FORESTRY PLANNING & DEVELOPMENT PROJECT
Government of Pakistan-USAID

REPORT #2

HOUSEHOLD-LEVEL FACTORS AFFECTING INTEREST IN PLANTING TREES AND OPERATING NURSERIES: THE NWFP.

Michael R. Dove

Office of the Inspector General of Forests
&
Winrock International Technical Assistance Team

Islamabad
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Distribution List:

Inspector General of Forests
Deputy Inspectors General of Forests
Secretary of Forests, NWFP
Chief Conservator of Forests, NWFP
Project Director, NWFP
Project Director, PFI
Project Officer, USAID
Winrock International Islamabad/Arlington

SUMMARY

I. INTEREST IN PLANTING TREES

1. Determinants:

(i) 69% of the farm households interviewed expressed interest in planting trees under the FP&D project.

(ii) Interest in planting trees is higher among farmers with mixed barani and irrigated lands, larger landholdings, and some 'wastelands', whose lands are farmed by sharecroppers or tenants. Interest is lower among the sharecroppers and tenants themselves.

(iii) Interest in no higher among more educated farmers.

(iv) Because of their numerical predominance, the greatest potential for the project, in terms of both people and acres, lies with the smaller, poorer, farmers.

2. Provincial Targets:

Farmer interest will suffice to meet the NWFP's PC-1 planting target of 3,000,000 trees for 1987-1988, and 18,500,000 trees for 1988-1991 (assuming that all project guidelines are followed).

II. NUMBER OF PLANTS REQUESTED PER HOUSEHOLD

(i) 85% of households request fewer than 1,000 seedlings for their first planting, with the average being 575.

(ii) Larger numbers of seedlings are requested by farmers with irrigated landholdings. Size of landholdings is irrelevant.

III. FARMERS' SPECIES PREFERENCES

(i) The 7 tree species most requested by farmers are lachi 'Eucalyptus spp.', shewa 'Dalbergia sissoo', kikar 'Acacia nilotica', toot 'Morus alba', supedar 'Populus spp.', palosa 'Acacia modesta', and dhrake 'Melia azedarach'.

(ii) With the exception of lachi and shewa, there is considerable inter-district variation in species preferences.

IV. INTEREST IN ESTABLISHING NURSERIES

(i) 9.5% of farm households are interested in establishing private project nurseries.

(ii) Interest is marginally associated with irrigated holdings, but not with larger holdings or higher education.

(iii) This interest will suffice to meet the NWFP's PC-1 target of 72 nurseries for 1987-1988, and 444 for 1988-1991 (assuming that all project guidelines are followed)

V. DATA COLLECTION BY PROVINCIAL PROJECT STAFF

The data base used for project planning can be enlarged, and its reliability enhanced, through the collection of data by project field staffs. A form for this purpose is appended.

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I. INTEREST IN PLANTING TREES

1. Determinants

68.7 % of the farm households in the sample are interested in planting trees. Interest varies according to the following factors.

i. Source of Water for Agriculture:

There is an association between the availability of water (other than rainwater) for agriculture and interest in planting trees:

		Household's Water Source	
		Completely Barani	Some/All Irrigated
Household is Interested in Planting Trees:	No	53 hh	29 hh
	Yes	63 hh	96 hh

n = 241 households (hh).
$X^2 = 13.5$.
$P < .001$.

This association can be restated as follows:

Household's Water Source:	% Interested in Planting Trees
Completely barani:	54% of all households
Partially/wholly irrigated:	77% of all households

Among the household's with irrigated lands, interest varies somewhat according to whether their lands are partially or completely irrigated, with the former being most interested:

Extent of Irrigation:	% Interested in Planting Trees
Mixed barani/irrigated	90% of all households
Completely irrigated	71% of all households

Despite the lower degree of interest among the households with only barani lands, their preponderance in the project areas means that they still comprise a sizeable minority of all interested households:

Interested Households:	40% have completely barani lands 23% have mixed barani/irrigated lands 38% have completely irrigated lands
Uninterested Households:	65% have completely barani lands 5% have mixed barani/irrigated lands 30% have completely irrigated lands

ii. Size of Land Holdings

There is also an association between the size of the households' landholdings and their interest in planting trees.

		Household's Landholdings (acres):					
		0	>0-5	6-10	11-20	21-30	>30
Household is Interested in Planting Trees:	No	18	27	17	16	2	3
	Yes	9	55.5	34.5	27	16	41

$n = 266$ farm households.

$X^2_c = 28.4.$

$P < .001$

These findings can be restated as follows:

Household's Landholdings:	% of Households Interested in Planting Trees:	% of Households Not Interested:
0 acres	33%	67%
>0 < 5 acres	67%	33%
6 -10 acres	67%	33%
11 -20 acres	63%	37%
20 -30 acres	89%	11%
>30 acres	93%	7%
Average interested household: 24.2 acres (3.5 parcels) Average uninterested household: 7.1 acres (2.4 parcels)		

In short, interest in planting trees increases as landholdings increase. However, even among the smallest landowners, a <u>majority</u> (67%) are interested in planting trees (and even among the landless there is, at 33%, still significant interest). Moreover, since the small landowners greatly

outnumber the large ones, it is the former that ultimately present the greatest opportunity for project development, when measured in terms of households. When measured in terms of acres, the opportunity presented by the small landowners is somewhat less than that presented by the large ones.

Household's Landholdings	Total households in NWFP *	% Interested in Planting Trees	Total Households Potentially Interested
< 50 Acres	85,649 hh	66% hh	56,528 hh
> 50 acres	7,021 hh	92% hh	6,459 hh

* As of 1980 Census of Agriculture in Kohat (including Karak) & D.I. Khan.

Household's Landholdings	Total Acres in NWFP *	% Households Interested in Planting Trees	Total Acres Potentially Available
< 50 Acres	782,919 acres	66% hh	516,727 acres
> 50 acres	802,026 acres	92% hh	737,864 acres

* As of 1980 Census of Agriculture in Kohat (including Karak) & D.I. Khan.

iii. Land Use

Households owning some uncultivable lands (due to salinity or flooding, for example) have greater interest in planting trees than households whose lands are 100% cultivable:

		Household's Lands: All Cultivated	Some/All Barren
Household is Interested in Planting Trees:	No	57 hh	4 hh
	Yes	130 hh	29 hh

$n = 220$ households (hh).

$X^2_c = 3.92$.

$P < .05$.

This finding supports the project's original intention to

develop farm forestry on lands unsuited to food crop cultivation. Higher interest in planting trees also is found among households that let out some or all of their land on sharecropping or leasing arrangements:

		Some/All of Household's Land is Sharecropped or Leased by Others: No	Yes
Household is Interested in Planting Trees:	No	55 hh	8 hh
	Yes	119 hh	55 hh

n = 237 households (hh).
$X^2_c = 7.6$.
$P < .01$.

In contrast, the tenants and sharecropper households themselves (including those who own some land of their own, as well as those who are completely landless) have lower interest in planting trees than other households:

		Household Sharecrops or Leases Others' Lands: No	Yes
Household is Interested in Planting Trees:	No	46 hh	37 hh
	Yes	144 hh	39 hh

n = 266 households (hh).
$X^2 = 15.2$.
$P < .001$ (negative association).

Even among tenants and sharecroppers, however, the majority (51%) are still interested in planting trees: hence, this category of farmers should not be neglected in project outreach efforts.

These several relations between land use and interest in planting trees can be restated as follows:

Household's Lands:	% Interested in Planting Trees
Completely cultivated: vs Some/all Barren:	70% of all households vs 88% of all households
All land self-cultivated: vs Some/all shared/leased out:	68% of all households vs 87% of all households
Cultivate own land only: vs Sharecrop/lease others' land	76% of all households vs 51% of all households

iv. Education of Household Head

There is <u>no</u> statistically significant association between the level of education of the household head and interest in planting trees:

		Household Head's Education:				
		None 0	Prim. 1-5	Midd. 6-8	Matric 9-10	Interm 11-12+
Household is Interested in Planting Trees:	No	72	5.5	3.5	3	0
	Yes	132.5	21.5	18	9	3

$n = 268$ households.
$X^2 = 4.2$.
$P < .50$.

These findings can be restated as follows:

	Household Head's Education:				
	None	Prim.	Midd.	Matric	Int. +
% of Households Interested in Planting Trees:	65%	80%	84%	76%	100%

Thus, literacy is <u>not</u> a prerequisite to 'tree-mindedness'. In any case, the predominance of illiterate farmers in the population makes them the primary target for the project (almost 3/4 of all interested farmers are illiterate), a fact that must be incorporated into outreach strategies:

% of All Interested Households:	Education: None	Prim.	Midd.	Matric	Int. +
	72%	12%	10%	5%	1%

2. Provincial Targets

The data available on the size of the rural population and the extent of interest in planting trees indicate that demand is far in excess of the NWFP's 1987-1988 target of 3,000,000 trees planted (based on the PC-1 appendix 3, assuming a rate of 1,000 trees/acre):

Size of Rural Population *	% Interested in Planting Trees	No.Trees Asked Per Household	Total Demand for Trees
163,870 households	68.7% of all households	575 trees	64,732,746 trees

* As of the 1981 Population Census in the districts of Kohat (including Karak) and D.I. Khan

These data indicate that the 1987-1988 planting target can be easily met, assuming also the following:

(i) The farmers are not required to plant some minimum number of seedlings (for example, farmers requesting a few dozen or a few hundred seedlings are also served).
(ii) The farmers are not required to make block plantings (for example, scattered and linear plantings are also permitted).
(iii) The farmers are provided with the species that they want.
(iv) The farmers are provided with seedlings at the proper time of year, with respect both to the climate and their own work schedules (for example, not in the middle of the wheat harvest).
(v) The farmers are provided timely and accurate advice on planting and caring for the trees.
(vi) All project regulations, especially regarding the provision of free plants and advice, are strictly adhered to.

Assuming that the percentage of farmers interested in planting trees does not change, and that the number of plants requested per household also does not change, the present interest is more than sufficient to meet the NWFP's subsequent target for 1988-1991 of 18,500,000 trees (PC-1 appendix 3). In fact, the percentage of interested farmers is likely to increase, and many of the farmers that participate in the project are likely to request plants on more than one occa-

sion, so the actual future demand for plants is likely to be even more in excess of the target than indicated here.

II. NUMBERS OF PLANTS REQUESTED PER HOUSEHOLD

1. Pattern

i. Number of Plants Requested Per Species

The number of plants of each species requested by the average household is more or less of a constant, averaging 209 plants, for both popular and unpopular species alike. The number of plants requested does not increase as the overall popularity of the species increases (Rs =.01, P > .05).

Species	Rank Order of Popularity	Average Size of Request
lachi 'Eucalyptus spp.'	1st	266 plants
shisham/shewa 'D. sissoo'	2nd	180 "
kikar 'Acacia nilotica'	3rd	166 "
toot 'Morus alba'	4th	127 "
supedar 'Populus spp.'	5th	187 "
palosa 'Acacia modesta'	6th	215 "
dhrake/bakain 'Melia azedarach'	7th	125 "
sreen 'Albizia lebbeck'	8th	238 "
ber 'Zizyphus mauritania'	9th	200 "
sumbal 'Salmalia malabarica'	10th	99 "
peepal 'Ficus religiosa'	11th	260 "
ipil-ipil 'L.leucocephala'	11th	952 "
'any spp.'	11th	94 "

ii. Number of Plants Requested Per Household

The number of plants requested per household averages 575, with the following distribution:

Number of Plants Requested Per Household:	% of Households Requesting:
< 100 plants	31% of all households
100 - 999 "	54% "
1,000-2,000 "	8% "
> 2,000 "	7% "

2. Determinants

i. Source of Water for Agriculture

Access to a source of water for agriculture other than rain is associated with requests for larger numbers of trees:

		Household's Water Source	
		All Barani	Some/All Irrigated
Number of Trees Requested By Household	100	30 hh	20 hh
	100-999	30 hh	54 hh
	1000-2000	4 hh	11 hh
	>2000	2 hh	9 hh

n = 160 households (hh).

$X^2_c = 9.7.$

$P < .025.$

ii. Size of Landholdings

There is <u>no</u> statistical association between the size of the household's landholdings and the number of trees that it requests from the project:

		Household's Landholdings (acres):					
		0	>0-5	6-10	11-20	21-30	>30
Number of Trees Requested by Household:	< 100	2	16	14	8	3	6
	100-999	6	29.5	14.5	13	10	18
	1000-2000	0	3	3	2	0	7
	> 2000	0	0	1	2	2	6

n = 166 households.

$X^2_c = 15.3.$

$P < .50.$

That is, the larger farmers do not necessarily ask for more trees than the smaller farmers. Moreover, the larger farmers ask for fewer trees <u>per farm acre</u> than the smaller ones:

No. of Trees Requested ÷ No. of Acres Owned by Household	Household's Landholdings (acres): 0	>0-5	6-10	11-20	21-30	>30
	- -	106 tr/ac	54 tr/ac	46 tr/ac	27 tr/ac	15 tr/ac

The farmers with smaller holdings, therefore, tend to want to plant trees more intensively over their farms as a whole than do the farmers with larger holdings, which means that the overall economic and ecological impact of the project plantings will tend to be higher in the former case (on the smaller farms) than in the latter (on the larger farms).

III. SPECIES PREFERENCES

The species listed below are those that the farmers themselves have requested. The fact that the farmers requested them does not always mean that they are the optimal species from either biological or economic standpoints. (The abundant requests for eucalyptus are one example of a farmer preference that may be problematic, in areas where there the market for this wood is uncertain.) We also expect that the species preferences of farmers in the project areas will change as the project progresses and as new species and cultivation techniques are introduced to the farmers.

1. Overall Species Preferences

i. Preferences According to % of Households Requesting

Species	% of Households Requesting
lachi 'Eucalyptus spp.'	80 %
shisham/shewa 'D. sissoo'	51 %
kikar 'Acacia nilotica'	35 %
toot 'Morus alba'	27 %
supedar 'Populus spp.'	19 %
palosa 'Acacia modesta'	16 %
dhrake/bakain 'Melia azedarach'	13 %
sreen 'Albizia lebbeck'	9 %
ber 'Zizyphus mauritania'	5 %
sumbal 'Salmalia malabarica'	5 %
peepal 'Ficus religiosa'	4 %
ipil-ipil 'L.leucocephala'	4 %
'any spp.'	4 %

ii. Preferences According to % of Total Plants Requested

Species	% of Total Plants Requested
lachi 'Eucalyptus spp.'	37 %
shisham/shewa'D. sissoo'	16 %
kikar 'Acacia nilotica'	10 %
toot 'Morus alba'	6 %
supedar 'Populus spp.'	6 %
palosa 'Acacia modesta'	6 %
ipil-ipil 'L.leucocephala'	6 %
sreen 'Albizia lebbeck'	4 %
dhrake/bakain'Melia azedarach'	3 %
ber 'Zizyphus mauritania'	2 %
peepal 'Ficus religiosa'	2 %
sumbal 'Salmalia malabarica'	1 %
prasoo 'Prosopis juliflora'	1 %
'any spp.'	1 %

2. Species Preferences by District

i. Kohat:

Species	% of Total Plants Requested
lachi 'Eucalyptus spp.'	42 - 52 %
palosa 'Acacia modesta'	6 - 16 %
toot 'Morus alba'	3 - 13 %
dhrake/bakain'Melia azedarach'	2.5- 12.5 %
shisham/shewa'D. sissoo'	2.5- 12.5 %
ipil-ipil 'L.leucocephala'	1 - 11 %
supedar 'Populus spp.'	0 - 10 %
peepal 'Acacia modesta'	0 - 8 %
kikar 'Acacia nilotica'	0 - 4 %

ii. Karak:

Species	% of Total Plants Requested
lachi 'Eucalyptus spp.'	29 - 39 %
kikar 'Acacia nilotica'	23 - 33
shisham/shewa'D. sissoo'	7 - 17 %
supedar 'Populus spp.'	5 - 15 %
palosa 'Acacia modesta'	3 - 13 %
'any spp.'	0 - 6 %
peepal 'Ficus religiosa'	0 - 2 %

iii. D.I. Khan:

Species	% of Total Plants Requested
lachi 'Eucalyptus spp.'	24 - 34 %
shisham/shewa'D. sissoo'	19 - 29 %
kikar 'Acacia nilotica'	5 - 15 %
sreen 'Albizia lebbeck'	4 - 14 %
ipil-ipil 'L.leucocephala'	3 - 13 %
toot 'Morus alba'	1 - 11 %
supedar 'Populus spp.'	1 - 11 %
ber 'Zizyphus mauritania'	0 - 8 %
sumbal 'Salmalia malabarica'	0 - 4 %
prasoo 'Prosopis spp.'	0 - 4 %

IV. INTEREST IN ESTABLISHING NURSERIES

1. Determinants of Interest

9.5% of the farm households in the sample are interested in establishing project nurseries. Interest is marginally associated with access to sources of water for agriculture other than rain, but it is not associated with larger land-holdings or higher education (at least, these two variables do not distinguish the households that are interested in establishing nurseries from those that are interested in planting trees):

	Size of Landholding	% with some Irrigation	HH Head's Education
Households Interested in Establishing Nurseries	24.7 acres	67% of all hh	2.0 years
All Households Interested in Planting Trees	24.2 acres	60% of all hh	2.1 years
All Households	20.1 acres	52% of all hh	1.7 years

Accordingly, this province presents the project with a unique opportunity to involve in nursery establishment the truly average farmer, who is distinguished from his fellows by nothing more than ambition and willingness to experiment.

2. Provincial Nursery Targets

The data available on the size of the rural population and the extent of interest in establishing nurseries indicate

that demand is far in excess of the NWFP's PC-1 target for 1987-1988 of a minimum of 72 nurseries (calculated by taking the 1987-1988 planting target of 3,000,000 plants, adding 20% for replacement purposes, and dividing by the maximum nursery size of 50,000 plants):

Size of Rural Population *	% Interested in Establishing Nurseries	Total Interest in Nurseries
163,870 households	9.5% of all households	15,568 households

* As of the 1981 Population Census in the districts of Kohat (including Karak) and D.I. Khan.

These data indicate that the 1987-1988 nursery target can be easily met, assuming also the following:

(i) Nursery operators are provided timely and accurate technical assistance and guidance.
(ii) No agreements to establish nurseries are made and then broken with farmers, and there are no delays in purchasing their plants when they are mature: either circumstance would result in bad publicity for the nursery program and could appreciably lower farmer interest in establishing nurseries.

Assuming that the percentage of farmers interested in establishing nurseries does not change (and in fact it is very likely to increase, based on the demonstration effects of successful nurseries), the interest will also be more than sufficient to meet the NWFP's remaining PC-1 target for 1988-1991 of a minimum of 444 nurseries (derived from the planting target of 18,500 acres/18,500,000 trees, to which 20% is added for replacement purposes, divided by 50,000 plants/-nursery).

V. SAMPLING

1. Sample

This study is based on interviews with 280 farm households in 15 villages. This sample was carefully selected from a larger sample of 32 villages, containing approximately 10,000 households, and over 70,000 people.

2. Relevance for Nursery and Planting Targets

The fact that the figures on farmer interest in establishing nurseries and planting trees exceed targets by factors of tens or even hundreds makes any sampling error in these particular figures irrelevant.

3. Relevance for Species Preferences

Since these data are aggregated at the district as opposed to provincial level, the sampling error is accordingly higher. This is dealt with, in part, by presenting ranges of variation for each species.

4. Data Collection by Provincial Field Staff

The problem of sampling error can be further reduced through the enlargement of the sample by the regular project field staff, using the attached pro-forma.

The key to the use of this pro-forma is to select a random sample. The beat forester can do this by addressing the village men following evening prayers at the village mosque, for example, and asking who is interested in receiving seedlings for planting. The forester can then administer the pro-forma to everyone who replies in the affirmative. This should take no more than 3-5 minutes per person.

PROSPECTIVE PROJECT PARTICIPANT PRO-FORMA

Sheet # _____
Village Name: _____ Tehsil Name: _____
Project Officer Name: _____ Date: _____

1. Name: _____
   Father's Name: _____
   Acreage: _____
   Water Source: barani___well___tubewell___canal___floody___
   Trees desired: sp._____no.____sp._____no.__
   sp._____no.____sp._____no.____sp._____no.__
   Desired use of trees: fuel___ fodder___ timber___ market__
   Other _____
   Desired planting pattern: scattered___linear___block___

2. Name: _____
   Father's Name: _____
   Acreage: _____
   Water Source: barani___well___tubewell___canal___floody___
   Trees desired: sp._____no.____sp._____no.__
   sp._____no.____sp._____no.____sp._____no.__
   Desired use of trees: fuel___ fodder___ timber___ market__
   Other _____
   Desired planting pattern: scattered___linear___block___

3. Name: _____
   Father's Name: _____
   Acreage: _____
   Water Source: barani___well___tubewell___canal___floody___
   Trees desired: sp._____no.____sp._____no.__
   sp._____no.____sp._____no.____sp._____no.__
   Desired use of trees: fuel___ fodder___ timber___ market__
   Other _____
   Desired planting pattern: scattered___linear___block___

4. Name: _____
   Father's Name: _____
   Acreage: _____
   Water Source: barani___well___tubewell___canal___floody___
   Trees desired: sp._____no.____sp._____no.__
   sp._____no.____sp._____no.____sp._____no.__
   Desired use of trees: fuel___ fodder___ timber___ market__
   Other _____
   Desired planting pattern: scattered___linear___block___

5. Name: _____
   Father's Name: _____
   Acreage: _____
   Water Source: barani___well___tubewell___canal___floody___
   Trees desired: sp._____no.____sp._____no.__
   sp._____no.____sp._____no.____sp._____no.__
   Desired use of trees: fuel___ fodder___ timber___ market__
   Other _____
   Desired planting pattern: scattered___linear___block___

FORESTRY PLANNING AND DEVELOPMENT PROJECT

Government of Pakistan-USAID

Project Reports

REPORT #1 Household-level Factors Affecting Interest in Planting Trees and Operating Nurseries: The Punjab. By Michael R. Dove, 6 May 1987.

REPORT #2 Household-level Factors Affecting Interest in Planting Trees and Operating Nurseries: The NWFP. By Michael R. Dove, 6 June 1987.