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**A STUDY OF FARM NURSERIES  
IN  
PUNJAB AND NWFP**

by

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## EXECUTIVE SUMMARY

Deforestation is a serious problem in Pakistan. One of the possible ways of reversing this process is to plant trees on farm and marginal lands. To encourage the planting of trees on private lands, the Forestry Planning and Development (FP&D) Project gave farmers tree seedlings free of cost. The seedlings were raised in private farm nurseries under contracts with the provincial forest departments in all four of Pakistan's provinces. The primary aim of this study was to evaluate the success of project supported farmer nurseries in terms of the likelihood that they might continue as private businesses.

The study was restricted to the Project's operating areas within the Punjab and NWFP provinces during the period 1989 to 1992. Within this area and period there were 1,742 farm nursery contracts in Punjab and the 315 farm nursery contracts in NWFP. Approximately 10 percent of the farmers with nursery contracts were randomly selected from each tehsil (subdivision of a district administrative unit). Each farmer selected in this study was interviewed at his or her place of residence using a standardized questionnaire. A second questionnaire was developed to structure and standardize interviews of forest department officers involved in the project. The information that was analyzed and used to draw conclusions about the study's objectives was acquired from these questionnaires.

Over the past four years, it is estimated that nearly 110,800 persons were supplied a total of 56,483,200 tree seedlings in the four divisions of the Punjab. In addition, 36,100 persons demanded an additional 79,511,200 seedlings. During the same period, in NWFP it is estimated that nearly 36,900 persons were supplied a total of 15 million tree seedlings. In addition, over 50,300 persons have demanded an additional 20 million seedlings. In both provinces individuals were demanding seedlings under the assumption that they would be available free of cost.

Six percent of the farmers who had nursery contracts in Punjab directly sold seedlings to private individuals. In NWFP 28 percent directly sold seedlings. A major factor hindering the private sale of seedlings was the forest departments reluctance to relax a contractual agreement with the farm nursery operators which restricted them from making private sales. When sold, poplar and simal demanded the highest seedling price in Punjab. Eucalyptus was the major species sold in NWFP. Tree seedling sale is expected to increase since government, private and NGO sectors have shown interest in motivating farmers towards tree planting.

On average, one individual was hired on an hourly basis by farm nursery operators to work in the farm nurseries in Punjab while farm nursery operators in NWFP, on average, hired three

individuals. The remainder of the labor was provided by the farm nursery operator's family. The use of various types of family members as laborers in nursery operations varied by province. In Punjab, on average, two men and one woman labored in family farm nurseries with very limited involvement of children. In NWFP, on average, one man, two women and one child labored in the family's farm nursery.

In Punjab the average cost a farm nursery operator spent raising a seedling was Rs. 0.45 per plant as compared to Rs. 0.50 in NWFP. Land rent, hourly labor charges to family members, and water charges are not included in these estimates. Project staff has attained 100% success in training farmers to raise nurseries on their own.

Insects were the leading problem encountered by farmers raising nurseries. White ant attacks on Eucalyptus in nurseries were reported by 13 percent of the farm nursery operators in the Punjab and 19 percent of them in NWFP. This was particularly a problem in those areas where water was limited. Seedling losses resulting from poor germination averaged less than 10 percent in both the Punjab and NWFP. Seedling losses due to hailstorms and frost was less than 5 percent in both provinces.

Over the four year period, in Punjab, women were issued a total of 42 nursery contracts which is 2.4 percent of the total number of contracts issued. No nursery contracts were issued to women in NWFP during the past four years.

During the interview process, farmers were asked to comment on the project and make suggestions for its improvement. The two issues of greatest importance to farmers in both provinces were contracts with the forest department which would allow for the direct sale of seedlings and a simplified contract payment procedure. Farmers felt that restrictions imposed by forest department officials on the direct sale of seedlings kept them from finding opportunities to sell their seedlings. Secondly, farmers attributed the cause for delayed payments to the "chit" system. On occasion the delays were over a year long.

In order to remove bias in the distribution of nursery contracts and to give farmers an opportunity to determine their minimum profitable rate per seedling, nursery contracts should be disseminated through a "tender" system. It was also recommended that FP&D project activities should be emphasized on marginal lands in barani (rainfed) areas.

An important impact of the FP&D Project has been the change in forest officers attitudes and behaviors towards farm forestry which it has helped institutionalize. Many forest officers now believe that the future of forestry in Pakistan depends on the success of social forestry.

## INTRODUCTION

### BACKGROUND

One of the goals of the Forestry Planning and Development (FP&D) Project is to reverse the process of deforestation. One means of reversing the process of deforestation is through tree crop management on private lands. To encourage the planting of trees on private lands, farmers were given tree seedlings free of cost. The seedlings were raised in private farm nurseries under contracts with the provincial forest departments. The free and widespread distribution of tree seedlings on a large scale has resulted in the reclamation and increased productivity of marginal lands, particularly in barani (rainfed) areas.

During the period 1985 to 1992 the provincial forest departments, through the FP&D Project, issued over 4,500 contracts to farmers to raise farm nurseries. These nurseries produced 130 million tree seedlings which were planted on 128,000 farms throughout Pakistan. This report evaluates the progress of farmer nurseries over the past four years (1989-1992) in the provinces of Punjab and NWFP.

### STUDY OBJECTIVES

The primary objective of this study was to evaluate the success of FP&D Project supported farmer nurseries in terms of the likelihood that they might continue as private businesses. In this context, the study attempts to indicate the extent to which private farm nurseries have become self-sustaining businesses, to identify limitations which prevent the marketing of tree seedlings, and to outline suggestions which could increase seedling sales.

Specifically, information on the following aspects of the project's farm nursery program were evaluated:

1. Supply of, and demand for, tree seedlings by farmers from private farm nurseries.
2. Number of seedlings sold directly to farmers from private farm nurseries.
3. Physical and financial resources provided to farm nursery operators by the project and supplied by themselves.
4. Forest department policies which constrain the production and sale of farm nursery seedlings.
5. Description of individuals who operate farm nurseries including women.
6. Suggestions by nursery farmers and the project officials on ways of further improving project nurseries.

This report can serve as a guideline for similar schemes which may be initiated in the future.

### STUDY LOCATION

The study was restricted to the project's operating areas within the Punjab and NWFP provinces (Table 1). In Punjab province this included the Attock, Gujrat, Jhelum and Rawalpindi forest divisions. During the past four years, 1742 contracts for farmer nurseries were issued in these areas.

In NWFP the project's operating area included the D.I. Khan and Kohat forest divisions. During the same period an additional 315 contracts for farm nurseries were issued in this area.

TABLE 1. Number of farm nursery contracts by forest division.

<u>Province</u>	<u>Division</u>	<u>Tehsil</u>	<u>No. of Nurseries</u>	<u>No. Sampled</u>	
Punjab	Attock	Attock	393	40	
		Fateh Jang	73	8	
		Pindi Gheb	<u>143</u>	<u>14</u>	
		Subtotal	609	62	
	Gujrat	Daska/Gujranwala	Daska	9	1
			Gujrat	101	14
			Kharian	67	9
			Narowal	59	7
			Pasrur	44	6
			Phalia	16	2
			Shakargarh	116	13
			Sialkot	<u>16</u>	<u>3</u>
			Subtotal	428	55
			Jhelum	Chakwal	Chakwal
	Jhelum	76			11
	Khushab	132			15
	Noorpur	10			1
	P.D. Khan	120			15
	Sohawa	18			2
	Talagang	<u>52</u>			<u>10</u>
	Subtotal	581			78
Rawalpindi	Islamabad	Islamabad	5	1	
		Gujar Khan	57	6	
		Rawalpindi	33	3	
		Taxila	<u>29</u>	<u>3</u>	
		Subtotal	124	13	
TOTAL			1,742	208	
NWFP	D.I. Khan	Dera Ismail Khan	143	14	
	Kohat	Banda Daud Shah	23	2	
		Hangu	20	2	
		Karak	56	7	
		Kohat	<u>73</u>	<u>7</u>	
		Subtotal	172	18	
	TOTAL			315	32

## **METHODOLOGY**

### **COLLECTION OF NURSERY FILES**

The Punjab and NWFP Project Directors maintained a separate file for each contract issued to a farmer to raise tree seedlings under the FP&D Project. For the last four years these files were obtained from the Project Directors for all of the farm nursery contracts listed in Table 1.

### **COMPILATION OF NURSERY RECORDS**

Office orders given in the nursery contract files were used to construct a list of nurseries by tehsil (subdivision of a district administrative unit) for the four divisions of Punjab and the two divisions in NWFP. Within this list the number of seedlings raised in the nursery was recorded separately by species. If a farmer received more than one nursery contract to raise seedlings during different growing seasons, the farmer would appear in the list separately for each contract. Table 1 indicates the distribution of the 1,742 farm nursery contracts in Punjab and the 315 farm nursery contracts in NWFP by tehsil. The nurseries associated with these contracts formed the population of farm nurseries that were used in this study.

### **SELECTION OF SAMPLED NURSERIES**

Because of time constraints and financial limitations, it was not possible to interview all the farmers associated with the 2,057 nursery contracts. Therefore, approximately 10 percent of the farmers with nursery contracts were randomly selected from each tehsil. Table 1 gives the number of samples selected by tehsil. In Punjab 208 farmers were sampled and an additional 32 were sampled in NWFP. The probability that a farmer was selected was proportional to the total number of seedlings raised in that tehsil. Thus, farmers who raised larger nurseries, or raised nurseries under several contracts, had a greater chance of being selected than farmers who had smaller contracts or participated in the program only one time.

Alternate farmers were selected in each tehsil. In a few cases the selected farmer was not available but an employee or family member who had been actively involved in the nursery's operation was present. In this case that individual was interviewed in place of the selected farmer. If the selected farmer, or a knowledgeable representative no longer resided in the community or could not be located, the sample was rejected and an alternative sample was used.

## DATA COLLECTION PROCEDURES

Each farmer selected in this study was interviewed at his or her place of residence. A questionnaire was developed to structure and standardize the farmer interviews (Appendix 1). A second questionnaire was developed to structure and standardize interviews of forest department officers involved in the project (Appendix 2). The information that was analyzed and used to draw conclusions about the study's objectives was acquired from these questionnaires.

## ANALYSIS OF DATA

Since the samples were randomly selected from a known population, estimates for individual farm nurseries and for the total farm nursery population have been computed for selected attributes. Means, totals and 95% confidence intervals were estimated using statistical procedures associated with stratified random sampling of populations with known strata size.

## RESULTS AND DISCUSSION

This section reports on the results obtained from the sample of farm nursery operators. Supply of and demand for tree seedlings by farmers, number of seedlings sold directly to farmers, physical and financial resources required to raise tree seedlings, factors which constrain production and sale of seedlings, description of farm nursery operators, and farmer and forest officer suggestions on ways to improve the farm nursery program are each addressed separately.

### SUPPLY OF AND DEMAND FOR TREE SEEDLINGS

Distribution of nursery seedlings was carried out through an exhaustive evaluation mechanism that relied on "chits" (a formally written permission/authorization memo). A person who wished to receive seedlings from a project nursery had to first obtain a "chit" from a forest officer. The "chit" specified the name and location of the project nursery, the date the seedlings would be available, the quantity of seedlings that would be supplied and the place where the seedling would be planted. In cases where the farm nursery operator directly came in contact with a person willing to plant trees, the latter was directed to obtain a "chit" from a forest officer. A forest department evaluation team used the "chits" to locate recipients of seedlings. The team then verified the number of trees planted on farms and payment was made to the nursery operator based on the number of seedlings successfully planted.

In both provinces, the forest departments and farm nursery operators played significant roles in identifying farmers who desired tree seedlings (Table 2). However, in NWFP, forest officers alone identified 63 percent of the recipients of tree seedlings while forest officers alone in the Punjab identified 43 percent of the recipients.

TABLE 2. Individuals responsible for identifying recipients of tree seedlings in Punjab and NWFP.

Prov.	Division	Forest Dept.	Farm Nursery	Both
		Staff	Operators	
		Percent		
PUNJAB	Rawalpindi	0.0	47.5	52.5
	Attock	30.7	4.7	64.6
	Gujrat	66.8	3.8	29.4
	Jhelum	48.2	12.4	39.4
	<b>Average</b>	<b>43.2</b>	<b>10.1</b>	<b>46.7</b>
	<b>C.I. Half-width</b>	<b>5.9</b>	<b>3.5</b>	<b>6.3</b>
NWFP	D.I.Khan	64.3	0.0	35.7
	Kohat	61.4	0.0	38.6
	<b>Average</b>	<b>62.7</b>	<b>0.0</b>	<b>37.3</b>
	<b>C.I. Half-width</b>	<b>18.1</b>	<b>0.0</b>	<b>18.1</b>

Over the past four years, it is estimated that nearly 110,800 persons were supplied a total of 56,483,200 tree seedlings in the four divisions of the Punjab plus 36,100 persons demanded an additional 79,511,200 seedlings (Table 3). In per person terms, the 110,800 farmers, on average, each received 510 seedlings and the 36,100 farmers are now demanding, on average, an additional 2,200 seedlings per person.

The demand for seedlings per person in Gujrat division was 5,900. This was the highest per person demand of all divisions and may be due to the following reasons:

1. effective motivation of farmers to raise trees by both the Forest Department and Faruki Pulp Mill staff; and
2. expectation of a steady market for trees based on the proposed establishment of the Faruki Pulp Mill in Gujrat.

In NWFP, it is estimated that over the past four years nearly 36,900 persons were supplied a total of 15 million tree seedlings plus over 50,300 persons have demanded an additional 20 million seedlings (Table 3). In per person terms, the 36,900 farmers, on average, each received 409 seedlings and the 50,300 farmers are now demanding, on average, an additional 397 seedlings per person. Unlike the Punjab, the total number of farmers demanding seedlings is increasing.

TABLE 3. 1989-1993 Seedling Supply and Demand in Punjab and NWFP.

Prov.	Division	SUPPLY			DEMAND		
		No. Seedlings	No. Farmer	Seedl/ Farmer	No. Seedlings	No. Farmer	Seedl/ Farmer
PUNJAB	Rawalpindi	4,379,599	5,923	739	2,933,333	1,558	1,883
	Attock	17,877,288	32,313	553	56,606,803	16,846	3,360
	Gujrat	14,483,337	30,570	474	5,936,318	1,002	5,924
	Jhelum	19,742,954	41,988	470	14,034,727	16,693	841
	<b>Total</b>	<b>56,483,178</b>	<b>110,794</b>	<b>510</b>	<b>79,511,181</b>	<b>36,099</b>	<b>2,203</b>
C.I.	Half-width	2,733,987	30,842		24,790,436	20,198	
NWFP	D.I.Khan	6,097,950	7,707	791	8,738,321	7,354	1,188
	Kohat	9,003,576	29,179	309	11,232,134	42,950	262
	<b>Total</b>	<b>15,101,526</b>	<b>36,886</b>	<b>409</b>	<b>19,970,455</b>	<b>50,304</b>	<b>397</b>
C.I.	Half-width	1,722,932	18,512		6,131,271	53,698	

Although the overall supply of, and demand for, seedlings in Kohat division was high, there was significant variation between tehsils within the division. In project areas where land holdings were small and rainfall was low, forest officers had greater difficulty finding farmers who were willing to raise trees on their farmlands. Since Karak area has a shortage of water, and farmers in B.D. Shah have small land holdings and financial limitations, forestry activities were restrained in these areas. However, increased interest in the planting of tree seedlings in Hangu might

be related to the total on-going farm forestry activity in that area. Three projects, other than the FP&D Project, were in operation. Each had a component which encouraged the raising of nurseries and the distribution of tree seedlings to farmers. These were:

1. a UNHCR "Income Generating" project which provided polythene bags free of cost to Afghan refugees so they could raise and distribute tree seedlings;
2. a GTZ FECT Project which used women motivators to advertise fuel efficient cooking stoves and persuade women to plant trees that were supplied from FP&D Project nurseries; and
3. a FP&D Project NGO Grant to SRSC to raise nurseries. Furthermore, SRSC acquired the services of a FP&D project official to serve as a resource person.

In both provinces, the supply of seedlings to farmers was, on occasion, reduced because some project staff required that farm nursery operators pay them a commission before they would initiate a final evaluation of the nursery stock. This discouraged farmers from participating in the nursery program. Similar, individuals were demanding additional seedlings under the assumption that they would be available free of cost. No attempt was made to estimate the number of seedlings farmers would demand if they were only available at some price.

#### DIRECT SEEDLING SALES

In Punjab, over the past four years, it is estimated that only 6 percent of the farm nurseries sold seedlings directly to farmers (Table 4). Of the total seedlings supplied from project nurseries, about 4 percent were sold directly to farmers. Poplar and Simal were the main species which were sold and they demanded the highest prices, in part, because there is a ready market for mature trees and very few cuttings are available free of cost. Eucalyptus seedlings were sold on a very limited scale, in part, because they are presently available free of cost throughout the project area.

Gujrat division had the greatest number of private sales. The demand for tree seedlings in Gujrat is mainly due to the two reasons listed in the previous section of this report. The expectation of a steady market for trees motivated farmers to begin planting trees now even if they had to purchase the seedlings.

In NWFP, over the past four years, it is estimated that 28 percent of the farm nurseries sold seedlings directly to private individuals (Table 4). Nearly 4 percent of the total number of trees produced were directly sold to farmers.

TABLE 4. Direct seedling sales in Punjab and NWFP.

Prov.	Division	% Nur. Selling Seedl.	No. of Seedlings Sold	Percent Euc.	Rs. Value of Seedlings Sold	Percent Euc.
PUNJAB	Rawalpindi	8.9	880,000	0.0	220,000	0.0
	Attock	3.2	6,926	100.0	17,317	100.0
	Gujrat	14.6	1,417,108	35.9	3,962,902	19.3
	Jhelum	1.2	1,802	80.0	3,604	80.0
	<b>Avg./Total</b>	<b>5.8</b>	<b>2,305,836</b>	<b>22.4</b>	<b>4,203,823</b>	<b>18.7</b>
<b>C.I. Half-width</b>	<b>3.0</b>	<b>2,045,536</b>		<b>3,729,283</b>		
NWFP	D.I.Khan	14.3	122,571	16.7	326,857	6.3
	Kohat	39.7	426,029	90.2	550,964	92.4
	<b>Avg./Total</b>	<b>28.2</b>	<b>548,600</b>	<b>73.8</b>	<b>877,821</b>	<b>60.3</b>
	<b>C.I. Half-width</b>	<b>14.9</b>	<b>447,993</b>		<b>804,203</b>	

A delay in contract payment by the Forest Department to farm nursery operators during the 1991-92 season was a major reason that farm nursery operators directly sold their trees. Project staff informed the farm nursery operators that the department would make contract payments for the seedlings they had raised only if funds were released by FP&D Project and, in the farm nursery operators interests, allowed them to directly sell their seedlings. Under these conditions farm nursery operators made every possible effort to at least capture their initial investment through the direct sale of seedlings. Farm nursery operators in D.I.Khan were able to sell seedlings to farmers in adjoining areas of Punjab where no social forestry project was operating.

Farm nursery operators who sold seedlings indicated that they observed no competition for sale of seedlings from other nurseries operating in the area or competition for sale of seedlings from nurseries operated by the forest departments. Farm nursery operators were asked if they could produce adequate numbers of seedlings to meet the demand of forest departments and if they could meet that demand in a timely manner. In Punjab 90 percent of the farm nursery operators said they could do so and 100 percent of the farm nursery operators in NWFP expressed the same response.

#### PHYSICAL AND FINANCIAL RESOURCE REQUIREMENTS

##### Training

Project staff in both provinces successfully trained nearly 100 percent of the farmers who were contracted to raise nurseries (Table 5). Between 80 and 90 percent of the farm nursery operators felt that they did not need additional training. These farmers received no training in private marketing of seedlings. Such training could help increase the private sale of seedlings.

TABLE 5. Farmer training in the Punjab and NWFP.

Prov.	Division	Percent Farmers Receiving Training	Percent Farmers Who Don't Desire Additional Training
PUNJAB	Rawalpindi	92.2	59.3
	Attock	100.0	95.2
	Gujrat	94.5	80.1
	Jhelum	90.5	71.2
	<b>Average</b>	<b>94.9</b>	<b>80.9</b>
<b>C.I. Half-width</b>	<b>2.8</b>	<b>4.7</b>	
NWFP	D.I.Khan	100.0	71.4
	Kohat	100.0	100.0
	<b>Average</b>	<b>100.0</b>	<b>87.0</b>
	<b>C.I. Half-width</b>	<b>0.0</b>	<b>10.8</b>

Manpower

On average, one individual was hired on an hourly basis by farm nursery operators to work in the farm nurseries in Punjab while farm nursery operators in NWFP, on average, hired three individuals (Table 6). The remainder of the labor was provided by the farm nursery operator's family. Once experienced working in nurseries, some of the laborers were hired in NWFP to work in NGO nurseries.

The use of various types of family members as laborers in farm nursery operations varied by province (Table 6). In Punjab, on average, two men and one woman labored in family farm nurseries with very limited involvement of children. In NWFP, on average, one man, two women and one child labored in the family's farm nursery.

TABLE 6. Farm nursery labor in the Punjab and NWFP.

Prov.	Division	----- FAMILY LABOR -----				No. of Hired Laborers
		No. Adult Males	No. Child Males	No. Adult Females	No. Child Females	
PUNJAB	Rawalpindi	0.1	0.5	0.2	0.0	0.9
	Attock	1.2	0.6	0.1	0.0	0.9
	Gujrat	3.2	1.4	0.2	0.1	1.4
	Jhelum	2.4	0.7	0.4	0.3	1.7
	<b>Average</b>	<b>2.0</b>	<b>0.8</b>	<b>0.2</b>	<b>0.1</b>	<b>1.3</b>
<b>C.I. Half-width</b>	<b>0.3</b>	<b>0.3</b>	<b>0.1</b>	<b>0.1</b>	<b>0.2</b>	
NWFP	D.I.Khan	1.0	1.4	0.0	0.3	3.3
	Kohat	1.4	2.3	0.7	0.8	2.6
	<b>Average</b>	<b>1.2</b>	<b>1.9</b>	<b>0.4</b>	<b>0.6</b>	<b>2.9</b>
	<b>C.I. Half-width</b>	<b>0.3</b>	<b>0.6</b>	<b>0.3</b>	<b>0.4</b>	<b>0.7</b>

Since women are primary users of the wood and historically have been actively involved in its collection, their participation in farm nursery activities was anticipated. Frequently women were the family members who looked after the nurseries when the male members of the family were working in the fields.

#### Materials Supplied by the Forest Department

Initially, forest officers had difficulty motivating farmers to raise nurseries. In addition, farmers were unfamiliar with the purchase of tree seed and nursery materials. Therefore, the forest departments frequently purchased seed and polythene bags, and provided the farm nursery operators with these supplies. There cost was deducted when the forest department paid the farmer for the successful completion of the nursery contract. As farm nursery operators became more familiar with nursery operations, they directly purchased polythene bags and seed, and frequently paid a lower price for these materials.

#### Production Costs

In Punjab the average cost a farm nursery operator spent raising a seedling was Rs. 0.45 per plant as compared to Rs. 0.50 in NWFP (Table 7). Land rent, hourly labor charges to family members, and water charges are not included in these estimates.

In both provinces, 60 to 70 percent of the farmers would prefer to have an advance payment from the forest department at the beginning of the contract. This payment would help reduce capital requirements they need for materials and hourly labor expenses during the production process. To date, an advance payment has not been made to farm nursery operators.

TABLE 7. Seedling production costs in the Punjab and NWFP.

Prov.	Division	Rs. Cost to Produce a Seedling	Percent Farmers Desiring an Advance Payment
PUNJAB	Rawalpindi	0.59	69.2
	Attock	0.46	77.6
	Gujrat	0.39	27.8
	Jhelum	0.45	63.7
	<b>Average</b>	<b>0.45</b>	<b>60.2</b>
<b>C.I. Half-width</b>	<b>0.02</b>	<b>5.8</b>	
NWFP	D.I.Khan	0.58	64.3
	Kohat	0.42	69.3
	<b>Average</b>	<b>0.50</b>	<b>67.0</b>
	<b>C.I. Half-width</b>	<b>0.06</b>	<b>15.6</b>

In D.I.Khan, nurseries were raised using a greater proportion of hired labor and it was necessary to purchase good quality polythene bags in Peshawar or Lahore, hence elevating their cost. In Karak tehsil of Kohat division, the majority of the farm nursery operators had taken loans from the Agricultural Development Bank of Pakistan to buy tractors or to sink tube wells. They were paying Rs. 25,000 to 30,000 in yearly installments to the bank. Almost every family member assisted in the nursery operations plus simple mechanical procedures were used to fill polythene bags and water seedlings to reduce labor costs.

A majority of the farmers profited from their nursery contracts except for those who employed excessive labor, paid overly high rates for materials, or lost their nursery crop due to a natural calamity.

#### FACTORS INFLUENCING THE PRODUCTION AND SALE OF SEEDLINGS

Insects were the leading problem encountered by farmers raising nurseries. White ant attacks on Eucalyptus in nurseries were reported by 13 percent of the farm nursery operators in the Punjab and 19 percent of them in NWFP (Table 8). This was particularly a problem in those areas where water was limited. Seedling losses resulting from poor germination averaged less than 10 percent in both the Punjab and NWFP. Seedling losses due to hailstorms and frost was less than 5 percent in both provinces.

TABLE 8. Production and distribution factors in Punjab and NWFP.

Prov.	Division	% Distrib Problem	% Production Problems			
			Germ.	Insect	Frost	Hail
PUNJAB	Rawalpindi	32.0	0.0	8.9	0.0	7.7
	Attock	12.7	4.8	14.6	1.7	3.2
	Gujrat	20.1	7.4	10.5	0.0	1.7
	Jhelum	24.6	4.3	14.3	3.6	3.7
	<b>Average</b>	<b>19.8</b>	<b>4.9</b>	<b>13.1</b>	<b>1.8</b>	<b>3.3</b>
<b>C.I. Half-width</b>	<b>5.2</b>	<b>2.8</b>	<b>4.3</b>	<b>1.7</b>	<b>2.3</b>	
NWFP	D.I.Khan	28.6	7.1	21.4	0.0	0.0
	Kohat	42.7	10.7	17.4	6.1	0.0
	<b>Average</b>	<b>36.3</b>	<b>9.1</b>	<b>19.2</b>	<b>3.3</b>	<b>0.0</b>
	<b>C.I. Half-width</b>	<b>13.9</b>	<b>10.0</b>	<b>14.4</b>	<b>6.3</b>	<b>0.0</b>

Farm nursery operators in NWFP, on average, had greater difficulty distributing their seedlings than farm nursery operators in Punjab (Table 8). This problem was greatest in Kohat division where farm nursery operators were paying Rs. 150 per 3000 seedlings to distribute them to the door step of farmers so they might more rapidly receive their contract payment from the forest department.

In the Punjab, 53 percent of farm nursery operators felt the size of the minimum profitable nursery unit was between 40 and 80

thousand seedlings while 26 percent felt nurseries with less than 40 thousand seedlings were profitable (Table 9). This contrasted with farmers in NWFP where 68 percent felt the size of the minimum profitable nursery unit was between 40 and 80 thousand seedlings while none felt nurseries with less than 40 thousand seedlings were profitable (Table 9).

TABLE 9. Minimum desired nursery size in Punjab and NWFP.

Prov.	Division	Nursery Size		
		<40,000	40,000 - 80,000	>80,000
PUNJAB	Rawalpindi	56.3	36.0	7.7
	Attock	6.5	69.3	24.2
	Gujrat	39.5	48.9	11.6
	Jhelum	28.6	43.3	28.1
	<b>Average</b>	<b>25.5</b>	<b>53.3</b>	<b>21.2</b>
<b>C.I. Half-width</b>	<b>5.2</b>	<b>6.2</b>	<b>5.2</b>	
NWFP	D.I.Khan	0.0	57.1	42.9
	Kohat	0.0	76.5	23.5
	<b>Average</b>	<b>0.0</b>	<b>67.7</b>	<b>32.3</b>
	<b>C.I. Half-width</b>	<b>0.0</b>	<b>16.7</b>	<b>16.7</b>

#### DESCRIPTION OF FARM NURSERY OPERATORS

In both Punjab and NWFP, over 80 percent of the farm nursery operators resided on farms (Table 10). The average farm size of these individuals in Punjab was 60 acres as compared to 40 acres in NWFP (Table 10). In both provinces, about 25 percent of the farm nursery operators relied on non-farm sources of income to sustain their livelihoods (Table 10). Over the four year period, in Punjab, women were issued a total of 42 nursery contracts which is 2.4 percent of the total number of contracts issued. No nursery contracts were issued to women in NWFP during the past four years.

TABLE 10. Characteristics of nursery farmers in Punjab and NWFP.

Prov.	Division	Income Sources			Reside Farm		No. of Contracts
		Farm	Farm+ Other	Non Farm	on Farm	Size in Ac.	
PUNJAB	Rawalpindi	28.4	47.2	24.4	83.3	21.6	2.3
	Attock	45.0	34.1	20.9	74.3	100.6	2.7
	Gujrat	41.8	20.6	37.6	85.0	28.3	2.1
	Jhelum	31.4	47.9	20.7	90.8	44.4	1.3
	<b>Average</b>	<b>38.5</b>	<b>36.3</b>	<b>25.2</b>	<b>83.1</b>	<b>58.5</b>	<b>2.1</b>
<b>C.I. Half-width</b>	<b>6.4</b>	<b>6.0</b>	<b>5.7</b>	<b>5.1</b>	<b>34.1</b>	<b>0.1</b>	
NWFP	D.I.Khan	28.6	50.0	21.4	85.7	70.0	2.0
	Kohat	45.9	23.2	30.9	100.0	10.9	2.1
	<b>Average</b>	<b>38.0</b>	<b>35.4</b>	<b>26.6</b>	<b>93.5</b>	<b>37.7</b>	<b>2.1</b>
	<b>C.I. Half-width</b>	<b>15.5</b>	<b>17.0</b>	<b>15.0</b>	<b>8.4</b>	<b>17.6</b>	<b>0.4</b>

In both Punjab and NWFP, farm nursery operators, on average, had been awarded two contracts by the forest department (Table 10). In both provinces, the forest department played a dominant role in motivating farmers to raise nurseries. However, in NWFP nearly 20 percent of the farmers sought out the forest department for nursery contracts (Table 11).

TABLE 11. Source of nursery farmer motivation in Punjab and NWFP.

Prov.	Division	Source of Motivation To Raise a Nursery		
		Self	For. Dept.	Family Members
PUNJAB	Rawalpindi	7.8	75.7	16.5
	Attock	16.2	80.6	3.2
	Gujrat	5.5	79.2	15.3
	Jhelum	2.7	93.0	4.3
	<b>Average</b>	<b>8.4</b>	<b>84.1</b>	<b>7.5</b>
<b>C.I. Half-width</b>	<b>3.8</b>	<b>4.9</b>	<b>3.3</b>	
NWFP	D.I.Khan	7.1	78.6	14.3
	Kohat	29.5	59.2	11.3
	<b>Average</b>	<b>19.4</b>	<b>68.0</b>	<b>12.6</b>
	<b>C.I. Half-width</b>	<b>13.7</b>	<b>14.6</b>	<b>11.9</b>

#### FARMER AND FOREST OFFICER SUGGESTIONS FOR PROJECT IMPROVEMENT

During the interview process, farmers were asked to comment on the project and make suggestions for its improvement. Table 12 summarizes the most consistent comments of farmers in Punjab and NWFP. The two issues of greatest importance to farmers in both provinces were contracts with the forest department which would allow for the direct sale of seedlings and a simplified contract payment procedure. Not unexpectedly, farmers in both provinces would also like the contracted rates per seedling to be increased.

Farmers felt that restrictions imposed by forest department officials on the direct sale of seedlings kept them from finding opportunities to sell their seedlings. Secondly, farmers attributed the cause for delayed payments to the "chit" system. On occasion the delays were over a year long.

TABLE 12. Comments of nursery farmers in Punjab and NWFP.

Comment	Percent Responding in:	
	PUNJAB	NWFP
Forest Department did not allow us to make private sales.	90.9	65.6
Payment procedure should be simplified and accelerated.	51.4	34.4
Contracted rates per seedling should be increased.	40.4	34.4
The final checking of the nursery stock leading to payment should only be done in the nursery.	13.5	15.6
Distribution of the nursery seedlings should be done by the forest department.	9.1	12.5
Improper guidance was given by forest officers.	11.5	6.3
Number of plants per nursery should be increased.	10.1	15.6
Quality seed not available.	2.4	9.4
New species/varieties should be introduced.	7.2	3.1
Abolish "chit" system.	9.6	-
Late approval of nursery contracts.	8.2	-
Field evaluations should be done promptly.	-	9.4
Duration of contract should be reduced from 1 year to 6-8 months.	-	3.1

**NOTE:** Percent in Punjab is based on comments of 208 farmers.  
 Percent in NWFP is based on comments of 32 farmers.  
 - Comment not expressed in that province.

Forest officers accompanied the individuals who interviewed the farmers. Between interviews and during periods of travel to farms, forest officers were asked to comment on the project and make suggestions for its improvement. Table 13 summarizes the most consistent comments of forest officers in Punjab and NWFP. Unlike farmer comments, forest officer concerns varied by province. Forest officers in both provinces were concerned that farmers do not meet department targets in a timely manner nor do farmers follow their advice.

Forest officers in Punjab, like farmers, believe that the contract payment procedure should be simplified. They also believe that farm forestry would be strengthened if the facilities available to officers posted in farm forestry projects were comparable to those of the territorial staff. Two issues of importance to forest officers in NWFP were the desire that project staff have priority for project training opportunities and that project staff positions be increased.

TABLE 13. Comments of forest department staff in Punjab and NWFP.

Comment	Percent Responding in:	
	PUNJAB	NWFP
Forest department should advance payment to the nursery farmer.	7.1	42.9
Farmers do not follow forest department technical advice.	7.1	28.6
Farmers do not meet forest department targets in a timely manner.	21.4	14.3
Payment procedure should be simplified and accelerated.	35.7	-
Forest department should provide farm forestry officers more facilities like houses, POL, timely salary payments and TA/DA.	35.7	-
The final checking of nursery stock leading to payment should only be done in the nursery.	28.6	-
Number of plants per nursery should be increased.	21.4	-
Political pressure has caused bias in the distribution of nursery contracts.	14.3	-
Schemes should be introduced to use the experience of retired forest officers.	14.3	-
Price per plant should be increased.	14.3	-
Project staff should have priority for project training opportunities.	-	42.9
Project is under staffed.	-	28.6
Every year the seedling targets should be increased.	-	28.6
Delay in nursery payments to farmers should be resolved.	-	28.6
Subsidy should be given for planting.	-	28.6

**NOTE:** Percent in Punjab is based on comments of 14 staff.  
 Percent in NWFP is based on comments of 7 staff.  
 - Comment not expressed in that province.

An important impact of the FP&D Project has been the change in forest officers attitudes and behaviors towards farm forestry which it has helped institutionalize. Many forest officers now believe that the future of forestry in Pakistan depends on the success of social forestry.

## CONCLUSIONS

### FACTORS EFFECTING PRODUCTION AND DISTRIBUTION OF SEEDLINGS

The primary aim of this study was to evaluate the success of FP&D Project supported farm nurseries in terms of the likelihood that they might continue as private businesses. One aspect of this question deals with factors which effect the production and distribution of seedlings from private farm nurseries. With respect to these factors, the study determined that:

1. Forest department staff successfully trained farmers to raise nurseries. Some of these trained individuals have been hired by NGOs to raise nurseries.
2. The demand for nursery seedlings is increasing in the Punjab but fewer individuals are demanding a greater number of seedlings. In NWFP, both the demand for nursery seedlings and the number of individuals requesting seedlings is increasing. The demand for nursery seedlings from FP&D Project nurseries also increased where farm forestry activities, associated with other donor agency projects, are in progress.
3. Farm nursery operators and forest officers had difficulty distributing nursery seedlings in areas where rainfall was low, land holdings were small, and sub-soil water was deep. In cases where the cost of distribution was also incurred to help insure a more rapid contract payment, the future supply of seedlings was reduced.
4. The final evaluation of nursery seedlings that is used to certify contract payment by the forest department is done after the seedlings have been planted in the field. This procedure frequently causes lengthy delays in contract payments to farm nursery operators and tends to discourage their participation in future nursery contracts.
5. The approval of forest department farm nursery seedling production targets often occurred late in each season. This increases the difficulty in motivating farmers to successfully raise nurseries because of the added costs and demands on their time.
6. In some cases, the interest of farmers in raising nurseries has decreased because of inadequate guidance, infrequent visits, and lack of cooperation including the demand of commissions by forest department staff.
7. Women have actively participated in nursery raising activities along with other family members, and have been awarded a limited number of nursery contracts by the forest department in Punjab.

8. Political pressure on forest officers and favoritism by forest officers influenced the distribution of nursery contracts to farmers and, on occasion, resulted in the production of poorer quality seedlings.

In general, it was concluded that farmers had been adequately motivated and trained to operate farm nurseries. The seedlings which were produced met forest department quality standards and were in demand by farmers. From a technical standpoint, the farm nurseries have been a success.

#### FACTORS EFFECTING THE DIRECT SALE OF SEEDLINGS

To determine the likelihood that farm nurseries might continue as private businesses the study needed to evaluate factors which effect the direct sale of seedlings from private farm nurseries. With respect to these factors, the study determined that:

1. The private sector and NGOs, as well as government, are encouraging farmers to raise trees. This will help create markets for sale of tree seedlings.
2. Emphasis was placed on raising Eucalyptus seedlings whereas farmers want to have a wider variety of choices which, preferably, included species with known markets.
3. The private sale of nursery seedlings from farm nurseries was generally not encouraged and frequently not allowed by forest department staff. Furthermore, free distribution of seedlings by the forest department, in areas surrounding the farm nurseries, restricted the farmer's chances of directly selling seedlings in the open market.

In general, it was concluded that farm nursery operators must become more aggressive in the marketing of nursery seedlings and the forest department must eliminate contractual requirements which limit the direct sale of seedlings by farm nursery operators. These two changes could result in significant increases in direct seedling sales from private farm nurseries.

#### NURSERIES AS SUSTAINABLE PRIVATE BUSINESSES

The primary objective of this study was to determine the likelihood that farm nurseries might continue as private businesses. One aspect of this question deals with whether or not an environment exists which would allow farm nurseries to operate as private businesses. With respect to this question, the study determined that:

1. Increasing demand for tree seedlings and the availability of trained farm nursery operators make a network of decentralized nurseries possible.
2. Forest departments could help insure decentralized markets by purchasing seedlings for planting on state lands from private farm nurseries.
3. Forest department policies and administrative procedures need to more actively foster the development of private farm nurseries.

Technically, it is possible for farm nurseries to continue as private businesses. Significant demand for tree seedlings continues to exist in farming communities of Punjab and NWFP. Whether or not farm nurseries are sustained on a large scale depends of the establishment of stable markets for farm grown wood and the institutionalization of forest department policies and actions which strongly support their continuation.

## RECOMMENDATIONS

The following recommendations suggest ways the FP&D Project might be strengthened and provide ideas which might be used to design and implement future farm forestry projects.

1. Forest department nursery contracts with farmers should include a provision which allows farmer to directly sell seedlings on the open market.

This provision would convey a message to the farmer from the forest department that the direct sale of seedlings to farmers was desired, and hence remove current ambiguities associated with the private sale of tree seedling to farmers.

2. The species included in nursery contracts should vary according to local market conditions, farmer requirements, and ecological suitability as given in the FP&D Project Technical Note No. 11.

Farmers would benefit from a greater selection of species and this could facilitate the sale of seedlings.

3. The final evaluation of nursery seedlings that is used to certify contract payment should take place at the nursery with emphasis placed on the production of seedlings that meet quality standards. The certification of payments after seedlings are planted in the field should be eliminated.

The payment process will be accelerated by eliminating the cumbersome process of validating seedlings after they are planted in the field. This will result in forest department staff having more time to do outreach activities. It would also simplify the cumbersome "chit" system and facilitate the direct sale of seedlings to farmers.

4. Project activities should be emphasized in barani areas.

A major portion of the marginal lands in Pakistan are confined to barani areas. Farm forestry provides economic and environmental opportunities to farmers in these down trodden areas.

5. The contract rate per seedling should not exceed Rs. 0.70 for nurseries with 50,000 or more seedlings.

The cash expenditure per seedling incurred by farm nursery operators averaged Rs. 0.50. A contract rate per seedling of Rs. 0.70 would insure the availability of seedlings at a reasonable price while providing an economic incentive for farmers to raise seedlings.

6. FP&D Project nurseries should not be established in areas where other farm nursery projects are operating.

Although multiple projects in the same area increases the demand for seedlings, duplicating farm nursery programs does not appear to be an efficient use of project resources.

7. The distribution of nursery contracts to farmers should be on a "tender" system.

Introduction of a "tender" system will help:

- Eliminate political pressure and favoritism associated with the distribution of nursery contracts.
- Give farmers better control over the rate they are paid to raise nursery seedlings.
- Provide farmers who have been trained in nursery technologies a better opportunity to profit from their training.
- Hasten the privatization of farm nurseries.

8. NGOs should be used to motivate and train individuals, including women, to raise nurseries and grow trees.

NGOs are likely to be more effective than the forest department in reaching women and facilitating their participation in farm forestry activities. In addition, NGOs could also raise the environmental conscience of communities, both children and adult members, which would help sustain forestry activities.

Appendix No. 1

FARMER INTERVIEW PROFORMA

Village : \_\_\_\_\_ Tehsil: \_\_\_\_\_  
District: \_\_\_\_\_ Date : \_\_\_\_\_

INTERVIEW WITH NURSERY OWNER

I. GENERAL INFORMATION

- a) 1. Owner's name : \_\_\_\_\_  
Father's name: \_\_\_\_\_  
2. Total area owned : \_\_\_\_\_  
3. Major source(s) of livelihood: \_\_\_\_\_  
4. Place of residence : \_\_\_\_\_  
5. Who first convinced you to establish a nursery for project?  
\_\_\_\_\_
- b) Name/status of the informer: \_\_\_\_\_

II. PRODUCTION

1. Progress made uptill now .

Year	Species	Quantity(No.)			Recipients(No.)
		Contr.	Total	Extra	

2. Who identified recipients to you ?

Project / FD: \_\_\_\_\_ Owner: \_\_\_\_\_ Both: \_\_\_\_\_  
Any Middleman : \_\_\_\_\_

3. Were any resources provided to you by the project?

Yes: \_\_\_\_\_ No: \_\_\_\_\_

If yes, then in which form :

i) Training : \_\_\_\_\_

a) Nursery raising : \_\_\_\_\_

b) Marketing : \_\_\_\_\_

c) Any other : \_\_\_\_\_

ii) Physical : \_\_\_\_\_

If yes, then:

Items: a) \_\_\_\_\_

b) \_\_\_\_\_

c) \_\_\_\_\_

d) \_\_\_\_\_

e) \_\_\_\_\_

If no, then farmer's investment was :

Items: a) \_\_\_\_\_

b) \_\_\_\_\_

c) \_\_\_\_\_

d) \_\_\_\_\_

e) \_\_\_\_\_

4. No. of persons required to raise a nursery :(Family members)

Adult| Male : \_\_\_\_\_ Female : \_\_\_\_\_

Children| Male: \_\_\_\_\_ Female : \_\_\_\_\_

5. Planting stock demanded in the area:

Species	Seedlings demanded(No.)	Recipients (No.)

III. SALE (In case private sale of nursery stock has been made):

1. Selling price of nursery stock:

Year	Species	Price/Plant (Rs.)	Barter	Quantity (No.)	Market

---

2. Does there exist any competition in sale :

Yes : \_\_\_\_\_ No: \_\_\_\_\_

If yes then from whom :

FD: \_\_\_\_\_

Other private nurseries (No.): \_\_\_\_\_

IV. CONSTRAINTS

1. Are you presently raising the nursery on your own ?

Yes : \_\_\_\_\_ No: \_\_\_\_\_

If not, why ?

---

2. Should FD stop raising nurseries and provide its demand to you ? Yes: \_\_\_\_\_ No: \_\_\_\_\_

If yes, would you be able to meet their target in allotted time? Yes: \_\_\_\_\_ No: \_\_\_\_\_

3. Under what conditions you would be willing to work with FD in raising of nurseries?

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4. What criteria were considered by FD/Project before making payment for your available nursery stock?

i) \_\_\_\_\_

ii) \_\_\_\_\_

iii) \_\_\_\_\_

iv) \_\_\_\_\_

5. Did you face any problem in raising and distribution of nursery stock?

Yes : \_\_\_\_\_ No: \_\_\_\_\_

If yes, list:i) \_\_\_\_\_

ii) \_\_\_\_\_

iii) \_\_\_\_\_

6. What do you think should be the size of the nursery and why? \_\_\_\_\_

7.If an identical project is started in near future what suggestions you would like to give?

\_\_\_\_\_

\_\_\_\_\_

8.Any comments:

**Appendix No. 2**  
**FOREST OFFICER INTERVIEW PROFORMA**

1. Officer's name : \_\_\_\_\_

2. What problems were/are faced by farmers in this project?

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

3. Can you list any problems faced by you in project implementation. How can these be solved?

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

4. Any comments:

EVALUATOR'S COMMENTS

**Appendix No. 3**  
**ABBREVIATIONS**

FD	Forest Department.
FECT	Fuel Efficient Cooking Technology.
FP&D	Forestry Planning and Development.
GTZ	German Agency for Technical Cooperation.
NGO	Non-government Organization.
SRSC	Sarhad Rural Support Corporation.
UNHCR	United Nations High Commission for Refugees.
NWFP	North West Frontier Province.