 to 9.3.89	U.A.F. Faisalabad
8.	Ist Social Foresters Inservice Training Course.	Foresters	10	2.3.89 to 16.3.89	Ghoragali
9.	2nd Social Foresters Inservice Training Course	Foresters	10	1.4.89 to 15.4.89	Ghoragali
10.	3rd Social Foresters Inservice Training Course.	Foresters	10	14.5.89 to 28.5.89	Ghoragali
11.	4th Social Foresters Inservice Training Course	Foresters	10	1.6.89 to 15.6.89	Ghoragali
12.	Silkworm Breeding	Seed Examiner	5	7.4.90 to 16.4.90	Sericulture Research Lab. Lahore
13.	Computer Training	S.R.O/R.O.	7	25.6.90 to 27.6.90	PFRI Faisalabad

Research Planning and Study Plans Preparations	S.R.O/R.O.	16	19.7.92 to 23.7.92	PFRI Faisalabad
Training to Ministerial Staff in PFRI.	Ministerial Staff	18	17.10.92 to 27.10.92	PFRI Faisalabad
Nursery Raising, Field Planting and Management Techniques	Farmers (Trainees from Hafizabad Literacy Promotion Programme, a Non-Govt. Organization)	17	16.11.92 to 19.11.92	PFRI Faisalabad
Basic Training in Sericulture	Research Assistant	2	1.10.92 to 30.11.92	Sericulture Research Lab., Lahore.
Nursery Raising, Field Planting & Management Techniques	Lady Teachers (Trainees from Hafizabad Literacy Promotion Programme, a Non-Govt. Organization)	20	15.2.93 to 18.2.93	PFRI Faisalabad
Planning, Execution and Documentation of Research Studies	Research Officers/ARO/R.A.	22	10.5.93 to 11.5.93	PFRI Faisalabad
Nursery Raising, Field Planting and Management Techniques, and Agroforestry Systems	Farmers & Ladies	22	12.4.94 to 15.4.94	PFRI Faisalabad

NGO members (women) visiting research garden, PFRI

NGO members attending a training course in social forestry at PFRI

RESEARCH ACHIEVEMENTS

1. Research and other projects completed = 78
2. On-going Research Projects = 55

ARTICLES/PAPERS/TECHNICAL NOTES/REPORTS WRITTEN

1.	Research and Review Articles, Technical Notes	= 49
2.	Papers presented in Workshops/Conferences	= 15
3.	Technical Reports, Progress Reports	= 19
4.	Study Reports, Position Papers, Plans and Brochures	= 18
5.	Forestry Text Books, Monographs, Manuals	= 23
	Total:	= 124
6.	Research Articles being written	= 20
	Grand Total:	144

COMPLETED RESEARCH PROJECTS

1. AGROFORESTRY

1. Effect of *Populus deltoides* in various spacings (20x5, 30x5, 40x5 feet) on wheat and maize fodder.
2. Effect of shade of *Populus euramericana* CV-I-214 on wheat crop.
3. Effect of *Eucalyptus camaldulensis* (2 years old) in various spacings (6x6, 6x10, 6x12 feet) on Mash-beans, Mong-beans, clovers, wheat and fodder crops.
4. Allelopathic effect of *Eucalyptus camaldulensis* on wheat crop.
5. To study the effect of Simal tree rows on the production of cotton.
6. Effect of Simal tree rows on the yield of wheat crop.
7. Effect of single Shisham tree on the yield of cotton.
8. Effect of Shisham tree rows on the yield of wheat crop.
9. Effect of Shisham tree rows on Oat fodder production.
10. Effect of tree and benefit : cost analysis of *Acacia nilotica* growing in wheat field.
11. Effect of Forest (Shisham) vs Fruit (Mango) trees on wheat crop.
12. Effect of Shisham tree rows on wheat crop.
13. Effect of Simal tree rows on wheat crop.
14. Effect of Kikar tree rows on wheat crop.

15. Effect of Poplar tree rows on wheat crop.
16. Effect of Simal tree rows on cotton crop.
17. Effect of Shisham tree rows on cotton crop.
18. Effect of Kikar tree rows on cotton crop.
19. Effect of Eucalyptus tree rows on cotton crop
20. Effect of single tree of Shisham on the yield of cotton.
21. Cultivation of Medicinal plants in the Punjab.
22. Survey of existing agroforestry systems in barani tract of the Punjab.
23. Socio-economic conditions and end-uses of MPTS on small farms in barani areas of Pakistan.

TREE IMPROVEMENT AND GENETICS

1. Selection of plus trees of important commercial tree species.
2. Selection and demarcation of Seed Production Areas (SPA).
3. Genetic improvement of various commercial tree species - Progeny test plantations.
4. Establishment of seed orchards of important species.
5. Use of harmones for the vegetative propagation of commercial species.
6. Establishment of Poplar archive for its germplasm.
7. Selection of suitable Poplar clones for planting.
8. Selection and Propagation of Acacia nilotica Cupressiformis.
9. Establishment of Forest Tree Seed Centre at PFRI.
10. Establishment of arboreta at PFRI.

III. SEED, NURSERY AND AFFORESTATION

1. Cost efficient nursery techniques for raising Eucalyptus camaldulensis seedlings.
2. Effect of watering levels on the growth of tubed nursery plants and its effect on out-planting success.
3. Effect of nursery shade on seedling quality.
4. Studies on effect of size of polythene tubes on the growth and development of Eucalyptus camaldulensis seedlings.
5. Propagation of Eucaluptus camaldulensis through root-shoot cuttings.
6. Multiple landuse - Poplar plantation with Poplar nursery.
7. Afforestation of waterlogged and saline areas.
8. Effect of various superabsorbants on the survival and growth of forest species.
9. How to outplant a seedling raised in polythene tube?

IV. INTRODUCTION OF FAST GROWING MPTS

1. Multipurpose tree species trial for humid and sub-humid zone under F/FRED.
2. Multipurpose tree species trial for semi-arid zone under F/FRED.
3. Multipurpose tree species trial for arid zone under F/FRED.
4. Selection of suitable fast growing broad leaved species for growing in coniferous forests.
5. Introduction of salt-tolerant Australian woody species in saline and waterlogged areas.
6. Introduction and selection of suitable bamboo species for planting in the Punjab.
7. Introduction of sisal in the Punjab.
8. Selection of Eucalyptus species for afforestation.
9. Selection of better Poplar clones for planting in the field.

Nursery experiment regarding shade at PFRI

Agroforestry (Poplar with maize) experiment at PFRI

V. MANAGEMENT TECHNIQUES AND UTILIZATION

1. Economics of different methods of raising *Acacia nilotica* on farmlands.

2. Economical utilization of *Eucalyptus camaldulensis*.

3. Selection of suitable formula for the volume measurement of timber logs.

4. Effect of irrigation frequencies on the performance of species under irrigated conditions.

5. Effect of watering frequencies on the performance of various species under rainfed conditions.

6. Silvicultural methods of weed control in irrigated plantations.

7. Quantitative assessment of reduction in survival and growth due to weeds in irrigated plantations.

8. Assessment of reduction in survival and growth due to weeds (Dab grass).

9. Chemical control of weeds in irrigated plantations of Punjab.

10. Economics of conversion of Shisham and Mulberry firewood into 5 feet and 2½ feet billets.

11. Development of Integrated Model Farm for the improvement of scrub forests in Jhelum district:

    (a) Assessment of dependence of local population on scrub forests.

    (b) Mulching techniques for dry afforestation.

    (c) Use of wetting agents for dry afforestation.

    (d) Use of different micro-catchment techniques for dry afforestation.

12. Underplanting of Bamboo in irrigated plantations.

13. Underplanting of Sisal in irrigated plantations.

14. Effect of chemical fertilizers on the growth of Hybrid Poplar.

VI. SERICULTURE

1. Development of pure races of mulberry silkworm Bombyx mori L.

2. Artificial hatching of silkworm eggs by acid treatment.

3. Artificial hatching of silkworm eggs after chilling.

4. Investigations on the method of cold storage and artificial hatching of autumnseason for spring rearing.

5. Trials on autumn silkworm rearing in Pakistan.

6. Field trials on autumn silkwork rearing in pakistan.

7. Trials on the multiple silkworm rearing in spring, postspring season.

8. Trials on the cold storage of silkworm eggs after being treated for artificial hatching.

9. Development and improvement of Pure inbred lines of Bombyx mori L.

10. Hybridization of inter-regional races of silkworm Bombyx mori L.

11. Investigation on the hybridization of Inbred lines of silkworm Bombyx mori L.

12. Development of gene pool of Mulberry varieties.

13. Introduction of improved Mulberry varieties for silkworm rearing.

14. Trials on the spacing of Mulberry cultivation for silkworm rearing.

15. Trials on the inducing of rooting by ringing twigs in mulberry (Morus sp.).

15. Investigation on the characters of the Race PAK 1 & PAK 2 and their F1 hybrid (PAK 1 x PAK 2).

17. Study of characters and the Races PAK 3 and PAK 4 and their F1 hybrid (PAK 3 x PAK 4).

18. Investigation on the the characters of the Races PFI 1 and PFI 2 and their F1 hybrid.

19. Effect of dusting lime-bleaching powder on silkworm in the control of "Muscardine" disease.

LIST OF RESEARCH ARTICLES, TECHNICAL NOTES, PAPERS, REPORTS AND TEXT BOOKS WRITTEN

I. Research and Review Articles, Technical Notes

Sl. No.	Topic	Author	Year
1.	Isolation and Development of Pure Races of Silkworm. The Pakistan Journal of Forestry, April, 1985.	Mian M. Muslim	1985
2.	Trials on Multiple Silkworm Rearing in Spring, Post Spring Season in Pakistan. The Pakistan Journal of Forestry, January, 1986.	Mian M. Muslim	1986
3.	"Energy Crisis and Mesquite". The Pakistan Journal of Forestry Vol. 38 (1).	M. Hafeez	1988
4.	"Assessment of the dependence of local population on the scrub forests" The Pakistan Journal of Forestry Vol. 39 (2).	M. Hafeez & M. Afzal	1989
5.	Artificial Hatching of Silkworm Eggs After Chilling. The Pakistan Journal of Forestry, April, 1990.	Mian M. Muslim	1990
6.	Present Status of Sericulture in Punjab. The Pakistan Journal of Forestry, April, 1990.	Mian M. Muslim	1990
7.	Investigation on the Characters of Parent Silkworm Races Pak 1 & Pak 2 and their Cross Hybrid (PAK-1xPAK-2). The Journal "Pakistan Entomologist", Vol:XII, 1990.	Mian M. Muslim	1990

8.	Selection of suitable Poplar clones for large scale plantations in the Punjab. P.2.	M. Hafeez and Baqar Ali Khan	1991
9.	Effect of shade of Poplar (Populus euramericana CV-I-214 on Wheat crop. P.2.	M. Hafeez	1991
10.	Effect of chemical fertilizers on the growth of Hybrid Poplar. P.4.	M. Hafeez	1991
11.	Selection of Eucalyptus species for afforestation. P.3.	M. Hafeez	1991
12.	Under-planting of Bamboo in Irrigated Plantations. P.2.	M. Hafeez	1991
13.	Introduction of Sisal in the Punjab. P.2.	M. Hafeez and Baqar Ali Khan	1991
14.	Under-planting of Sisal in Irrigated Plantations. P.2.	M. Hafeez	1991
15.	Economical utilization of Eucalyptus camaldulensis. P.8.	M. Hafeez, M. Afzal and M. Saleem	1991
16.	Cost efficient techniques for raising Eucalyptus camaldulensis seedlings. P.12.	Dr. Zafar Iqbal	1991
17.	Multiple land use - Poplar plantation with Poplar nursery.	M. Afzal	1991
18.	Economics and feasibility of bamboo cultivation on farmlands. P.6.	M. Afzal	1991

19.	Social forestry in the Punjab: Need, Concept and Recommendations.	M. Hafeez	1991
20.	Development of culturable wastelands for production of wood and other needs. P.11.	M. Hafeez	1991
21.	Note on introduction of Eucalyptus in the Punjab with Special Reference to Arid Localities. P.9.	M. Hafeez	1991
22.	Establishment of seed orchards in the Punjab. P.8.	M. Hafeez and A. Khaliq	1991
23.	Studies on the Characters of Parental Pure Lines of Silkworm PFI-1 & PFI-2 and their F1 Hybrid (PFI-1xPFI-2).	Mian M. Muslim	1992
24.	Inducing of rooting by ringing twigs in Mulberry (Morus sp.).	Mian M. Muslim	1992
25.	How to plant a seedling raised in polythene tube. P.4.	A. Khaliq	1992
26.	Effect of shisham (Dalbergia sissoo) tree rows on the yield of wheat crop. P.10.	Wahid Rashid and M.Hafeez	1992
27.	Economics of different methods of raising Acacia nilotica on farmlands. P.5.	M. Hafeez, L.H.Jafri and M. Rafique	1992
28.	Effect of tree rows of shisham and simal on the yield of wheat crop. P.11.	L.H.Jafri, M. Hafeez, Neeem Hussain, & M. Rafique	1992

29.	Field planting of Eucalyptus camaldulensis through root-shoot cuttings.	Abdul Khaliq	1992
30.	Selection of suitable formula for the volume measurement of shisham logs.	M. Afzal and M. Hafeez	1992
31.	Survey of the existing Agroforestry systems in barani areas of the Punjab.	M. Hafeez and M. Afzal	1992
32.	سفیدے کی لکڑی کا اقتصادی استعمال۔	M. Afzal	1992
33.	Novel genetic techniques for plant improvement. P.17.	Dr.Zafar Iqbal	1992
34.	Benefit: Cost analysis and effect of trees of Acacia nilotica growing in wheat fields.	M. Hafeez and W. Rasheed	1992
35.	Allelopathic effect of Eucalyptus camaldulensis on wheat (T.aestivum) crop.	M. Rafique and M. Hafeez	1992
36.	Possible field of collaboration regarding medicinal plants.	M. Hafeez and M. Saleem	1992
37.	Volume estimation for shisham and kikar (canalside plantations).	M. Afzal and Dr.M.J.Ghauri	1992
38.	Cost efficient techniques for raising Eucalyptus camaldulensis seedlings.	Dr.Zafar Iqbal	1992

39.	Nursery techniques for raising Eucalyptus camaldulensis.	Dr.Zafar Iqbal	1992
40.	An overview of work on breeding and clonal multiplication of important forest trees for planting programmes.	Dr.Zafar Iqbal	1992
41.	An overview of research on vegetative propagation of important tree species in the Asian Pacific Region.	Dr.Zafar Iqbal, Dr.M.J.Ghauri, M. Saleem, and M.Afzal	1993
42.	An overview of work on genetic improvement of shisham in Pakistan.	Dr. Zafar Iqbal	1993
43.	Review of silvicultural and management work done on Dalbergia sissoo in Pakistan.	Dr.M.J. Ghauri	1993
44.	Current trends of forestry research priorities.	M. Hafeez	1993
45.	Performance of criteria for regressors selection in linear regression model of shisham (Dalbergia sissoo).yield.	Dr.M.J. Ghauri	1993
46.	Why social forestry and agroforestry in the Punjab.	M. Hafeez	1993
47.	Suitable spacing for planting Poplar in Agroforestry Systems.	Sahibzada M.Hafeez & M. Hafeezullah	1994

48.	Optimum watering level for Eucalyptus camaldulensis plants in the nursery stage.	Abdul Khaliq, Sahibzada M.Hafeez and M.J. Ghauri	1994
49.	Effect of spacings on the growth of Eucalyptus camaldulensis under Agroforestry Systems.	Abdul Khaliq & M.J. Ghauri	1994
50.	Effect of forest vs fruit trees on wheat crop.	M. Afzal and M. Hafeez	1994
51.	Effect of shisham rows on fodder (oat) production.	M. Afzal	1994

II. Papers Presented in Workshops/Conferences

Sl. No.	Topic	Author	Year
1.	"Development of Wastelands for Fuelwood Energy and Rural Needs" FAO Regional Workshop on Development of Wastelands for Fuelwood Energy and Rural Needs, 1-9 Nov. 1988, Vadodara, India.	M. Hafeez	1988
2.	Diversification of Fodder Resources. Presented in Regional Workshop on Problems of Himalayan Pasture Lands, 20-26th Nov. 1989, PFI, Peshawar.	M. Hafeez	1989
3.	Current status of tropical forests and scope of multipurpose tree species. Proceedings of National Organization MPTS Meeting held on 14-16 February, 1989 at PFI, Peshawar.	M. Hafeez	1989
4.	Multipurpose tree species Research network trial in Pakistan. Proceeding of National Organizing MPTS Meeting held on 14-16 February 1989 at PFI, Peshawar.	M. Hafeez & Abdul Khaliq	1989
5.	Agroforestry Systems. Proceedings of National Workshop on Agroforestry Research 3-5 April,1989 held at PFRI, Faisalabad.	M. Hafeez	1989
6.	Existing Agroforestry Systems in Pakistan. Proceedings of National Workshop on Agroforestry Research 3-5 April, 1989 held at PFRI, Faisalabad.	M. Hafeez	1989

7.	Socio-Economic Conditions and End-uses of MPTS on Small Farms in Barani Areas of Pakistan, Submitted for F/FRED MPTS Meeting held in Bangkok (Thailand).	M. Hafeez	1989
8.	Social Forestry - Need, Present Status and Future Strategy. Presented in the Seminar on "The Role of Small Farmers in the Economy of Crop and Livestock Sectors" 14-15 March, 1990, UAF, Faisalabad.	M. Hafeez	1990
9.	Effect of Waterlogging on the early development and performance of three important forest tree species and two provenances of A. nilotica. Presented in the Workshop on "Tree production from Saline, Sodic and Waterlogged Soils" (USAID) 1-6 December, 1990, Serena Hotel, Faisalabad.	Dr. Zafar Iqbal	1990
10.	Exchangeable sodium, its effects on soil conditions and plant growth. Presented in the Workshop on "Tree Production from Saline, Sodic and Waterlogged Soils"(USAID) 1-6 Dec. 1990, Serena Hotel, Faisalabad.	Dr. M. Arshad	1990
11.	Effect of Soil salinity on the early development of three important forest tree species and two provenances of A.nilotica. Presented in the Workshop on "Tree Production from Saline, Sodic and Waterlogged Soils" (USAID) 1-6 Dec. 1990, Serena Hotel, Faisalabad.	Dr. Zafar Iqbal	1990
12.	Forest tree seed supply situation in Punjab. Presented at National Workshop on Tree Seed Technology Nov. 21-26, 1992, PFI, Peshawar.	M. Hafeez	1992

13.	An overview of seed technology work at PFRI, Faisalabad. Presented at National Workshop on Tree Seed Technology, Nov.21-26, 1992, PFI, Peshawar.	M. Hafeez and Dr.Zafar Iqbal	1992
14.	Establishment of forest tree seed supply system in the Punjab. Presented at National Workshop on Tree Seed Technology, Nov.21-26, 1992, PFI, Peshawar.	M. Hafeez	1992
15.	Identification of better performing salt tolerant tree germplasm. Presented at "International Conference on Innovative Approaches to Utilization of Salt Affected Lands in Agriculture and Forestry 19-20 March, 1994 - Tandojam Sindh".	S.M. Hafeez	1994

III. Technical Reports, Progress Reports

Sl. No.	Topic	Author	Year
1.	Annual Progress Report of PFRI, Faisalabad for the year 1983-84 and 1984-85.	Anon.	1985
2.	Annual Progress Report of PFRI, Faisalabad for the year 1985-86.	Anon.	1986
3.	Annual Progress Report of PFRI, Faisalabad for the year 1985-86.	Anon.	1987
4.	Development of an Integrated Model Farm for the improvement of Scrub Forests in Jhelum District - Final Technical Report.	M. Hafeez and L.H.Jaffery	1988
5.	Annual Progress Report of PFRI, Faisalabad for the year 1987-88.	Anon.	1988
6.	Annual Progress Report of PFRI, Faisalabad for the year 1988-89.	Anon.	1989
7.	Establishment of Seed Orchards in the Punjab - Final Technical Report.	M. Hafeez and A. Khaliq	1990
8.	Annual Progress Report of PFRI, Faisalabad for the year 1989-90.	Anon.	1990
9.	Cultivation of Medicinal Plants in Forest Areas in the Punjab.	M. Hafeez, Raja Attaullah and M. Saleem	1991

10.	Annual Progress Report of PFRI, Faisalabad for the year 1990-91.	Anon.	19
11.	Half Yearly Progress Report of PFRI, Faisalabad for the year 1990-91.	Anon.	19
12.	Research Programme of PFRI for the year 1986-87 to 1990-91.	Anon	19
13.	Annual Research Programme of PFRI for the year 1991-92.	Anon	19
14.	Review of research and training activities: Constraints and Recommendations.	A.R.Tariq M. Saleem M.M. Khan M. Hafeez	19
15.	Salient achievements of PFRI upto June, 1992.	Anon.	1992
16.	Annual Progress Report of PFRI for the year 1991-92.	Anon.	1992
17.	Annual Research Programme of PFRI for the year 1992-93.	Anon.	1992
18.	Annual Progress Report of PFRI for the year 1992-93.	Anon.	1993
19.	Annual Research Programme of PFRI for the year 1993-94.	Anon.	1993

IV. Study Reports, Position Papers, Plans and Brochures

Sl. No.	Topic	Author	Year
1.	Study Report regarding Post Graduate Studies in the University of Oxford, Oxford Forestry Institute, Oxford, U.K. 1986. P.40.	M. Hafeez	1986
2.	Punjab Forest Department Operational Plan for Forestry Research 1988-89 to 1992-93. P.8.	M. Hafeez	1988
3.	Position Paper on Forest Education in the Punjab. P.4.	M. Hafeez	1988
4.	A Brochure on PFRI, Faisalabad. P.24.	Annon.	1988
5.	A brief note on range management activities in the Punjab. P.8.	M. Hafeez	1988
6.	Forestry Research in the Punjab. P.9.	M. Hafeez	1988
7.	Strategy for Afforestation in the Punjab. P.4.	M. Hafeez	1989
8.	Rules and Regulations for Diploma-in-Forestry and Certificate-in-Forestry Courses for Punjab Forest Schools. P.19.	Annon.	1989

9.	Syllabus for Diploma-in-Forestry and Certificate-in-Forestry Courses for Forest Schools. PFRI Education Bulletin No.2. P.43.	Anon.	1989
10.	A Brochure on PFRI, Faisalabad 2nd Edition. P.26.	Anon.	1990
11.	Proposal for the Development of Forestry in the Punjab. P.5.	M. Hafeez	1991
12.	Holding of Refresher/Special Courses at PFRI, Faisalabad - A Report. P.7.	M. Hafeez	1991
13.	A proposal for Upgradation of PFRI, Faisalabad. P.6.	M. Hafeez	1991
14.	Proposal for the development of Murree-Kahuta Hilly Areas.	M. Hafeez	1991
15.	Concept Paper for World Bank Assistance.	Anon.	1993
16.	Social Forestry in the Punjab - A Major Break Through.	Anwar Masrur M.Hafeez Dr.Zafar Iqbal Dr.M.J.Ghauri	1993
17.	Five-Year Plan for Forestry Research and Training in the Punjab.(1993-94 to 1997-87)	M. Hafeez	1993
18.	Rules and Regulations for Training for Forestry Schools(II-Edition) tion). PFRI.Education Bulletin No.5.	Anon.	1993

V. Text Books, Monographs, Manuals

Sl. No.	Topic	Author	Year
1.	"Importance of Forests and Forest Types of Pakistan".	M.I. Sheikh and M. Hafeez	1990
2.	"Seed Supply and Forest Nursery".	M. Hafeez and M.I.Sheikh	1990
3.	"Afforestation and Regeneration of Forests".	M.I. Sheikh and M. Hafeez	1990
4.	"Raising of Important Fast Growing Species".	M.I. Sheikh and M. Hafeez	1990
5.	"Tending of Forest Crops".	M. Hafeez and M.I. Sheikh	1990
6.	"Forest Protection-I".	M. Hafeez and M.I. Sheikh	1990
7.	"Silviculture of Important Forest Tree Species".	M.I. Sheikh and M. Hafeez	1990
8.	"Forest Ecology"	Mian Mehmood Ahmad and S.Akmal Rahim	1990
9.	"Management of Various Types of Forests".	M.I.Sheikh and M. Hafeez	1990
10.	"Silvicultural Systems".	M. Hafeez and M.I. Sheikh	1990

11.	"Soil Conservation and Watershed Management".	Dr.B.H. Shah	1990
12.	"Research Methods and Simple Experimental Designs Used in Forestry".	M.I. Sheikh, R.W.Hussain & M. Hafeez	1990
13.	"Forest Protection-II".	Ch.Ghulam Hussain	1990
14.	"Soil Science".	Dr.Zafar Iqbal	1990
15.	"Introduction to Sericulture, Appiculture and Lac-Culture".	Mian M.Muslim	1990
16.	Practical Field Training Record for Diploma-in-Forestry.	M. Hafeez, et.al.	1990
17.	Practical Field Training Document for Certificate-in-Forestry.	M.Hafeez, et.al.	1990
18.	"Accounts and Procedure".	Sh.Saif-ur-Rehman	1990
19.	"Forest Utilization", Vol.I.	M. Saleem and M. Hafeezullah	1991
20.	"Forest Utilization", Vol.II.	M. Saleem and M. Hafizullah	1991
21.	FAO Monograph on "Prosopis cineraria (L) Druce. Its production, management and utilization. FAO Regional wood energy development programme in Asia GCP/RAS/ 111/NET Field Document (A Monograph).	M.Hafeez	1991

22.	Forest Tree Seed Supply. (A booklet of p.90).	M. Hafeezullah and Nighat Naheed	1991
23.	A Manual for Seed Technologists. P.72.	Dr.Zafar Iqbal	1993

SDI SERVICE

Important professional articles concerning forestry and allied subjects which appear in renowned international and national journals are selected and sent to all senior forest officers in the Punjab. The articles sent so far are listed below:

1. FORESTRY PROGRAMME FIGHTS RURAL POVERTY.
2. ENERGY CRISIS AND MESQUITE.
3. INTEREST IN FARM FORESTRY.
4. FARM FORESTRY AND WASTELAND DEVELOPMENT.
5. SOCIAL FORESTRY DEVELOPMENT.
6. PEOPLE, TREES, AND RURAL DEVELOPMENT - THE ROLE OF SOCIAL FORESTRY.
7. EXTENSION IN SOCIAL FORESTRY: PROBLEM AREAS AND NEEDED SOLUTIONS.
8. USE OF LEUCAENA BY KENYAN FARMER INSPIRES OTHERS TO DO SAME.
9. FUTURE DIRECTIONS FOR SOCIAL FORESTRY EXTENSION.

10. PROMOTING PROSOPIS JULIFLORA IN SALING LANDS.

11. RANGE IMPROVEMENT THROUGH WATER CONSERVATION IN PAKISTAN.

12. IPIL IPIL - A HIGH POTENTIAL FODDER CROP.

13. FORESTRY IN THE OLD WORLD.

14. CURRENT STATUS OF TROPICAL FORESTS AND SCOPE OF MULTIPURPOSE TREE SPECIES.

15. PROSOPIS: PROBLEMS AND POTENTIAL FOR PAKISTAN.

16. DIALECTICS OF CHANGE IN PAKISTAN.

17. A TREE BEFORE BREAKFAST.

18. THE GREEN HOUSE EFFECT.

19. FORESTS TO OFFSET THE GREEN HOUSE EFFECT.

20. FAST GROWING SPECIES FOR MEETING RURAL AND INDUSTRIAL NEEDS OF PUNJAB - PRESENT STATUS AND FUTURE RESEARCH NEEDS.

21. PAKISTAN: NEW DIMENSIONS IN FOREST POLICY.

22. AGROFORESTRY'S COMING OF AGE.

23. AGROFORESTRY,...A VERY SOCIAL SCIENCE.

24. PERSPECTIVE, PLANNING AND PEOPLE'S PARTICIPATION IN PROPOSED SOCIAL FORESTRY MODELS FOR ECONOMIC DEVELOPMENT AND NATIONAL PRODUCTIVITY.

25. LEUCAENA.

26. TREES - LET'S TAKE A BALANCE VIEW.

27. GREVILLEA ROBUSTA - Australian tree finds success in Africa.

28. THE GREENHOUSE EFFECT.

29. Economic Analysis of Agroforestry Options for Small Irrigated Farms in Punjab Province, Pakistan.

30. FINANCIAL ANALYSIS OF SELECTED SHELTERBELTS SYSTEMS IN PAKISTAN.

31. WOMEN IN THE FOREST SERVICE: THE EARLY YEARS.

32. FOREST, A HERITAGE FOR THE FUTURE.

33. TROPICAL FORESTRY RESEARCH, PAST, PRESENT AND FUTURE.

34. AUTHENTICITY IN THE FORESTRY PROFESSION.

35. WOMEN'S INCOME FROM NON-TIMBER FOREST PRODUCTS.

36. PROBLEMS AND PROSPECTS AT THE URBAN-FOREST INTERFACE.

37. NEW APPROACHES TO FOREST MANAGEMENT: PART ONE OF TWO PARTS.

38. NEW APPROACHES TO FOREST MANAGEMENT, PART TWO OF TWO PARTS.

39. PUBLIC PARTICIPATION IN NATIONAL FOREST PLANNING.

40. WHAT'S ALL THIS DEBATE ABOUT OVER CUTTING?

41. VIEW POINT: ON LIVING WITH THE LAND.

42. A BROCHURE FOR PUNJAB FORESTRY RESEARCH INSTITUTE.

43. LIVING WITH THE LAND.

44. THE GLOBAL COMPETITION FOR LAND.

45. THE POLITICS OF THE ENVIRONMENT.

46. PLANNING THE USE OF LAND FOR THE 21ST CENTURY.

47. WHY FARMERS ADOPT PRODUCTION TECHNOLOGY.

48. RELIGION AND THE ENVIRONMENT: PROVIDING LEADERSHIP FOR ECOLOGICAL VALUES.

49. RANGE IMPROVEMENT INTERVENTIONS.

50. AGROFORESTRY IN PAKISTAN: TWO COMMENTARIES.

51. ON BEING PROFESSIONAL: THE RESPONSIBILITIES OF A WORTHY VOCATION.

52. PUBLIC REGULATION OF PRIVATE FORESTRY: PROACTIVE POLICY RESPONSES.

APPLICATION OF RESEARCH FINDINGS

I. AGROFORESTRY AND SOCIAL FORESTRY

1. Suitable spacing for planting of Poplar in Agroforestry systems

On the basis of experimentation at PFRI, it has been possible to find out a suitable spacing for planting Poplar in Agroforestry systems. A spacing of 5x20, 5x30 and [illegible] feet has been recommended by the Administrative Department to the farmers for field application on the basis of this research finding. Agroforestry has been found more paying than pure agriculture. The farmers can use any of these spacings according to their peculiar situations and their relative priority for agriculture and forestry.

2. Allelopathic effect of Eucalyptus camaldulensis on wheat crop

The result of the study revealed that extraction of allelo-chemicals from the leaves, bark, flower buds of Eucalyptus camaldulensis did not have adverse effects on wheat yield during six months study period. Further studies on this problem are suggested.

3. Benefit cost analysis and effect of [illegible] of Populus [illegible] growing in wheat fields

The profit of growing Populus [illegible] [illegible] [illegible] in wheat crops was [illegible] and [illegible] indicating that planting of [illegible] trees along wheat fields is a profitable practice [illegible]

further promoted through transfer of suitable technology
i through improvement of marketing.

. Economics of different methods of raising Acacia nilotica on farmlands

Method of direct sowing of kikar seed was compared with the method of planting its tubed plants on farmlands. It was concluded that method of planting tubed plants is better and preferable for raising kikar on farmlands along field boundaries.

5. Effect of tree rows of simal and shisham on the yield of wheat crop

Effect of tree rows of simal and shisham on wheat crop was studied. It has given interesting results regarding direction of tree rows and their effect on crop yield. Yield of wheat grain was more as compared to control on the southern side of wind-break and was lesser on northern side. North - south oriented wind-break of shisham depressed the yield of wheat grain upto 6 m on western side, beyond this distance the yield was more as compared to control indicating the protective effect of wind-break.

6. Effect of shisham trees on the yield of wheat crop

The conclusion was that although there is some loss in the yield of wheat grain and straw in the vicinity of tree rows, but this loss is more than compensated through sale of tree products.

7. Survey of existing Agroforestry systems in barani tract of the Punjab

The survey conducted during 1987 has given very useful information. 26% farms were found without any tree, 54% farms had artificially planted trees and others had naturally grown plants; 72% had scattered planting, 23% had linear and 5% had block planting. Main tree species grown were kikar, bakain, shisham, phulai, ber, mulberry and E. camaldulensis. Main functions of the agroforestry systems are production of fuelwood, timber, fodder, forage, soil and moisture conservation, and production of food, edible oil, milk, meat, manure, income, fencing, shade and baskets. Main constraints were noticed as protection problem from livestock, scarcity of water, erosion, poverty, nonavailability of loans, mesquite invasion and nonavailability of planting stock. Similarly lot of data has been obtained which will be finally compiled in a short course of time.

8. Socio-economic conditions and end-uses of MPTS on small farms in barani areas of Pakistan

A survey conducted in the barani areas of the Punjab showed that farmers are interested in multipurpose uses of trees. The species most preferred by the farmers were found to be kikar, bakain, shisham, phulai and ber. The tree uses in which the farmers are interested, are fuel, timber, fodder,

market sale and fencing. This survey also indicated the main problems of the small farmers like; scarcity of water for irrigation, soil erosion, protection from animals, tree-crop competition, fertility of the soil, etc. It also gave useful indications for research needs in this tract.

9. Effect of shade of Poplar (Populus euramericana CV-I-214) on yield of wheat

A study conducted in Changa Manga plantation indicated that the Poplar crop planted at 15x15 feet spacing did not affect the wheat yield even in its 3rd year of age. It was a useful indication for Poplar in agroforestry.

10. Effect of shisham rows on Oat fodder production

Reduction in fodder production was one-and-a-half time more on northern side as compared to southern side. Details are being worked out.

11. Effect of forest (shisham) versus fruit (mango) trees on wheat crop

Fruit trees (mango) have more adverse effect on wheat crop than shisham trees. Total loss per acre in case of shisham trees was Rs.422/- and in case of mango trees Rs.1172/-. Additional income due to shisham trees was Rs.500/- per acre and due to mango trees Rs.690/- per acre. Overall, shisham was found more beneficial.

12. Social Forestry: Need, Present Status and Future Strategy

This paper explains well the need for social forestry in Pakistan to meet the challenge of energy crisis and food emergencies. It also gives strategy for action i.e. adoption of agroforestry and social-forestry. It gives brief description of the present status of social forestry in the Punjab and also recommends a number of measures for further mobilizing public support for tree planting.

13. Social Forestry in the Punjab: Need, Concept and Recommendations

It mentions the need of spcial forestry in the Punjab, explains concept of social forestry and its components, gives and role of agroforestry and social forestry and contains recommendations for future action as regard social forestry/ agroforestry.

14. Why Social Forestry and Agroforestry in the Punjab?

The paper stresses the need for social forestry and agroforestry in the Punjab to meet the challenge of "Energy Crisis and Food Emergencies". Strategy for action on agro-forestry and social forestry has been proposed.

15. Social Forestry in the Punjab - A Major Break Through

The paper has reviewed the evolution of social forestry and development of agroforestry in the Punjab during the past

over two decades. Various problems in agroforestry have been discussed and recommendations have been given for successful agroforestry programmes in future.

16. Agroforestry Systems

Agroforestry is a new subject. This paper has defined agroforestry and has given classification of agroforestry systems. It is a good paper for those interested to know what is agroforestry and agroforestry systems.

17. Existing Agroforestry Systems in Pakistan

The paper gives a methodology for the diagnosis and design of agroforestry systems. It has also listed major agroforestry systems and practices in Pakistan which is a valuable information for all the foresters and others interested in agroforestry.

II. TREE IMPROVEMENT AND GENETICS

1. Establishment of seed orchards in the Punjab

Under this project, 416 plus trees of Eucalyptus camaldulensis, shisham, simal, chir, bakain, kikar, E. citriodora, kail, mulberry, white siris, etc. were marked in different areas of the Punjab for collection of quality seed for progeny test plantations and for supply to field officers. Progeny test plantations of more important species were raised over 26 acres which are now producing seed of good quality. Field planting of E. camaldulensis through root-shoot cuttings gave promising results and this technique is being further perfected for recommending to the field officers.

2. Selection of suitable Poplar clones for large scale plantations in the Punjab

As a result of trial of 48 clones of Poplar at Jallo, Changa Manga and Daphar, a few like I-8.L, I-4/64, I-48, A-65/27, I-116/60, Y-707 were found more promising for large scale introduction.

3. Selection of Eucalyptus species for afforestation

The results of a trial of six Eucalyptus species indicated that Eucalyptus kirtoniana was a new promising species for future attention, especially for ornamental purposes.

4. Forest tree seed supply situation in the Punjab

This paper reviews the role of seed in our forestry and the present practice. It has also attempted the calculation of current annual requirements of pure seed of different species. Useful suggestions have been given to develop adequate sources of good seed for future.

5. An Over View of Seed Technology Work at PFRI

Review of tree improvement activities of PFRI like seed sources selection i.e. marking of plus trees and seed production areas (SPA), raising of seed orchards, mass cloning of poplar, development of seed processing and storage facilities and tree seed research has been done in this paper.

6. Establishment of Forest Tree Seed Supply System in the Punjab

Establishment of a tree seed supply system in the Punjab has been suggested. Requirements of planting stock and seed of various species for the period 1993 to 1998 have been indicated. A separate unit for establishing seed supply system under the charge of a separate C.F/Director alongwith D.F.Os/S.D.F.Os/Seed Technicians and other supporting staff has been recommended. Training of technical staff and requirements of transport and equipment required for seed collection, extraction, testing and storage etc. have been listed.

7. An Overview of work on breeding and clonal multiplications of important forest trees for planting programmes

This paper reviews the work done on breeding and clonal multiplication of important species like poplar, Eucalyptus, shisham, etc. in Pakistan. The review is important for the researchers as a bench-mark for their breeding work.

8. An Overview of work on genetic improvement of shisham in Pakistan

This paper reviews the work of genetic improvement on shisham done in Pakistan. It again provides a bench-mark for a researcher to continue further work on this species.

9. An Overview of research on vegetative propagation of important tree species in the Asian Pacific Region

It is an important review of research on vegetative propagation including tissue culture of important tree species in the Asian Pasific Region. It is a useful work reviewing the latest techniques of vegetative propagation for various species in this region. It would be an interesting document for the senior field officers.

10. Novel genetic techniques for plant improvement

The review article briefly describes the range of techniques available for the invitro genetic manipulation of plants, their present and potential applications for

plant improvement and the foreseen limitations to their use.

It is useful to the researchers.

III. SEED, NURSERY AND AFFORESTATION

1. Identification of better performing salt-tolerant tree germplasm

Twenty-six woody tree species were procured from Australia for trial on saline and partially waterlogged areas. As a result of experiments a few species have been identified for planting in saline areas. A few such se selected species are E. camaldulensis, Casuarina cunningh amiana, C. glauca, C. obesa, C. equisatifolia, Acacia saliciana, etc.

2. Development of cultureable wastelands for production of wood and other needs

This review paper contains valuable information regarding planting techniques and the recommended species for afforestation of various categories of waste lands in different ecological zones of Pakistan.

3. Development of waste lands for fuel wood energy and other rural needs

A country report regarding Pakistan prepared by the Director PFRI for an FAO Regional Workshop in India gave the following important indications:

(i) Nearly 12 million ha. of land are lying as waste lands in Pakistan. In view of acute shortage of fuel and other needs for the ever-increasing human and

livestock population, a country like Pakistan cannot afford to let these lands lie as such. Their scientific management is essential not only for well being of the people living in them, but also for preservation and development of our natural resource base.

(ii) These lands suffer from various hazards like salinity, waterlogging, aridity, erosion, etc. Given an appropriate package of technology, institutional, financial and social support, these lands constitute a potential resource for the production of fuel wood and other rural needs. The entire wasteland area should be surveyed for its land capability classification and then lands requiring minimum inputs should be tackled first.

4. Proposal for the development of forestry in the Punjab

The paper says that given required financial input, there is much scope of improvement of existing forests, afforestation of blank areas and planting on farmlands. There is a brief proposal for each forest type i.e. dry hill forests, scrub forests, irrigated forest plantation, riverain forests and also for planting on farmlands. The development of watersheds and range lands has also been proposed. Constraints in faster development of forestry have been enlisted and a strategy for future has been recommended.

5. A strategy for afforestation in the Punjab

This paper gives valuable proposals for increasing tree wealth in the Punjab on Government-owned lands like; hilly areas, irrigated plantations, scrub forests, linear plantations, waste lands with Revenue and other Departments, Government agriculture farms, open places near villages, etc; and on private lands like non-agricultural lands in the hills, agricultural lands in the hills, private agricultural lands in the plains, etc. Feasibility study by a team of consultants and execution of Master Plan has been suggested.

6. Energy Crisis and Mesquite

Review of literature and actual experience has shown that mesquite (Prosopis juliflora) is an ideal candidate for energy plantations in semi-arid and marginal lands, not only to meet the fuel wood demand, but also to improve the soil fertility because this plant is fast growing, hardy and nitrogen fixing leguminous tree. The article contains an advice for the foresters to change their hostile attitude towards mesquite and develop amicable terms with it to direct its aggressiveness towards their benefit.

7. Cost efficient techniques for raising Eucalyptus camaldulensis seedlings

A study was made using high density polythene tubes as container for E. camaldulensis seedlings in the nursery.

Use of high density polythene bags gives reduction in cost from 62% to 72%. Use of smaller size (3"x7") tubes instead of larger (3.5"x8" or 4"x9") tubes gives further reduction in the cost of raising plants in the nursery. Similarly using 4 to 5 months old plants of E. camaldulensis for field planting, results in further decrease in nursery cost.

8. Nursery techniques for raising E. camaldulensis

This review paper has given a nursery technique for raising E. camaldulensis in polythene tubes adopting latest recommended techniques for various operations in nursery raising. The field staff should follow these procedures.

9. How to plant a seedling raised in polythene tube

Planting by a simple cut at the base of the tube gave equally good results as that from complete removal of tube. Planting with simply a cut at the base of the tube is preferable because complete removal of tube sometimes results in the dismentling of ball of earth and exposes root system.

10. Diversification of fodder resource

The increase in human population is dictating the greater food supply, and world food needs will increase in the future. In addition to a greater demand for food products,

there will be an increasing demand for animal protien, which would mean greater requirement for number of animals and their feed. This paper suggests ways and means of increasing productivity of range lands, productivity of fodder crops, preservation of forage to be used during winter forage-deficit period.

11. Cultivation of medicinal plants in forest areas in the Punjab

This is a final technical report regarding a PC.I. project on the subject. This report contains very useful information about the cultivation of medicinal plants, brief description of about 20 species of medicinal importance, experimental data and marketing of herbal drug plants. A few important conclusions and recommendations were as under:

(i) Planting, cultivation and harvesting of medicinal plants crops requires much investment in human labour and are, therefore, often not economical.

(ii) Marketing of medicinal plants produce is another problem which restricts their cultivation on large scale.

(The report can be referred for further recommendations.)

12. Effect of soil salinity on the early development of some important tree species and provenances

Development of Eucalyptus camaldulensis, Prosopis juliflora, Albizia lebbek and two provenance of Acacia nilotica to varying degree of salinity was studied in a Green House. Seed

germination, height growth, diameter growth, total biomass and shoot-root gradually decreased with the increase in the concentrations of all salts studied. Sodium chloride and sodium bicarbonate were found to be similarly harmful in these parameters while sodium sulphate produced less harmful effects than other two salts. Best performance was shown by E. camaldulensis upto 0.75 percent on salt level. Overall performance was shown better in Shorkot material than Dera Ismail Khan material of Acacia nilotica.

13. Effect of waterlogging on different forest tree species and provenances of kikar

Albizia lebbek was found to be most sensitive to waterlogging and E. camaldulensis was least affected by waterlogged conditions, while Prosopis juliflora was intermediate in reaction to waterlogging condition. Both provenances of Acacia nilotica (kikar) reacted similarly under waterlogged conditions.

14. Exchangeable sodium effect on soil condition and plants growth

The main objectives of this paper were to familiarize the participants of the Workshop with basic concepts relating to soil salinity/sodicity and the role of exchangeable sodium in soil exchange system. Sodium as a specific ion has been shown to have a toxic effect whereas secondary effect is exerted

on plant growth by causing adverse structural changes in the soil. Its replacement from exchange complex with calcium is considered necessary in reclamation of saline sodic and sodic soils. This reclamation is usually done with chemical amendments such as calcium sulphate, sulphur, sulfuric acid and/or from biological or organic amendments or both.

IV. INTRODUCTION OF FAST GROWING MPTS

1. Current status of tropical forests and scope of multipurpose tree species

This is an important paper which cautions about the forest resource and its destruction, causes of deforestation and degradation and fuel wood deficits in the world tropics. It also provides valuable answers to the following questions:

(i) What will happen if the process of deforestation is not reversed?

(ii) What action is required?

(iii) What extent of tree planting efforts needed?

(iv) What MPTS can contribute?

(v) What the action will reward?

It emphasizes the involvement of millions of people who live within and beside the forests and depend upon them to help and satisfy their basic needs.

2. Multipurpose tree species research network field trial in Pakistan

Three species i.e. Leucaena diversifolia, Acacia mangium and Acacia auriculiformis of humid and sub-humid zone were tried at PFRI to study their performance under our local conditions. Both the provenances of L. diversifolia have shown best results in respect of survival, height and diameter growth. Acacia auriculiformis has also faired well.

These species can be recommended for growing in suitable areas having irrigation water. At the same time these shall be tested further on pilot project scale.

3. Note on introduction of Eucalyptus in the Punjab with special reference to arid locality

This review paper enlisted Eucalyptus species suitable for irrigated plantations, for waterlogged and saline areas and particularly for arid localities. It has also given specific features of some important Eucalyptus species.

V. MANAGEMENT TECHNIQUES AND UTILIZATION

1. Selection of suitable formula for the volume measurement of shisham logs

An assignment was given to PFRI by the Administrative Department to find out a suitable formula for measurement of volume of shisham logs. Field work was undertaken for this purpose and different formulae were used for the measurement of volume of the same logs and difference in the resultant volume was noted. Smalian formula gave the highest volume over the other two i.e. Hubers and Quarter Girth formulae. For under-bark volume measurement, percent ratio of Smalian, Hubers and Quarter Girth formulae came to 100 : 86 : 68, while Hubers and Quarter Girth formulae gave 100 : 79 ratio respectively. The department has an economic benefit on sale of shisham timber by giving 1" bark allowance per foot girth instead of selling it on under-bark volume basis. It is upto the Chief Conservators of Forests to select any-one formula.

2. Economical utilization of E. camaldulensis

This project was undertaken to compare the economics of use of E. camaldulensis as firewood and ballies. The results showed that Eucalyptus trees should be converted into ballies of various sizes instead of converting the trees into firewood. Conversion into ballies gives 36% additional revenue as compared to that of convertion into firewood.

3. Economics and feasibility of Bamboo cultivation on farmlands

This feasibility study has shown that bamboo cultivation is more economical than any other agricultural crop, as no agri. crop gives so much net income per acre per year. In addition to this, agricultural crops could also be raised mixed with bamboo crop, at least, for first two years which would contribute additional returns from the same piece of land with nominal additional cost. Bamboo cultivation on farm lands was found to be very much feasible technically, financially as well as economically.

4. Volume estimation for shisham and kikar for canalside plantations

On the request of C.F. Canalside Plantations, local volume tables for shisham and kikar were prepared for a distributory in Bahawalnagar district. The difference of volume table figures from the actual volume figures alongwith basis of difference was indicated in this.

5. Review of silvicultural and management work done on shisham (Dalbergia sissoo) in Pakistan

This paper reviews silvicultural and management work done on shisham in Pakistan. It provides useful information for field foresters as well as for the researchers.

6. Multiple land-use: Poplar plantation with Poplar nursery

It was concluded from this study that 19% of the expenditure is saved by raising Poplar nursery and Poplar plantation together instead of growing them separately. The combination of one year old Poplar plantation with 2nd stage Poplar nursery gave net return of Rs.5300/- per acre. The conclusion was that 2nd stage Poplar nursery should be grown with new Poplar plantation for economical utilization of land.

7. Under planting of Bamboo in irrigated plantations

The experiments conducted in Daphar, Chichawatni, Shorkot and Changa Manga plantations showed that given proper protection from browsing cattle and porcupine, the bamboo can grow as an under-storey in irrigated plantations in recently thinned-out areas.

8. Introduction of Sisal in the Punjab

In an effort to find a substitute of jute, attention was concentrated on sisal (Agave sisalana). Trials conducted at Jallo, Islamabad and Daphar to study the pattern of its cultivation and effect of irrigation showed that irrigation does have beneficial effect on the growth of sisal. It was concluded that porcupine control is essential for the success of sisal plantations. Hard clay soil is not relished by it.

9. Under-planting of Sisal in irrigated plantations

The interim results obtained from experimental under-planting of sisal in irrigated plantations, revealed that control of damage by porcupine and other animals is very essential for the success of this species in recently thinned-out areas as under-storey.

10. Effect of chemical fertilizer on the growth of Hybrid Poplar

The conclusion was that in good and rich soils like that of Changa Manga plantation, there is no need of any fertilizer application. The soil already contains enough food for supporting poplar crop.

11. Performance of criteria for regressors selection in linear regression model of shisham yield

A stand yield prediction model for shisham has been developed by using possible regressions approach. It is mainly for the use of the researchers.

VI. SERICULTURE

1. Development of pure races of mulberry silkworm Bombyx mori L.

Ten pure races have so far been evolved. These are:

i. Japanese strain: Pak 3, M 101, M 103, M 107.
ii. Chinese strain : Pak 2, Pak 4, M 104, M 108.
iii. European strain: ZM 76.

These races are now being deployed for producing hybrid seeds and being supplied to the farmers for commercial rearing.

2. Artificial hatching of silkworm eggs by acid treatment

Treatment of silkworm eggs, after 21 hours of ovi-position, with 14.5% HCl solution for a period of 5.5 minutes was found to be most suitable for obtaining maximum useful hatchibility (98%) under local conditions. This investigation has made it possible to effect artificial hatching of eggs for multiple rearing.

3. Artificial hatching of silkworm eggs after chilling

The silkworm eggs of local variety (Pak 1xPak 2) F 1 laid in spring at 26° C, stored at 22° C for 61 days and refrigerated at a temperature of 4° C to 6° C for 93 days, when treated with 20% HCl solution at 46° C for a period of 6 minutes gave maximum useful hatchibility (92.3%) under local conditions. By this investigation, the spring laid eggs can be used for autumn rearing through artificial batching.

4. Investigations on the method of cold storage and artificial hatching of autumn eggs for spring rearing

The best useful hatchibility (97.6%) was obtained in F 1 hybrid eggs (Pak 3 x Pak 4) produced in autumn and refrigerated,

55 hours of oviposition, at 5° C for 45 days and at 2.5° C for 39 days when treated with 18% HCl solution at 48° C for 5.5 minutes. By this nethod, the eggs produced in autumn can be utilized for spring rearing through artificial hatching.

5. Trials on autumn silkworm rearing in Pakistan

Autumn silkworm rearing was successfully conducted under local conditions during September-October. The cocooning ratio (86%) and cocoon shell ratio (20%) was found to be satisfactory. The practices of autumn rearing shall enhance the silk production and farm income to two folds with the existing rearing facilities with the farmer.

6. Field trials on autumn silkworm rearing in Pakistan

The trial was conducted through 10 farmers in Jauharabad district. The average yield of cocoon (17.585 kg) per packet, cocooning ratio (82%) and cocoon shell ratio (21.15%) were found to be satisfactory under the local conditions.

7. Trials on the multiple silkworm rearing in spring-postspring season

Of the three overlaping rearings of the race (SHUNER X SHOGESTSU) conducted in spring-postspring season, the Ist rearing (February 19 to March 19) and 2nd rearing (March 3 to March 31) resulted in 94.67% and 94.87% cocooning ratio, 1.786 gram and 1.481 gram single cocoon weight and 23.00% and 22.21% cocoon shell ratio respectively and were considered highly satisfactory whereas the results of 3rd rearing (March 21 to April 16) were considered on low side. Two over-laping crops in spring-postspring season

ave been introduced, enhancing the farm income and silk output.

8. Trials on the cold storage of silkworm eggs after being treated for artificial hatching

The eggs treated for artificial hatching, hatched well (84.95%) without any bad effect, after having been stored upto 20 days at 5^{0} C and 1 to 3 days after treatment was considered the fittest time of storing. This investigation has made it possible to protect the silkworm eggs treated for artificial hatching, under unavoidable circumstances, which otherwise were apt to hatch and die.

9. Development of gene pool of mulberry varieties

The indigenous and exotic mulberry varieties procured from various sources and propagated and cultivated at close spacing of 150 m x 90 m are maintained in bushy form by training in low cut form at Changa Manga forest plantation, compartment No.79. These varieties include; local Mulberry, Japanese Hybrid variety, Japanese Early variety, Japanese Late variety, Chinese Husung variety, Chinese Evergreen variety, Chinese Lun-40 variety, Korea Gaeryung Suban variety, Srilankan variety Morus indica. It is useful for making selection, comparative study of various varieties and providing material for further propagation.

10. Introduction of Improved mulberry varieties for silkworm rearing

Four promising mulberry varieties; Chinese Lun-40, Chinese Husung, Japanese Hybrid and Japanese Early variety on the basis of their high leaf yields (12834.225, 13455.945, 12076.650 and 8129.205 kg per acre) fast growth rate (29.25, 32.95, 28.55 and 27.58 m per

plant per growing season respectively) and being early sprouting with longer growth period were introduced for extensive cultivation. These varieties are being cultivated on mass scale both on state as well as farmland for supporting the silkworm rearing programme in the province.

11. Trials on the spacing of mulberry cultivation for silkworm rearing

The average leaf yields (5148.613, 6213.866 and 6791.466 kg per acre for the adopted spacings (1.5 m x 0.9 m, 0.9x0.6m and 0.3 m x 0.3 m respectively) concluded that the spacing of (0.9mx 0.6m) was more suitable for obtaining optimum leaf yield and easy management in respect of the Japanese hybrid mulberry when maintained in low cut form.

12. Trials on the inducing of rooting by ringing twigs in mulberry (Morus sp.)

Ringing induced rooting in mulberry when six months old twigs were ringed at the bottom by removing 1 cm bark during monsoon, although the extent of rooting varied from variety to variety. The rooted twigs, when planted in the earthen pot, sprouted well. It has developed the possibility of successful vegetative propagation by hard wood cutting during monsoon.

13. Effect of dusting lime-bleaching powder on silkworm in the control of "muscardine" disease

Application of lime-bleaching powder had a positive effect on the control of "Muscardine" disease. This fatal disease can effectively be controled by this treatment.

VII. TEXT BOOKS, MONOGRAPHS AND MANUALS

1. Practical field training document for Diploma and Certificate Courses

The training schedule of Diploma-in-Forestry and Certificate-in-Forestry courses was revised by the Government in order to lay more emphasis on practical aspect of their training. Now the Diploma trainees and Certificate trainees spend half of their total training period i.e. one year (for Diploma) and 6 months (for Certificate), respectively in the field with their respective nominating agencies for practical field training. After this training, the candidates have to report back to the schools for their final practical field training examination.

This is the document prepared containing detailed instructions and a number of proformas for meticulous guidance of the nominees during their field training period. The respective C.Fs and D.F.Os have been made responsible for this field training of their nominees. Different aspects of forestry have to be covered during this training and definite credit hours have been fixed for each type of training. A Board of Examiners (BOE) headed by Director, PFRI and containing one territorial C.F., Principal Forest School, and others as members conducts final examination of these trainees. The impression of the territorial C.Fs, who have been the members of the B.O.E, is that this field training has been very useful and the trainees learn many things which they would not have learnt for a long time without field training.

2. A monograph of Prosopis cineraria: Its production, management and use in Pakistan

This was an assignment from the F. A.O. which was nicely completed. It contains good information on the production, management and use of this very important species of our arid lands. Prosopis cineraria is an important tree for agroforestry also. The yield of agricultural crop increases in the vicinity of this tree.

3. Forest tree seed supply

This booklet is meant to meet the needs of the tree growers for the basic knowledge of the principles and technique involved regarding quality seed production, its testing and use. It also gives brief description of 21 important forest trees regarding their distribution, uses and seed treatment etc.

4. Forestry text books

Surprisingly there was no text-books for the subject of forestry and allied disciplines in Pakistan since its creation in 1947. Teachers as well as students have been feeling great difficulty to cope up with their studies in the absence of any text-book.

Keeping in view this long-felt need, the task of writing up of text-books for various forestry subjects was taken up & nearly twenty text-books have been written. These

shall be very useful for all the forestry students including M.Sc. Forestry, B.Sc. Forestry as well as Diploma and Certificate trainees in the forest schools.

VIII. MISCELLANEOUS PROJECTS

1. Proposal for the development of Murree-Kahuta Hilly Areas

This paper contains a few suggestions and ideas for the development of Murree-Kahuta Hilly Areas. It has given causes of degradation of land, a proposal for feasibility survey, preparation of master plan, phased programme, integrated development and involvement of local community. It has also mentioned some special problems of hilly region.

2. Current trends of forestry research priorities

Due to growing human and animal population and severe food and fuel-wood supply problems in the world, the emphasis in national development has bent towards forestry for local community development. Consequently there has been a parallel increase in the need for research on topics like farming systems that incorporate tree and watershed protection, production and use of energy, utilization and marketing, integration of forestry into national development etc. Forestry research priorities have, therefore, been indicated in view of this latest trend.

3. Development of integrated model farm for the improvement of scrub forests in Jhelum district

This technical report of a PARC-sponsord project contains the following useful messages for planners, foresters and others:

(i) Experimentation is needed in Pothwar tract to determine the water requirements of various species for their successful afforestation. (Consequently experiments were conducted by PFRI to study the effect of watering frequencies on the performance of various species. Its results are available in a separate article).

(ii) The dependence of local population for firewood on the adjoining scrub forests goes on increasing with the decrease in their annual income and vice versa.

(iii) The demand for firewood from forest area increases with the decrease in number of trees on agricultural lands and vice versa in the neighbouring areas. This means increased number of trees on farmlands shall reduce biotic pressure on state forests.

(iv) With the increase of family size, their dependence on 'jungle' for firewood increases proportionately.

(v) The dependence for firewood on the neighbouring forests is inversely proportional to the size of land holdings of farmers.

(vi) A decrease in size of holdings results in the increased dependence of livestock population for grazing on state forests and vice versa.

(vii) 60 percent of total population around the scrub forests depends on forests for their firewood needs. Whereas 96 percent of the total population depends on state forests for grazing of their livestock. It is an indication for the foresters to grow multipurpose species in these forests for the production of fuel wood and fodder to improve the socio-economic conditions of the people of this tract.

(viii) In case of different micro-catchment techniques used for afforestation in scrub forests, trench planting gave the best results as compared to pit-planting and trough-planting.

(ix) In various experiments Leucaena leucocephala gave better survival than Eucalyptus camaldulensis.

(x) Similarly when different types of mulching material like plastic mulching, straw mulching and stone mulching were compared, plastic mulching gave better results.

(xi) In case of different super-absorbents tried as an aid for afforestation, one gram of Alcosorb AB_3 per plant and 20 gram of Terra-sorb per plant gave better survival percentage than other doses. Economics will not allow their use for the time being.

4. Position paper on forest education in the Punjab

Position of forestry education at technical level was reviewed and some recommendations were made for future. These

provided a guidance for the improvement of technical forestry education in our forest schools. Most of these recommendations have been implemented and there has been a considerable improvement in forestry education in the Punjab.

5. Position paper on forestry research in the Punjab

This position paper contains the past achievements in brief. It also mentions the importance of research institutions and scientific manpower in a country. Moreover this gives the forestry research priority areas for the Punjab. This report has provided the main base for the formulation of annual research programme for PFRI.

6. Operational Plan for forestry research

This plan reviewed the past forestry research activities in the Punjab and suggested research projects for the plan period i.e. 1988-89 to 1992-93. Work on most of the proposed research projects was taken up during the plan period. Most of these have been completed and valuable results have been achieved.

7. Up-gradation of Punjab Forestry Research Institute, Faisalabad

It was a proposal to upgrade the status of the Institute upto the level of Director General with 3 or more Directors and nearly 14 branches, each headed by a Senior Research Officer.

8. A brief note on range management activities in the Punjab

It contains useful information regarding various development projects implemented in Pothwar, Thal, Cholistan and D.G. Khan tracts and objectives of management, etc. It was useful for any person interested in range areas in the Punjab; whether he is a field man or a researcher or a planner.

9. Five Year Plan for forestry research and training in the Punjab, 1993-98

The Plan has briefly given the next five years requirements of PFRI in terms of manpower and its training, experts, research and training facilities, and non-residential and residential buildings. It has also given forestry research priority areas and proposed training programme.

10. Rules and Regulations for Training

Rules and regulations for training in forest schools have been updated and compiled together in a comprehensive form for the guidance of Principals and nominating and other agencies.

11. Review of research and training activities, constraints and recommendations

It was a review report prepared by a Committee of four Senior Conservator of Forests regarding the research and training activities of PFRI. The Committee has very much

appreciated uptodate progress. The Committee also gave valuable recommendations to higher authorities regarding ways and means for the development of human resources in PFRI.

12. Holding of refresher/special courses at PFRI

This paper reviews the refresher courses conducted at PFRI in the past. It enlists the requirements regarding training technology and human beings, as well as physical facilities and equipment for conducting inservice training. It gives a brief plan for conducting such courses in future.

13. Concept Paper for World Bank Assistance

It contains a proposal for the development of PFRI during the next six years by meeting deficiencies in the development of human resources and scientific equipment etc. (May see July 1993 Edition)

14. Assessment of dependence of local population on scrub forests in district Jhelum

This article gives an important indication that multi-purpose tree species should be introduced in scrub forest area to provide fuel-wood and fodder for the surrounding human and livestock population to improve their over-all socio-economic conditions.

PEST CONTROL ACTIVITIES

YEAR	SPRAY OF FIREWOOD	SPRAY OF NURSERIES	CONTROL OF PORCUPINE
	Cft.	Acres	Acres
1987-88	6,34,000	1410	-
1988-89	10,52,640	2480	1,98,943
1989-90	50,00,000	17500	88,200
1990-91	5,000	3069	77,009
1991-92	7,21,835	1431	1,46,118
1992-93	1,80,500	3523	1,00,423
1993-94	1,36,000	6480	1,63,328

MAIN CONSTRAINTS

1. SHORTAGE OF MANPOWER DUE TO VACANT GAZETTED POSTS.
2. DELAYED PROMOTION OF RESEARCH OFFICERS.
3. POSTING OF UNWILLING AND INCAPABLE OFFICERS FOR RESEARCH AND TEACHING ASSIGNMENTS.
4. FREQUENT TRANSFERS OF RESEARCH AND TEACHING STAFF.
5. PRACTICALLY NO PRIORITY GIVEN TO PFRI (REGARDING FOREIGN TRAINING ETC.).

SUGGESTIONS FOR IMPROVEMENT

1. FILLING UP OF VACANT GAZETTED POSTS.
2. PROMOTION OF RESEARCH OFFICERS AGAINST VACANT POSTS.
3. SEPARATE CADRE FOR RESEARCH AND TEACHING STAFF. REVISED SERVICE RULES IN THIS REGARD HAVE ALREADY BEEN SUBMITTED TO THE ADMINISTRATIVE DEPARTMENT.
4. POSTING OF ONLY WILLING AND CAPABLE OFFICERS IN PFRI.
5. RESEARCH SCIENTISTS SHOULD BE GIVEN PREFERENCE FOR HIGHER TRAINING.

STATEMENT SHOWING THE PRESENT POSITION OF VARIOUS POSTS OF GAZETTED RESEARCH STAFF OF PFRI

Sl. No.	Name of post with grade	Sanctioned strength	In position	Vacant
1.	Senior Research Officers (BS-18)	5	1 + 3*	4
2.	Research Officers (BS-17)	14	8 + 2*	6
3.	Assistant Silviculturist (BS-17)	1	-	1
4.	Sub-Divisional Forest Officer (BS-17)	1	1	-
5.	Entomologist (BS-17)	1	1	-
6.	Research Officer Seri.(BS-16)	1	1	-
7.	Assistant Research Officers (BS-16)	10	2 + 2*	8
8.	Librarian (BS-16)	1	-	1
	Total:	34	14 + 7*	20

* These have been filled up by borrowing officers from the territorial cadre temporarily. In fact these are to be filled up through Punjab Public Service Commission against PFRI cadre. Actually, therefore, 20 posts out of 34 are vacant.

MONITORING AND EVALUATION OF PFRI ACHIEVEMENTS

Observations, views and remarks of some V.I.Ps and the reviewing committee are reproduced below:

1. Views of Mr. Farid-ud-Din Ahmad, Secretary, Forestry, Wildlife, Fisheries and Tourism Department dated 12.3.90.

"During my visit to PFRI, Faisalabad on 12.3.1990 I was briefed by the Director and the staff regarding the activities undertaken by the Institute. Research Institutes take a long time in maturing. It will take another at-least ten to fifteen years for PFRI to show any tangible results. But, I was glad to note that it is working on the right lines. The Director and the staff are doing their work with dedication. I would particularly commend the effort and the dedication of Sahibzada Mohammad Hafeez, Director, PFRI, Faisalabad."

2. Remarks by Raja Ashfaq Sarwar, Minister for Forests, Wildlife, Fisheries and Youth Affairs, Punjab dated 30.4.91.

"Trip to the Centre has been very informative and encouraging, lot of research is being done and I am sure if this hard work with same dedication carries on, the results would be very good. I would like personally and would try as Minister Forests that this Centre should produce the same results as Peshawar Institute and we should not be dependent on the Peshawar Institute on any type of research."

3. Observations of Fact Finding Committee constituted by the Chief Conservator of Forests, (P&E) Punjab regarding review of Forestry Research and Training Activities.

i. Regarding institutional build up

"Procurement of manpower and its training, arrangement of auditional scientific and research equipment, setting up of research laboratories and library, formulation of research programme, writing of study plans for individual projects, and landscapping and beautification of PFRI Campus to make it worth living were the basic essential tasks which all required immediate attention of the Director.

The Committee noted with pleasure that all these basic aspects of development of the Institute have been well taken-care of by the Director and his team of young officers. The achievements made in a short period of five years are indeed appreciable."

ii. Regarding forestry research and training

"The Committee appreciates the efforts of the Director who has been facing the problems in the development of the Institute successfully by giving highest priority to work. He has been able to train and prepare a team of young scientists of PFRI Officers who are working hard to put forestry research on sound footing."

Observations of other VIPs

4. Mr. Abeed Ullah Jan (25.2.1989), Inspector General of Forests, Government of Pakistan, Islamabad.

"A budding Research Institute, coming up very well and under the guidance of the present Director, who is capable, devoting and upright, it will serve as a becon of light for forestry in Punjab."

5. Mr. Bahauddin Sirhindi (4.4.1989), Chief Conservator of Forests, Sind.

" Set in beautiful environs, this beautiful Institute is set for tremendous development in "Forestry Research" under the leadership of its Director. I wish we could have a similar Forestry Research Institute in Sind."

6. Mr. Mahmood Iqbal Sheikh (8.3.1990), Forestry Policy and Management Specialist, USAID, Forestry Planning and Development Project, Islamabad.

"This is place where one could devote one's life to the cause of forestry research. Research is a collaborative effort and each and every individual of the component has to play his role fully. I am sure the researchers under the benign leadership of Sahibzada Mohammad Hafeez bring this Institute into sharp international focus within foreseeable future. I wish them God speed."

7. Standing Forestry Research Review Committee, Government of Pakistan

A high level Standing Forestry Research Review Committee constituted by the Government of Pakistan under the chairmanship of Inspector General of Forests and represented by a Chief Conservator of Forests of each province reviews the annual progress of research and training of this Institute also. This Committee is always satisfied with our progress and our agro-forestry research projects are particularly appreciated.

8. Presentation on the Research Accomplishment of PFRI

The Secretary Forests convened a seminar at Changa Manga on 21st December, 1991 and the Director was required to make a presentation on the research accomplishment of the Punjab Forestry Research Institute. All senior officers of Forestry, Wildlife and Fisheries Department were the participants. Presentation was made by the Director giving research accomplishments and some interim results of on-going projects. The uptodate achievements and work on current projects was greatly appreciated by the senior forest officers.

9. Review by Mr. Muhammad Masood Rana, C.C.F.(P&E) Punjab and Mr. M.I. Sheikh, Forestry Policy and Management Specialist on 8th and 9th January, 1994.

Sahibzada M. Hafeez, Director, PFRI presented the achievements of his Institute over the years. Inspite of several handicaps such as paucity of staff and funds the achievements appeared to be impressive. He gave the details of completed research projects and its findings. He covered establishment of arboreta; marking of Seed Production Areas; streamlining nursery techniques; field research; wood utilization; tree/crop interface studies; control of weeds; soils analysis; development of pure races of silkworm and its hybridization.

10. Presentation on the Research and Training Activities of PFRI on 17th May, 1994.

In the Conference of Senior Officers of Forestry, Wildlife and Fisheries Departments held at Lahore on 17th May, 1994, Director PFRI was asked to present briefly the activities of PFRI. Sahibzada M. Hafeez gave a presentation on the training and research achievements, particularly on the application of research findings made so far. The Secretary Forests, Mr. Muhammad Akram Malik appreciated the work done by PFRI and advised to keep it up and also issued guidelines for future work. He also advised the forest officers to make use of research findings and particularly directed for the use of quality seed only for all planting works.

IV - P R O G R A M M E S

TRAINING PROGRAMME

I. REGULAR COURSE

1. DIPLOMA-IN-FORESTRY (2 YEARS) COURSE:

- Class-room studies with short tours from Ist September to 31st August.
- Practical field training in respective divisions during 2nd year from Ist September to 12th August.
- Final evaluation from 13th August to 31st August.

2. CERTIFICATE-IN-FORESTRY:

- Class-room studies with short tours from Ist September to 28th February and Ist March to 31st August.
- Practical field training in respective divisions from Ist March to 12th August and Ist September to 10th February.
- Final evaluation from 13th August to 31st August and 11th February to 28th February.

II. INSERVICE TRAINING/REFRESHER COURSES

1. LEVELS OF TRAINING:

- Officers in BS-17 and above.
- Officers in BS-16.
- Foresters and Forest Guards.
- Office staff of the level of Assistants and above.
- Office staff of the level of Senior & Junior Clerks.
- Tree farmers.
- N.G.O. Members.

2. NATURE OF TRAINING:

a. FOR OFFICERS BS-16 AND ABOVE:

- Concept of social forestry.
- Communication and public relations.
- Management of irrigation.
- Watershed Management.
- Range Management.
- Preparation of working plans.
- Research methodology.
- Modern teaching techniques.
- Computer training.
- Project identification, preparation and analysis.
- Other topics as per need of the department.

b. FOR FORESTERS AND FOREST GUARDS :

- Communication and public relations.
- Seed technology and raising of nurseries.
- Afforestation and choice of species.
- Tending operations and harvesting.
- Preparation of estimates for forestry operations and engineering works.
- Forest Law and Procedure.
- Social forestry and extension education.
- Other topics as per need of the department.

c. FOR OFFICE STAFF:

- Accounts and Procedure.
- Rules and regulations regarding establishment.
- Typing and maintenance of files.
- Lease and contract cases.
- Computer training.

3. EXTENT OF TRAINING:

- Each official of every category should attend a course at least once in 5 years.
- Duration of each course can vary according to category of staff and nature of training. It may vary from one week to 12 weeks.
- The course can be arranged twice or thrice a year at different places.
- Attendance of at least one long - duration (3 months) inservice training course as a pre-requisite for promotion in each cadre. (a proposal)

4. VENUE OF TRAINING:

- For Officers: Officers' Hostel, PFRI.
- For Other Staff: Forest Schools, Ghoragali and Bahawalpur.
- For Tree Farmers and NGOs: Officers' Hostel, PFRI.

ANNUAL RESEARCH PROGRAMME

PUNJAB FORESTRY RESEARCH INSTITUTE, FAISALABAD FOR THE YEAR 1993-94

Sl. No.	Name of Project	Date of commence-ment.	Date of comple-tion	Location	Project Incharge
	I. AGROFORESTRY/SOCIAL FORESTRY				
1.	Effect of various block spacings of Eucalyptus camaldulensis on the yield of Agri. crops (Maize fodder & Clover).	1989-90	1993-94	PFRI	A. Khaliq
2.	Effect of various spacings of Eucalyptus camaldulensis on the yield of Agri.crops (Maize and Wheat).	1989-90	1993-94	PFRI	A.Khaliq
3.	Effect of different line spacings of Poplar on the yield of Agri. crops (Maise and Wheat).	1990-91	1996-97	PFRI	Hafeezullah
4.	Effect of different line spacings of Eucalyptus camaldulensis on the yield of Agri.crops (Sorghum & Sheat).	1991-92	1996-97	PFRI	Hafeezullah
5.	Effect of simal rows of various spacings on the yield of Agri.crops (Wheat and Fodder).	1993-94	1999-2000	PFRI	Rafique
6.	Effect of tree rows on the yield of Agri.crops.	1990-91	Continuous nature.	Punjab	Wahid Rashid
7.	Survey of existing agro-forestry systems in the irrigated areas of the Punjab (FPDP/USAID).	1993-94	1994-95	Irrigated plains	Rafique and Wahid Rashid

8.	Effect of Eucalyptus and its various spacings on the yield of Agri.crops under cotton-wheat rotation.	1991-92	1996-97	Lal Sohanra	R.O. Bwr.
9.	Effect of Poplar on the yield of Agri.crops (Turmeric).	1993-94	1996-97	Changa Manga	A.S/ARO
10.	Socio-economic survey of woodlot growers.	1992-93	1993-94	.Faisalabad .Sahiwal	Wahid Rashid Rafique
	II. SEED, NURSERY AND AFFORESTATION				
11.	Seed collection, testing, storage and supply of important tree species.	1986-87	On-going	PFRI	Afzal
12.	Studies on the effect of size of polythene tubes on the growth and development of Eucalyptus camaldulensis seedlings.	1991-92	1992-93	PFRI	Rafique
13.	Standardization of nursery technique for shisham.	1993-94	1994-95	PFRI	Hafeezullah
14.	Growth enhancement of seed-lings through EM (effect of micro-organism) technology.	1993-94	1994-95	PFRI	A.Khaliq
15.	Optimum age/size for out-planting of tubed plants of Eucalyptus camaldulensis.	1992-93	1994-95	Bhagat B'pur	Afzal R.O.BWR.
16.	Best season for regeneration of phulai through coppice, sowing and planting.	1992-93	1995-96	Kharian	Amjad

17. Introduction of salt tolerant Australian woody species in waterlogged and saline/sodic area of Shorkot plantation.	1990-91	1995-96	Shorkot	Sanaullah
18. Afforestation trials of salt infested areas.	1991-92	1995-96	Pirawala Lahore Park	Sanaullah & ARO CCE ARO Hq.
19. Method of artificial regeneration of Chir Pine and Blue Pine.	1991-92	1993-94	G.gali	Mazhar
20. Propagation of Eucalyptus camaldulensis through root-shoot cuttings.	1993-94	1996-97	PFRI	Afzal
21. Study of coppice management for Eucalyptus camaldulensis in irrigated plantations of the Punjab.	1989-90	1994-95	.PFRI .BWR	Hafeezullah R.O.BWR
22. To find out suitable tree species for I P. of Thal Tract.	1989-90	1994-95	Bhakkar	Hafeezullah

III. ENERGY PLANTATIONS

23. Multipurpose tree species network trials under F/FRED for Arid Zone.	1989-90	1994-95	PFRI Research Garden	Khaliq
24. Multipurpose tree species network trials under F/FRED for semi-arid Zone.	1989-90	1994-95	Pabbi Hills Kharian	Khaliq

IV. INTRODUCTION OF FAST GROWING SPECIES

25. Introduction of fast growing broad-leaved species in hills.	1988-89	1994-94	.Murree Hills .Pothwar	Mazhar
26. To select appropriate combinations of tree species for raising multi-storeyed plantations.	1988-89	1993-94	.CCE .Changa Manga	Khaliq A.S/ARO
27. Comparative studies of local and exotic bamboos for growth and yield.	1988-89	1993-94	Daphar	A.S/ARO Lahore
28. Introduction of Dioscorea deltoidea.	1990-91	1995-96	Murree Hills	Mazhar

V. GENETICS

29. Establishment of seed orchards/progeny trials	19984-85	On-going	.Bhagat .CCE	Dr.Zafar & Afzal
30. Selection of Seed Production Areas.	1991-92	On-going	Punjab	-do-
31. Establishment of Poplar Orchive.	1988-89	On-going	PFRI	Hafeezullah
32. Development of Arboreta in the Punjab.	1983-84	On-going	.PFRI .Changa Manga .CCE	Afzal/ARDs
33. Improvement of fast growing hardwood plantations through genetic means.	1989-90	1992-93	.Bhagat .CCE .Cmga. .G.gali	Dr.Zafar & Afzal

34.	Vegetative propagation of important tree species including tissue-culture.	1991-92	On-going	PFRI	Dr.Zafar & Afzal

VI. MANAGEMENT TECHNIQUES

35.	Effect of watering frequencies on the performance of species under rainfed conditions(FPDP/USAID).	1988-89	1995-96	Pabbi Hills	Khaliq
36.	Effect of irrigation frequency on the performance of species.	1988-89	1993-94	CCE	Khaliq
37.	To study the effect of various spacings on the growth of shisham and other forest species.	1986-87	1995-96	CCE	Sanaullah
38.	Quantitative assessment of reduction in survival and growth due to weeds in irrigated plantations.	1988-89	1994-95	.Cmga. .CCE	Khaliq
39.	Effect of NFT species on the yield of Eucalyptus camaldulensis.	1988-89	1994-95	CCE	Khaliq
40.	Preparation of ready-reckoner for yield statistics (Eucalyptus, Poplar, Shisham and Kikar).	1993-94	1994-95	Punjab	Dr. Ghauri

VII. SOIL STUDIES

41.	Physical and chemical studies on soils of experimental areas.	1987-88	To continue	Punjab	Khaliq

VIII. RANGE MANAGEMENT

42.	Establishment of range research nursery and conservation of germplasm of various grasses/ legumes.	1986-87	To continue	PFRI	Amjad
43.	To study nutritive value of important fodder tree species and range grasses.	1990-91	1993-94	PFRI	Amjad
44.	Effect of clipping methods and frequency on the yield of Dhaman and Gorkha grasses.	1992-93	1994-95	Dagar Kotli	Amjad
45.	Contribution of fodder trees towards forage resources in range areas.	1993-94	1994-95	Range areas	Amjad
46.	To determine seed rate and optimum number of ploughings necessary before carrying out seed sowing of grasses.	1993-94	199495	Thal	Amjad

IX. SERICULTURE

s on the spacing ulberry cultivation.	1986-87	1993-94	.Sargodha .Cmga.	M.Muslim
ls on the training tem of mulberry crop.	1986-87	1993-94	Changa Manga	-do-
velopment of mulberry chard of parent rieties.	1986-87	To continue	-do-	-do-
stablishment of Model emonstration Mulberry lantation.	1987-88	-do-	.PFRI .Cmga.	-do-
Trials on the application of fertilizers.	1988-89	1995-96	Cmga.	-do-
Development of parent silkworm races.	On-going		Seri. Research Lab.Lhr.	-do-
Trials on the cross breeding of silkworm.	1988-89	To continue	-do-	-do-
. Trials on the artificial hatching of silkworm eggs.	1987-88	1993-94	-do-	-do
5. Trials on the inducing of rooting in the mulberry by ringing twigs.	1990-91	1993-94	-do-	-do-

FORESTRY RESEARCH PRIORITY AREAS

1. Forestry

- Investigations on seedings, seed collection and storage, testing and distribution of forest tree seeds.
- Development and improvement of cost-efficient techniques for raising of nursery plants for various local and exotic species.
- Introduction, selection and management of fast growing tree species in various ecological zones with special emphasis on trees of industrial and commercial importance.
- Selection of species and evolving of planting techniques for forest problem areas such as those affected by water-logging, salinity, aridity, erosion etc.
- Methods of regeneration, afforestation and planting including direct sowing versus planting, type of planting stock, season of planting or sowing etc.

- Forest management studies to maximize production of timber and other forestry products per unit of forest lands.
- Development and production of seed and planting material of improved genetic quality.
- Vegetative propagation of forest trees including tissue culture.
- Effect of fertilizers on the growth of selected forest tree species especially in the nursery stage.
- Water requirements for establishment of selected species for barani, irrigated plantations and riverain forests.
- Chemical and cultural methods of weed control in forest plantations.
- Physical and chemical studies on soils and their correlation with the productivity of the area.
- Development of models for multiple use of forest lands.
- Investigate causes of declining productivity in irrigated plantations and hill forests.
- Develop ways and means to improve the existing output from irrigatd plantations through land levelling, better water resource management, silvicultural practices, and introduction of fast growing multipurpose species.
- Land capability classification of plantation areas as well as such forests.
- Survey of existing wood resource on farm lands.

2. Agroforestry

- Effect of single tree, group of trees, wind breaks/ shelter-belts on the production of agricultural and fruit crops.
- Documentation and evaluation of existing agroforestry/ tree planting practices of farmers.
- Study tree/crop interface especially competition for water, nutrients and light using most common crops and trees.

- Finding of optimum spacing for trees and agriculture crops in combination and assessing the merits of combined production system.
- To design suitable agroforestry systems and develop its management techniques.
- Identify soil improvement possibilities by planting nitrogen fixing trees and other species.
- Examine economics of irrigated plantations viz-a-viz agroforestry system.
- Study organization, transportation and marketing of forest produce from farm land to provide maximum returns to the farmers.

3. Range Management

- Range improvement through artificial and natural seeding, planting of fodder trees shrub species, fertilization and water spreading etc.
- Adaptability of different strains of grasses, legumes and tree species in over grazed and mis-managed range lands.
- To evolve high yielding varieties of grasses through selection and breeding methods.
- Species and techniques for dune stabilization.
- Studies in grazing management with particular reference to the ecological effects of stocking rate, rest periods and combination of animals of different feeding habits.

4. Sericulture

- Isolation of pure races/lines of silk worm.
- Trials on cross breeding of pure races of silk worms so far obtained.
- Survey of morphological characters of different mulberry varieties and introduction of suitable varieties in the field including farm lands with the assistance of Conservator of Forests(Extension).

5. Pest Control

- Develop efficient chemical, biological and physical control/measures against insects.
- Develop methods for the control of damage by animals such as porcupines, wild boars etc.

TRANSFER OF TECHNOLOGY

At present transfer of technology is being done in routine through the following means:

- Published in Pakistan Journal of Forestry.
- Annual Progress Reports (giving detailed account of all research and training activities). Copies are sent to the Administrative Department, all C.C.Fs and sometimes to all C.Fs.
- Important articles are sent to the Administrative Department, all C.C.Fs and sometimes to all C.Fs.
- SDI Service. This regular service is also utilized sometimes to convey our own articles to the Senior Officers.
- Agroforestry and Social Forestry Seminars.
- Conducting special courses for N.G.Os and Farmers.
- Conducting special courses for Forest Staff.
- Common but unscheduled visits of farmers to our research garden.
- Arranged visits of farmers to PFRI.
- Radio talks.
- Personal contacts.
- Distribution of planting stock/clones of selected species.
- It is proposed to bring out Quarterly News Bulletin from PFRI, which will be doing this transfer of technology regularly in future.
- Publishing in "Zarai Digest" of UAF which is most commonly read Journal of Farmers.

PLAN
PUNJAB FORESTRY RESEARCH INSTITUTE
FAISALABAD

SCALE: 1" = 720'