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FORESTRY PLANNING & DEVELOPMENT PROJECT
Government of Pakistan-USAID

REPORT #8

THE FUELWOOD SUPPLY AND DEMAND IN RURAL HOUSEHOLDS:
THE PUNJAB, NWFP, BALUCHISTAN.

By

Michael R. Dove, Nasrullah Khan Aziz, Jamil A. Qureshi

With the assistance of Zafar Iqbal Marwat & Umar Farooq Marwat

Office of the Inspector General of Forests

Islamabad
31 December 1988



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THE PUNJAB, NWFP, BALUCHISTAN.

Distribution List:

Inspector General of Forests
Deputy Inspectors General of Forests (4)
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Chief Conservators of Forests: NWFP, Punjab (Lahore, Multan,
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Rural Sociology & Extension.
Project Officer, U.S.AID
Project DFO's (9)
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SUMMARY

I. COLLECTION OF FUELWOOD

1. Seasonal & Spatial Pattern

- A. 70% of the farmers surveyed gather fuelwood regularly, 23 % gather it on a seasonal basis, and 7% do not gather it at all.
- B. Most fuelwood is gathered from the farmer's own land.

2. Difficulty

- A. 66% of the farmers surveyed find it difficult to gather fuelwood.
- B. The difficulty is greatest among farmers with medium-sized holdings, among tenants and self-cultivators, and among farmers with completely irrigated lands.

II. PURCHASE/SALE OF FUEL

1. Purchase of Fuelwood

- A. 32% of the farmers surveyed regularly purchase fuelwood.
- B. The most frequent purchasers are farmers that are self-cultivators, and that have small holdings.
- C. The species most commonly purchased is 'Acacia nilotica'.
- D. Prices average Rs.25/maund (37.3 kg.) as of 1987, but vary from Rs.12 to Rs.40 per maund.
- E. The poorest farmers pay as much as 20% more for fuelwood than the wealthiest farmers.

2. Sale of Fuelwood

- A. Only 7% of the farmers surveyed have ever sold fuelwood.
- B. The most frequent sellers are farmers that are landlords, and that have large holdings.
- C. Fuelwood is variously sold to itinerant contractors, other farmers, brick factories, and in bazars.

III. FUELWOOD SPECIES PREFERENCES

The species that farmers most prefer for fuelwood is 'Acacia nilotica'; 'Acacia modesta' is the second preference.

IV. ANALYSIS OF FUELWOOD SUPPLY

1. Adequacy of Supply

- A. 41% of the farmers interviewed say that their supply of fuelwood is inadequate.
- B. The farmers with the most inadequate supplies are those that are self-cultivators, that have small holdings, and that have partially or completely irrigated lands.

2. Proposed Use of FP&D Project Trees

- A. Among farmers wanting to grow trees with FP&D Project assistance, fuel is the major uses proposed (by 91%) for the trees, followed by timber use, and then market sales.
- B. Interest in growing trees for use as fuel is high among all types of farmers, without regard for size of farm, tenurial status, or irrigation.
- C. In addition to use as fuel, 81% of farmers are interested in one or more other uses for these trees.
- D. The farmers with the least interest in multiple uses are tenants and farmers with small holdings.

V. SUMMARY AND RECOMMENDATIONS

1. The Fuelwood Shortage and The FP&D Project

Given the evidence of widespread fuelwood shortages in this survey, the focus of the FP&D project should continue to be on the country's fuelwood shortage.

2. The Use of Trees Planted under the Project

- A. Since 91% of the farmers surveyed express interest in planting trees for use as fuel, the 'accepted wisdom' that farmers will not plant trees for fuel can be disregarded.
- B. Since most farmers are interested in planting trees for one or more other purposes in addition to fuel, the project should continue to emphasize multi-purpose trees.
- C. Since the knowledge of multi-purpose trees is least among those that need them most, tenants and small farmers, this knowledge should be a focus of extension efforts among these two groups.

3. Species of Trees Planted

- A. Since 'Acacia nilotica' and 'Acacia modesta' are the overwhelming choice as fuelwood among farmers (and since fuel is the major tree use desired by farmers), these two species should be emphasized in project plantings.
- B. In view of the comparatively slower growth rates of these indigenous trees, however, the project should also encourage farmers to plant faster growing exotic species, concentrating these efforts on areas where the traditionally preferred 'Acacias' are scarce.

4. Target Households

- A. The farmers that most need project assistance with their fuelwood supplies are those that are tenants or self-cultivators, that have small to medium-sized holdings, and that have completely irrigated lands.
- B. The project should de-emphasize fuel uses in favor of other uses of trees when working with landlords, farmers with larger holdings, and farmers with partially or completely rainfed lands.

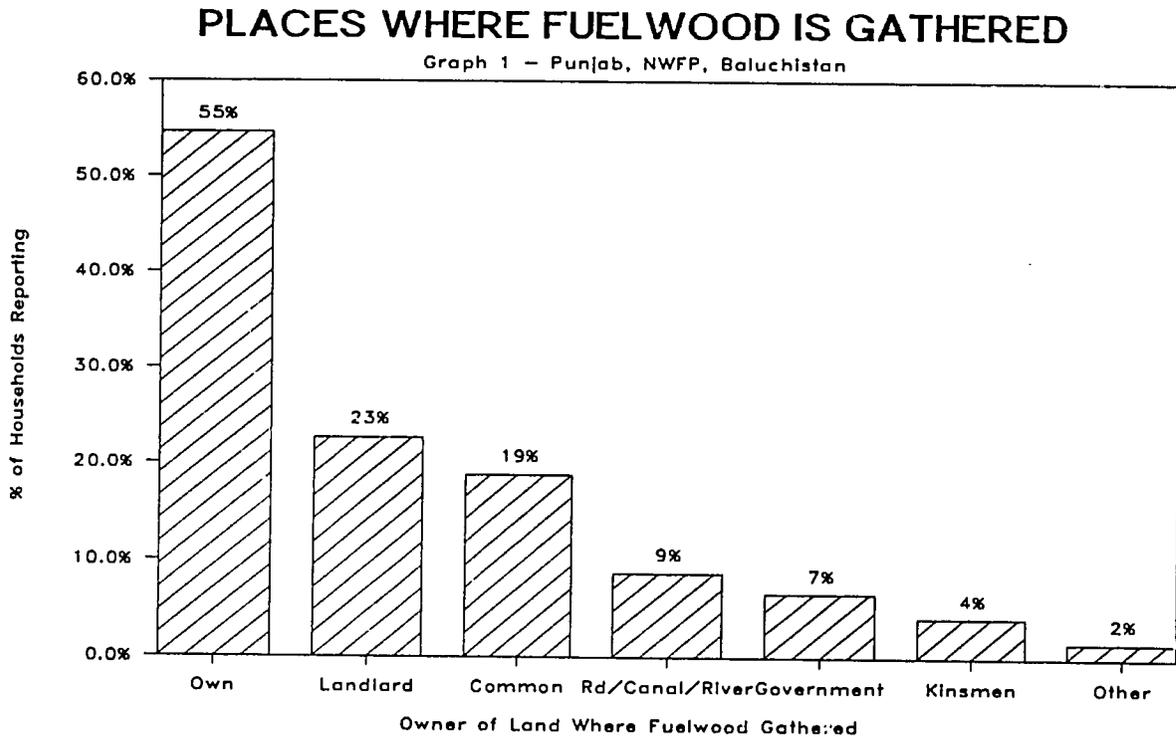
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I. COLLECTION OF FUELWOOD

1. Seasonal & Spatial Pattern

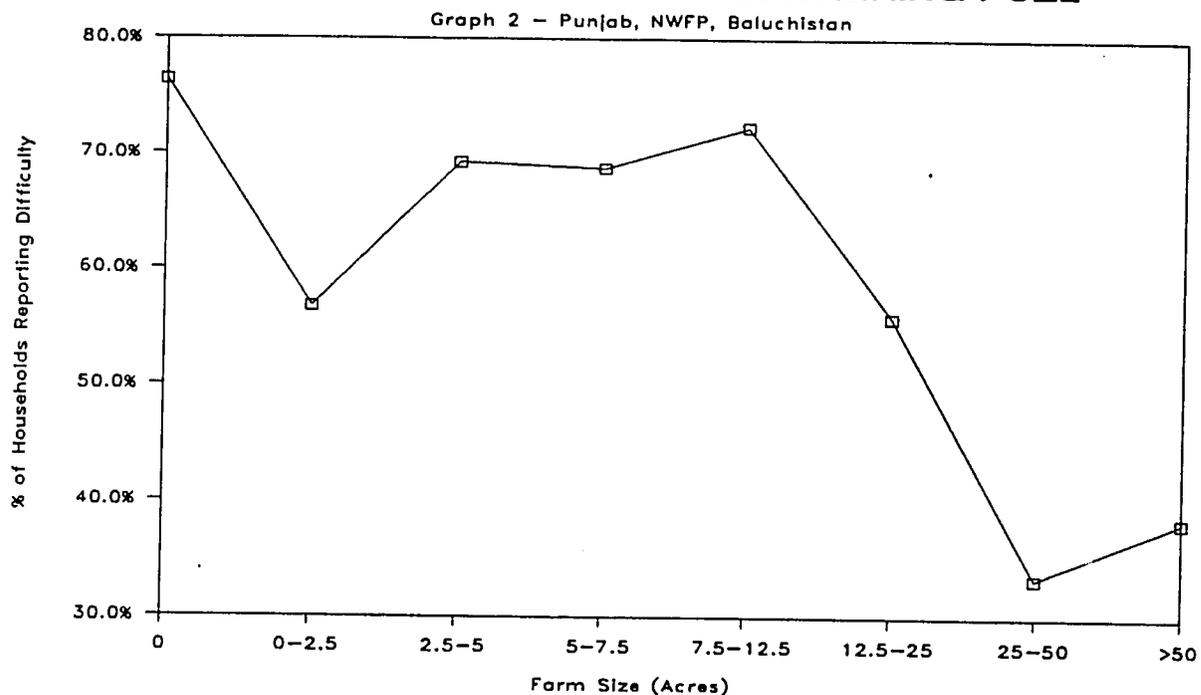
Among farmers interviewed for this study, 70 % gather fuelwood regularly throughout the year, 23 % gather it seasonally (once or twice a year), and the remaining 7 percent do not gather fuelwood at all (but exclusively purchase wood or other fuels).¹ Most fuelwood is gathered from the farmer's own land:²



2. Difficulty

Among farmers who gather fuelwood, 66 percent say that it is difficult to do so. The difficulty is greater among farmers with smaller farms and (usually in consequence) fewer trees:³

FARM SIZE & DIFFICULTY GATHERING FUEL



The difficulty of gathering fuelwood is also greater among farmers with completely irrigated farms, on which there tend to be fewer trees because there is less uncultivated land:

% Households Reporting Difficulty Gathering Fuelwood:	Source of Water for Farm:		
	Rainfed	Mixed	Irrigated
	63%	46%	73%

Difficulties are equally great among tenants and self-cultivators:

% Households Reporting Difficulty Gathering Fuelwood:	Tenurial Status:		Self-Cultivator
	Landlord	Tenant	
	20%	69%	68%

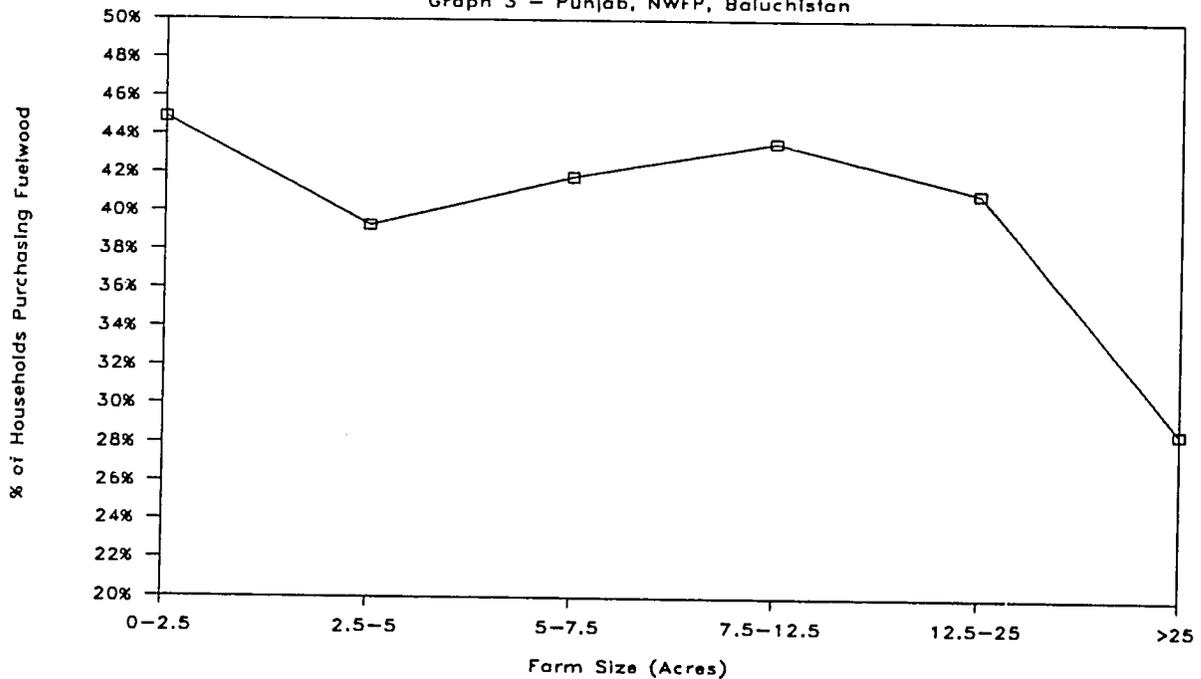
II. PURCHASE & SALE OF FUELWOOD

1. Purchase of Fuelwood

Of all farmers interviewed, 32% regularly purchase wood for use as fuel.⁴ Firewood is often purchased because it is too difficult to gather. Hence, farmers with smaller farms - who find it most difficult to gather wood - are most likely to purchase it:⁵

FARM SIZE & PURCHASING FUELWOOD

Graph 3 - Punjab, NWFP, Baluchistan



Despite their difficulty in gathering wood, tenants farmers - because of their poor economic circumstances - are least likely to purchase it:

% Households That Purchase Fuelwood:	Tenurial Status:		
	Landlord	Tenant	Self-cultivator
	33%	9%	47%

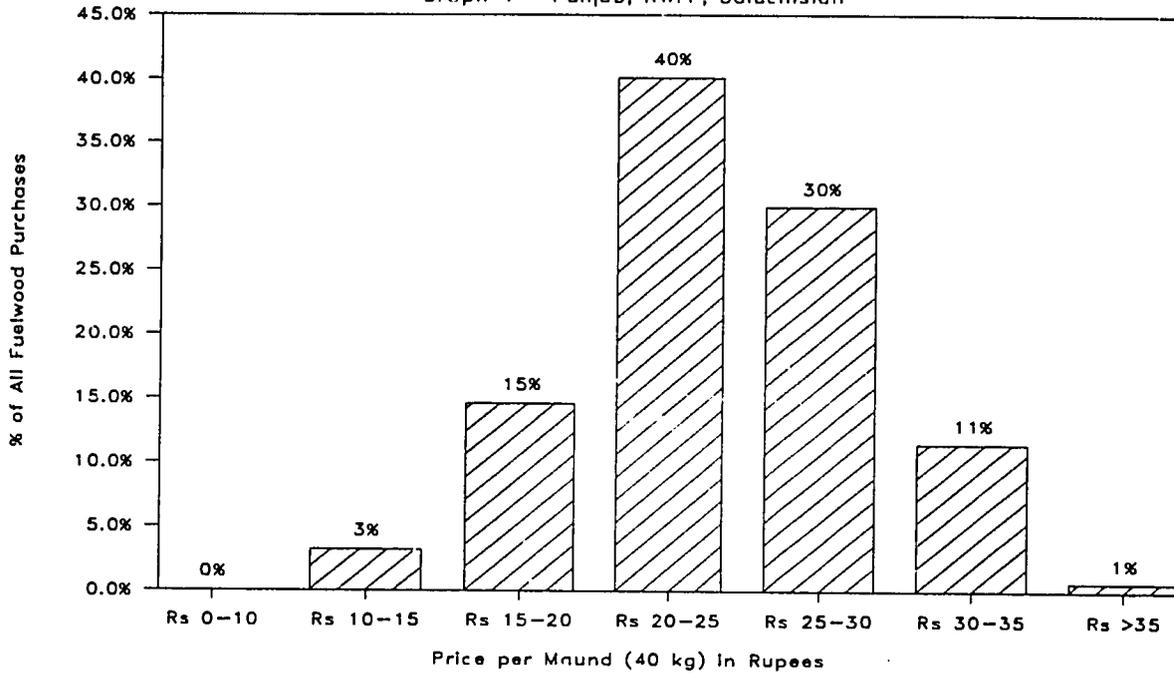
Most fuelwood is bought from bazars or taal:

% Purchases:	Where Fuelwood is Purchased:		
	Bazar	Itinerant Sellers	Other Farmers
	72.5%	16.5%	11%

The species purchased for use as fuel in 80 % of all cases is kikar 'Acacia nilotica'. The price paid per maund/37.3 kg averages (as of 1987) Rs. 25, but the range of variation is considerable:

PRICES PAID FOR FUELWOOD (1987)

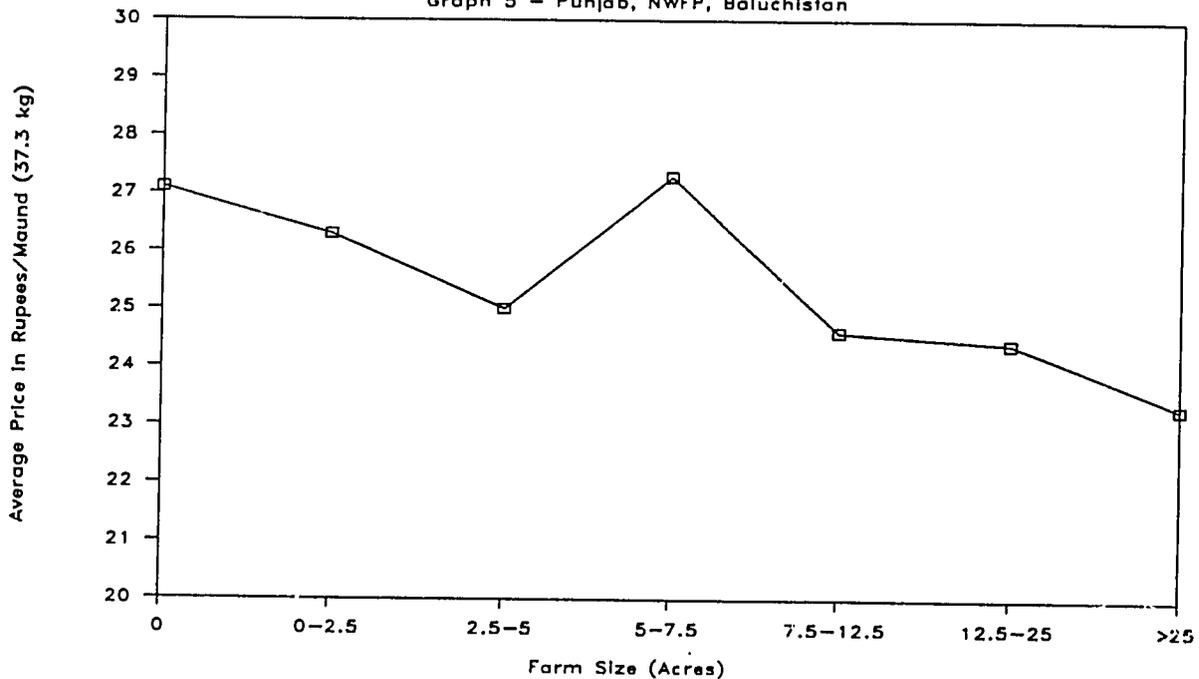
Graph 4 - Punjab, NWFP, Baluchistan



The farmers with more land and more resources pay less for fuelwood than farmers with less land and resources, because they are able to buy in larger quantities, at more opportune times, in cheaper markets:⁶

FARM SIZE & PRICE PAID FOR FUELWOOD

Graph 5 - Punjab, NWFP, Baluchistan

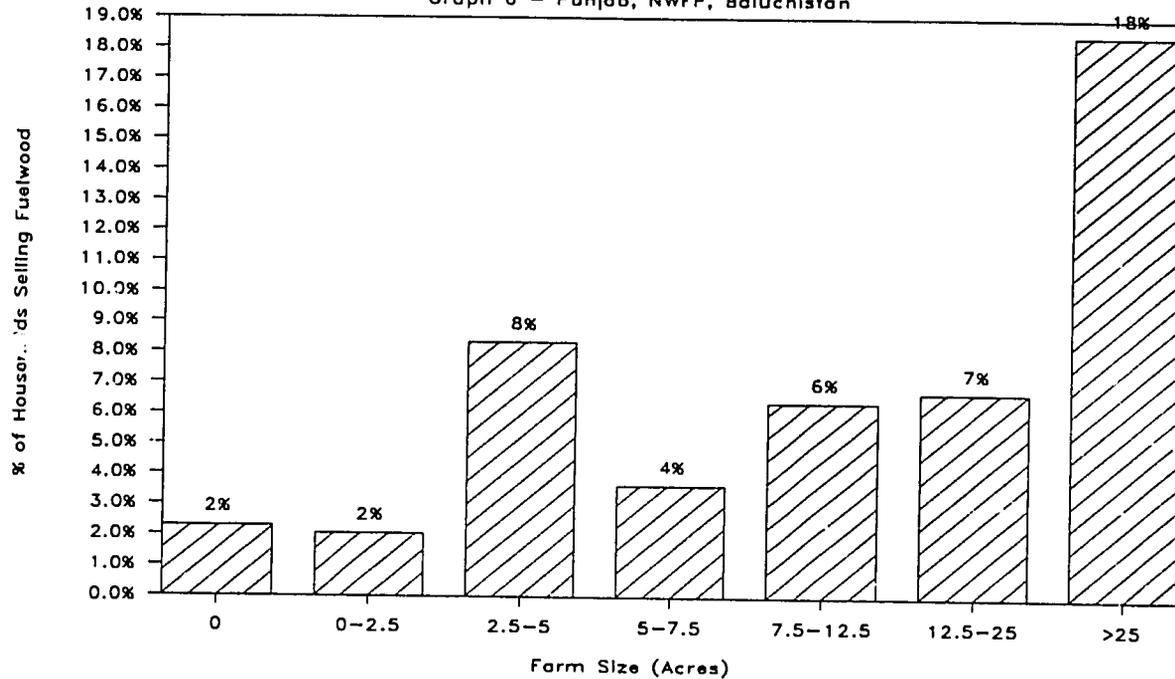


2. Sale of Fuelwood

Just 7 percent of the farmers interviewed had ever sold fuelwood. Those who experience the least difficulty in gathering - the farmers with larger holdings - are also the most likely to sell it:

FARM SIZE & SELLING OF FUELWOOD

Graph 6 - Punjab, NWFP, Baluchistan



Landlords are also significantly more likely to have sold fuelwood than self-cultivators or tenants:

% of Households That Sell Fuelwood:	Tenorial Status:		
	Landlord	Tenant	Self-cultivator
	16%	3%	8%

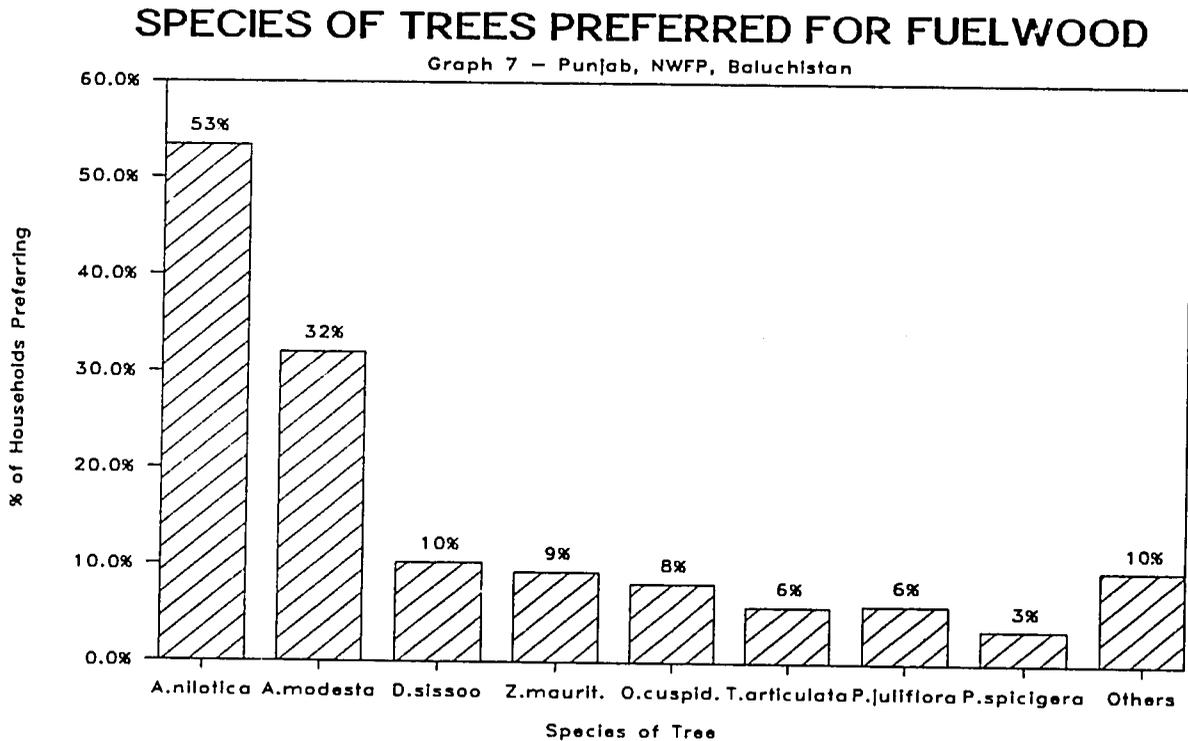
Farmers sell their wood to a variety of buyers:

% Sales:	Where Fuelwood is Sold:			
	Itinerant Contractor	Other Farmer	Brickworks	Bazar
	34%	27%	22%	17%

The species most often sold (in 85% of cases) is kikar 'Acacia nilotica'. The average price obtained is Rs.12 per maund (37.3 kg), or less than one-half of the average resale price in the bazar.

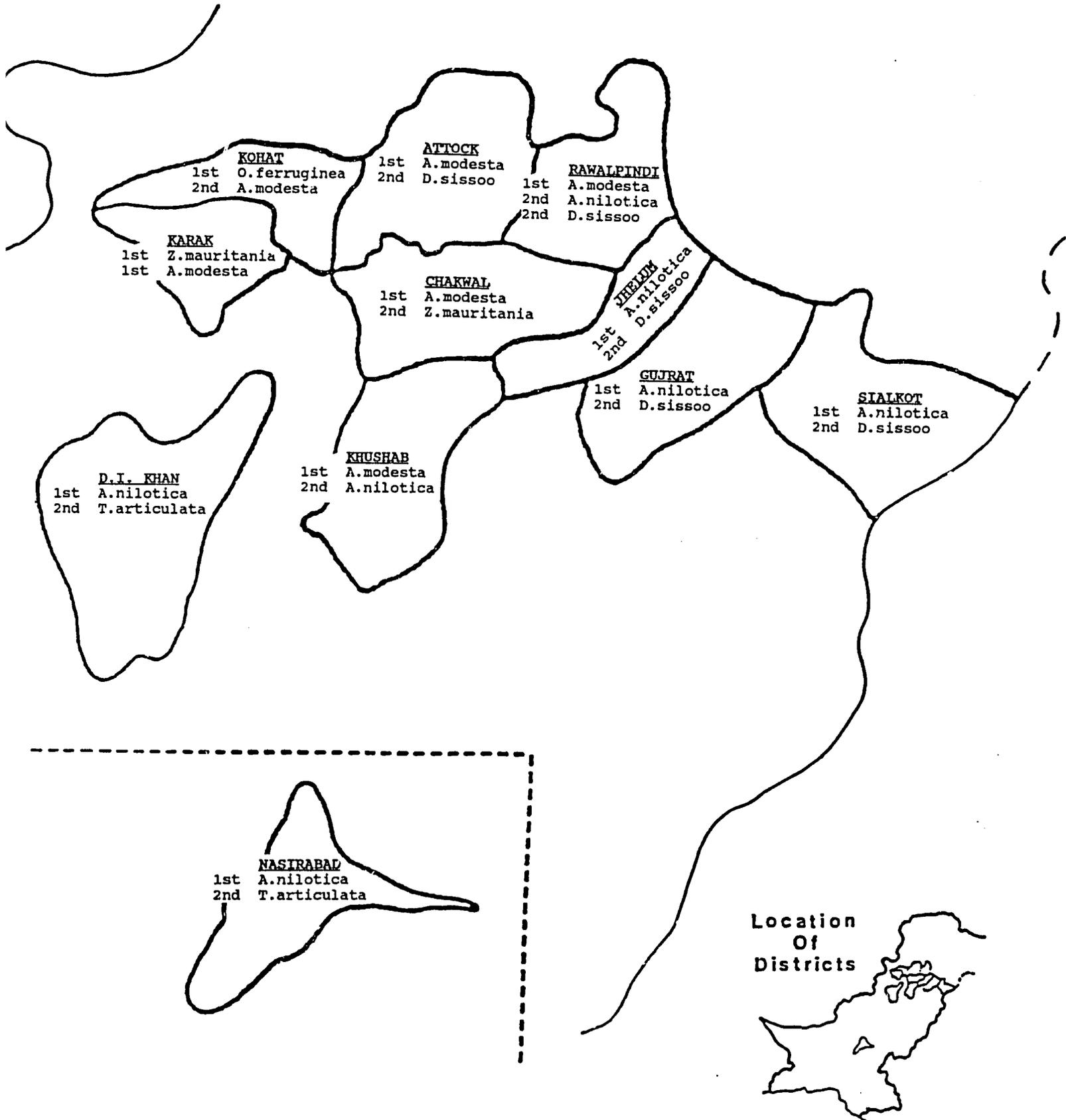
III. FUELWOOD SPECIES PREFERENCES

The species that farmers prefer above all others for use in cooking is - as the data on purchases and sales suggest - kikar 'Acacia nilotica', with phulai/palosa 'Acacia modesta' being a strong second preference:



These species are preferred both because their wood has good character (burning easily and with high heat) and because they are readily available. Hence, 'Acacia nilotica' is preferred in the southern and eastern project districts, while the more cold-tolerant 'Acacia modesta' is preferred in the northern and eastern districts (Map #1):

Map #1 - Fuelwood Species Preferences by District



IV. ANALYSIS OF FUELWOOD SUPPLY

1. Adequacy of Supply

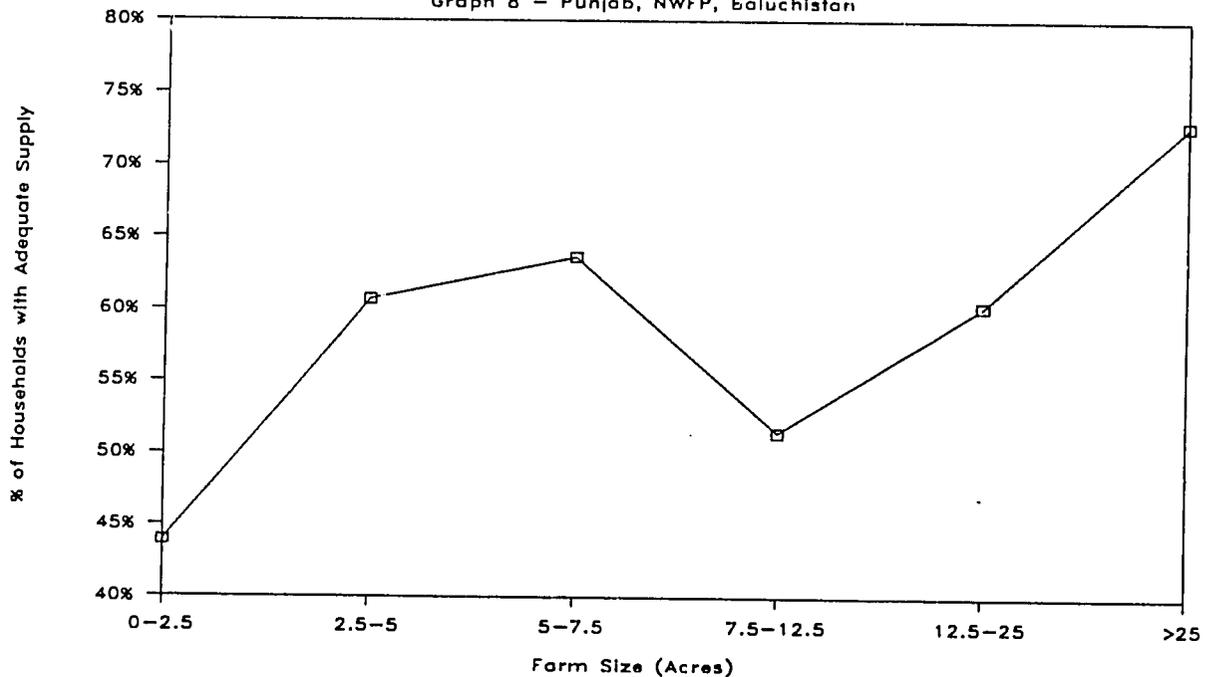
Among the farmers interviewed, 41% say that their present supply of fuelwood is not adequate. The main reason given for this inadequacy is lack of trees:

% of Households Reporting:	Reasons for Inadequate Supply of Fuelwood:				
	Lack of Trees	Restrictions on Trees' Use	Cost of Trees	Lack of Labor	Lack of Land
	100%	6%	5%	4%	2%

Farmers with large holdings are more likely to report adequate fuelwood supplies than farmers with small holdings, but even among the largest farmers (having over 25 acres) a significant minority (27%) report that their supplies are not adequate:⁹

FARM SIZE & ADEQUACY OF FUELWOOD SUPPLY

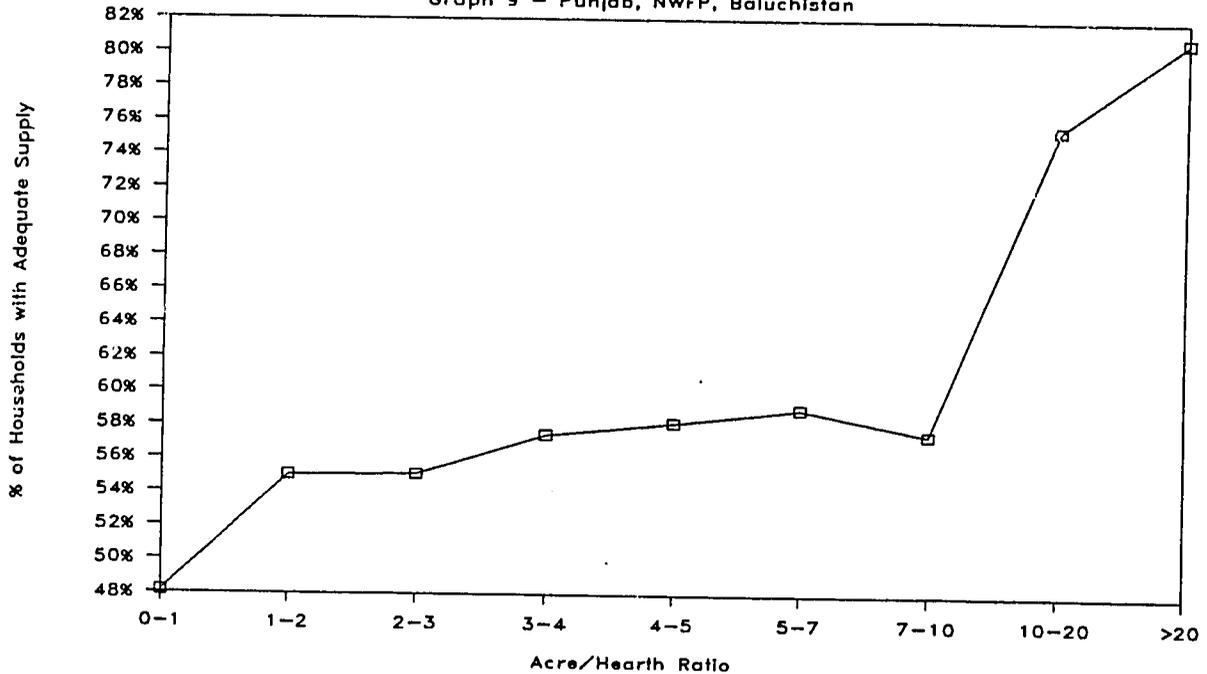
Graph 8 - Punjab, NWFP, Baluchistan



In addition to looking at acres per household, another way of assessing adequacy of fuel supply is to look at the number of acres per hearth (or oven) in the household. This shows a clear cut-off point at 10 acres per hearth: this suggests that the average household will have adequate supplies of fuel only if it has more than 10 acres of land for each of its hearths:¹⁰

ACRE/HEARTH RATIO & ADEQUACY OF SUPPLY

Graph 9 - Punjab, NWFP, Baluchistan



Landlords and their tenants are both more likely to report adequate supplies of fuelwood than self-cultivators, which in the tenants' case is due to the fact that they often receive fuel from their landlords, as well as to their greater willingness to burn dung (see Report #6, pp.6-7):

% of Households that Report Adequate Fuelwood Supply:	Tenorial Status:		
	Landlord	Tenant	Self-cultivator
	72%	65%	53%

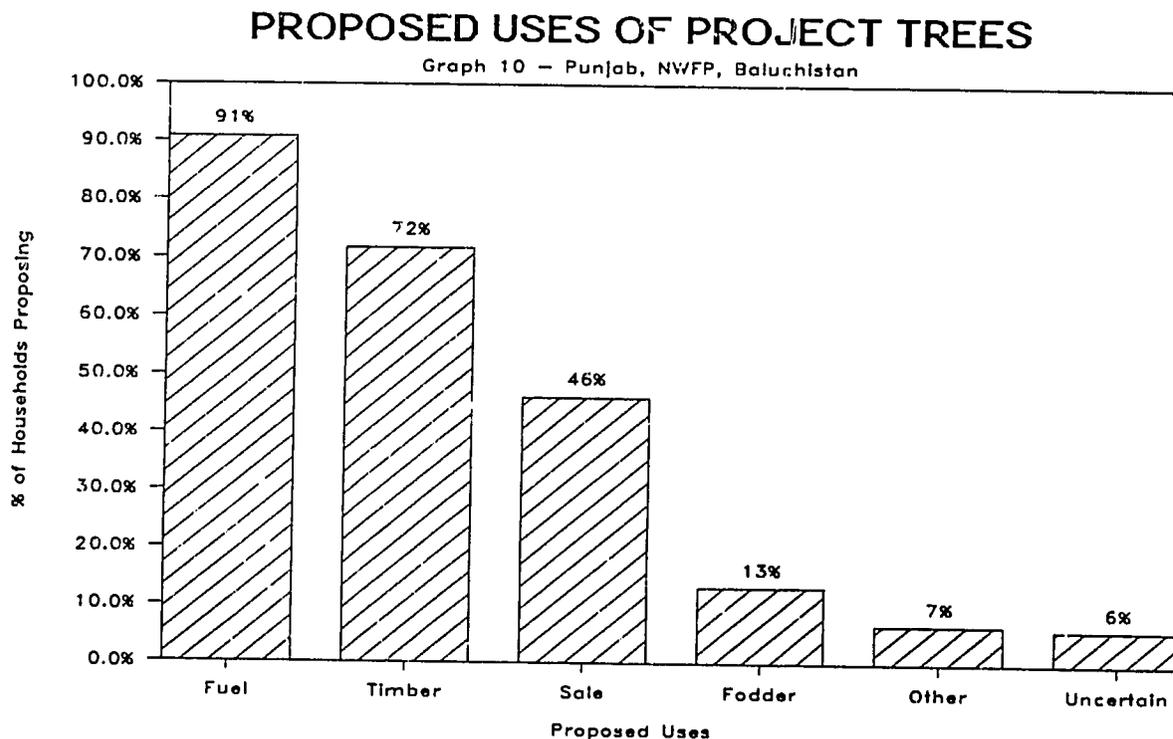
Farmers with completely rainfed lands - because they are more likely to have some uncultivated lands used as natural woodlots - are more likely to report adequate supplies than farmers with partially or completely irrigated lands:¹¹

% of Households that Report Adequate Fuelwood Supply:	Source of Water for Farm:		
	Rainfed	Mixed	Irrigated
	66%	51%	56%

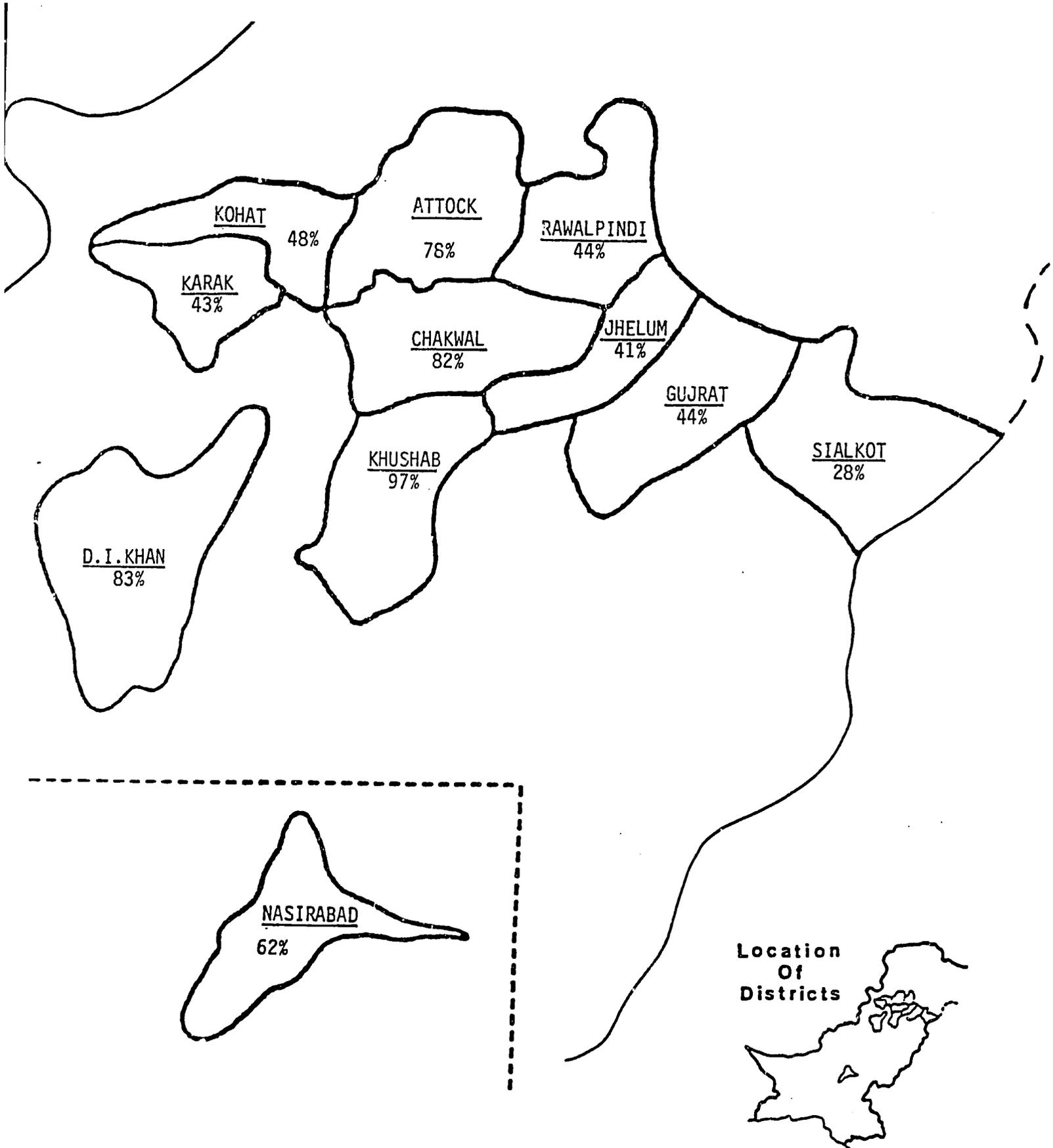
Comparing rainfed and irrigated lands on a regional basis (see Map #2, p.11), supplies are low in the more irrigated, intensively cultivated districts of the eastern Punjab, and they are high in the drier, less intensively cultivated districts of the West. (Across the Indus river in the NWFP, supplies are low where pressure from the refugee camps is high.)

2. Proposed Use of FP&D Project Trees

Fuel is the number one use that farmers propose for trees that they would grow under the FP&D project:¹²



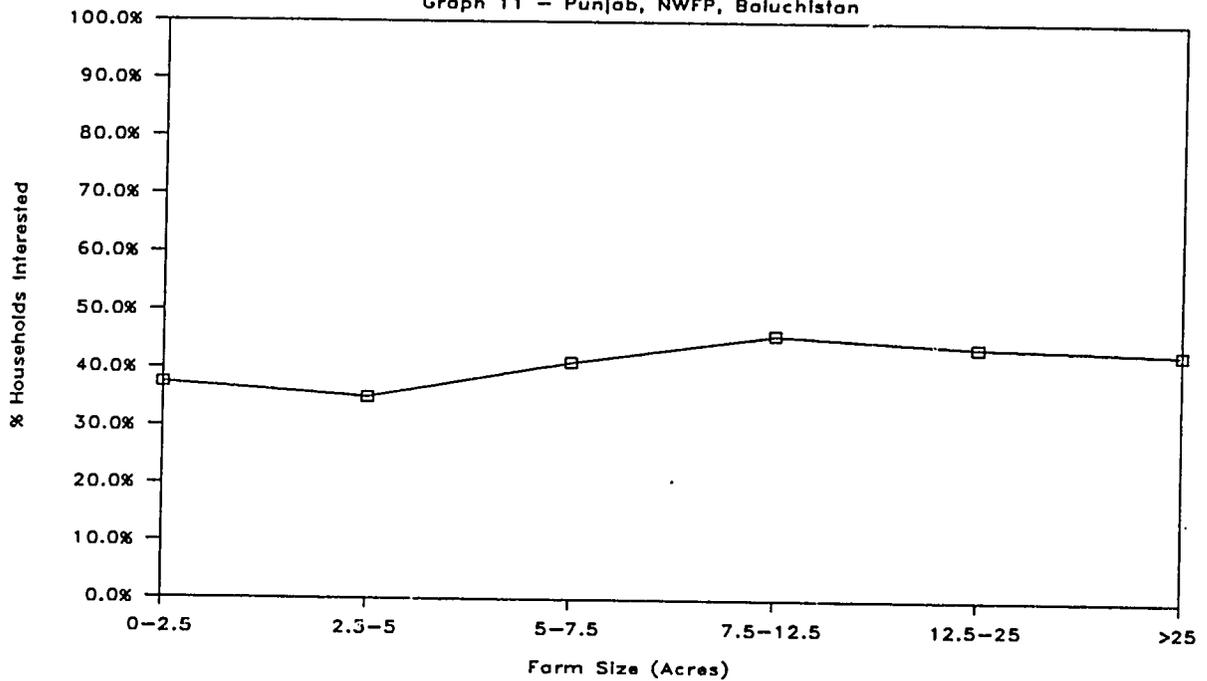
Map #2 -- Adequacy of Fuelwood Supply by District



Interest in growing trees for use as fuel is universally high. It is not statistically associated with differences in farm size (or tenure, or irrigation):¹³

FARM SIZE & INTEREST IN FUEL TREES

Graph 11 - Punjab, NWFP, Baluchistan



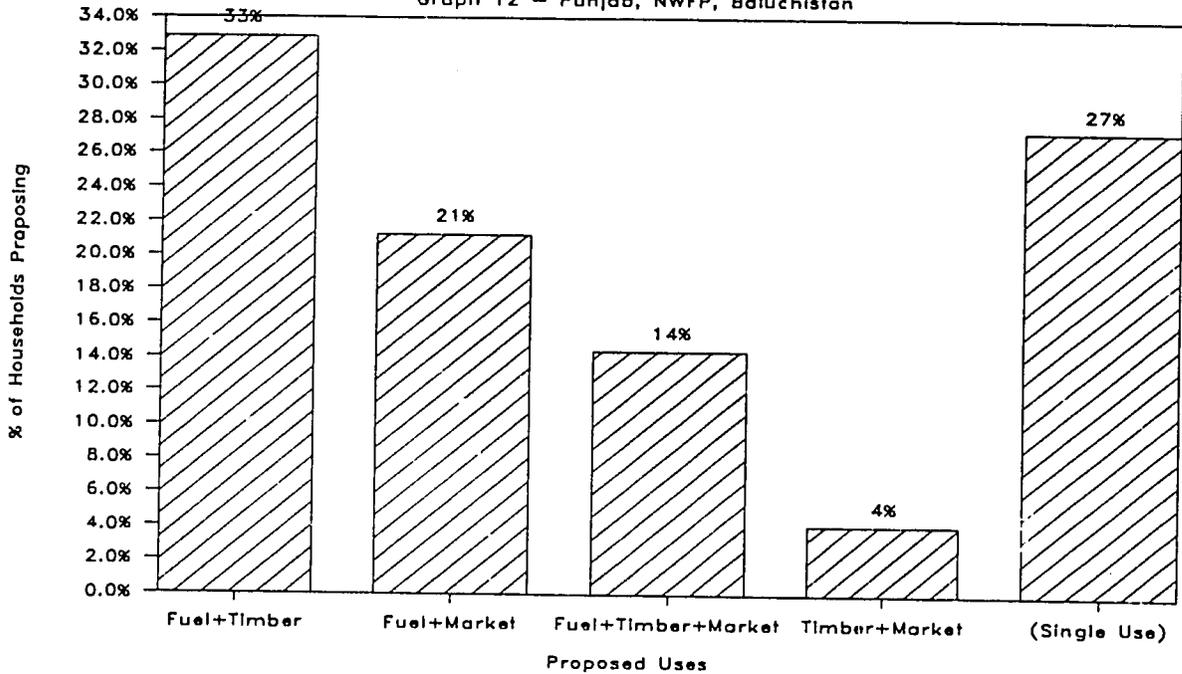
In 81% of the cases, however, farmers want to grow trees not for fuel alone, but for fuel plus one or more other uses - that is, for multiple uses:¹⁴

% of Households Reporting:	Number of Tree-Uses Requested Per Household			
	One	Two	Three	Four
	22%	46%	24%	8%

The specific combinations of uses that farmers request are as follows:

MULTIPLE USES OF PROJECT TREES

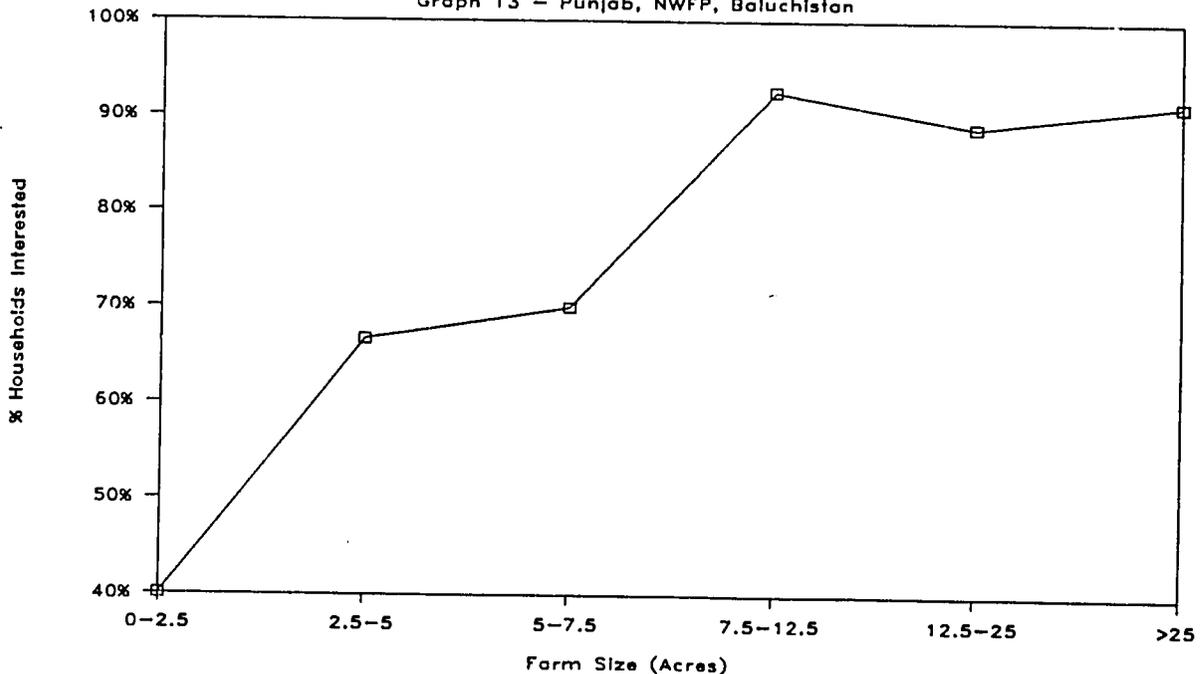
Graph 12 - Punjab, NWFP, Baluchistan



The least interest in or knowledge of multiple-use trees is found among the farmers with the smallest holdings (who for this same reason would otherwise stand to benefit the most from them):¹⁵

FARM SIZE & INTEREST IN MULTI-USE TREES

Graph 13 - Punjab, NWFP, Baluchistan



Lack of interest in multiple-purpose trees is also conspicuous among tenants:

% of Households that Want to Grow Trees for Multiple Uses:	Tenurial Status:		
	Landlord	Tenant	Self-Cultivator
	100%	58%	82%

V. STUDY SAMPLE

This analysis is based on interviews with 607 households in 41 villages in the Punjab (districts Attock, Chakwal, Rawalpindi, Khushab, Sialkot, Gujrat, Jhelum), NWFP (districts Kohat, Karak, D.I. Khan) and Baluchistan (districts Jalalabad, Tamboo). The villages were selected as being representative of their respective areas, based on a prior survey of major ecological, economic, and social variables of 111 villages in the same districts. The households were selected randomly from each village's voter's list. An average of 3-6 man-hours of time were spent with each household, in the course of 2 separate interviews. These interviews produced a great quantity of data, of which only those pertaining to the fuelwood supply are presented here.

VI. SUMMARY AND RECOMMENDATIONS

1. Rural Fuelwood Shortages and the FP&D Project

A. 93% of all farm households gather fuelwood, 66% of these find it difficult to do so, 41% find their supplies inadequate, and 32% must purchase fuelwood regularly.

B. These findings suggest that the principal focus of the FP&D project should continue to be on the country's fuelwood shortage.

2. Tree Uses Desired by Farmers

A. 91% of farmers who want to plant trees say that they will use some or all of them for fuelwood.

B. This finding refutes the common belief that farmers will plant trees only for cash income and not for use as fuel, and it supports the principal field strategy of the FP&D project, which is to assist farmers in planting fuelwood trees.

C. Since 81% of farmers want to plant trees for two or more different purposes, meaning one or more other uses in addition to use for fuel, the project should emphasize the selection and planting of trees having multiple uses.

D. The knowledge of multiple uses of trees is least among tenants and farmers with small holdings, so this should be one focus of extension efforts among these types of farmers.

3. Tree Species Desired by Farmers

A. 'Acacia nilotica' and to a lesser extent 'Acacia modesta' are the overwhelming choice of farmers for fuelwood and - since fuel is the major tree use desired by farmers - so these species should be emphasized in project plantings.

B. In view of the comparatively slower growth rates of these indigenous trees, however, the project should also encourage farmers to plant faster growing exotic species for fuelwood, concentrating this effort on areas where the traditionally preferred 'Acacias' are scarce and farmers are having to burn mostly dung and crop wastes. Such farmers are likely to be most receptive to experimenting with new species of fuel trees.

4. Target Households

A. The farm household types that have the most difficulty gathering fuelwood and have the shortest supplies - meaning those that are in greatest need of assistance with their fuelwood supplies - are those that are tenants or self-cultivators, that have small to medium-sized holdings, and that have completely irrigated lands.

B. The FP&D Project's efforts to remedy rural fuelwood shortages should focus on these types of farm households.

C. Farm households that have less need of assistance with their fuelwood supplies are those that are landlords, that have larger holdings, and that have partially or completely rainfed lands.

D. When working with these latter types of households, the Project should de-emphasize uses for fuel in favor of other uses of trees, such as timber, or market sales.

REFERENCES CITED

Mridha, MD Nurannabi

1986 Traditional Uses of Trees In Farming Systems in Two Villages in the Barani (Rainfed) Areas of Pakistan. M.Sc. thesis, Pakistan Forest Institute, Peshawar.

Sardar, Mohammad Rafique

1986 Mountain Farmers' Perceptions of Soil Erosion and Response to Soil Conservation. Ph.D. dissertation, SUNY, Syracuse.

ENDNOTES

1. Most of the farm households that gather fuelwood use one or more non-wood fuels as well, in particular dung:

% Households That Use:	Non-Wood Fuels:				
	Dung	Crop Waste	Kerosene	Electricity	Gas
	82%	21%	9%	4%	4%

2. The figure of 6.6 % of farmers gathering fuelwood from government land is likely too low, due to under-reporting in interviews.

3. This association is statistically significant. For $n = 423$ farm households, $X^2 = 48.2$, $P < .001$.

4. This compares with the figure of 42% reported in a recent study in Mansehra (Sardar 1986: 79[table 13]).

5. This association is not statistically significant, however. For $n = 476$ farm households, $X^2 = 6.7$, $P < .50$.

6. This association is not statistically significant, however: for $n = 157$ farm households, $X_c^2 = 9.3$, $P < .25$.

7. This association is statistically significant. For $n = 606$ farm households, $X_c^2 = 25.4$, $P < .001$.

8. The complete botanical names of the tree species listed in Graph #7 and Map #1 are as follows: *Acacia nilotica*, *Acacia modesta*, *Dalbergia sissoo*, *Zizyphus mauritania*, *Olea cuspidata*, *Tamarix articulata*, *Prosopis juliflora*, *Prosopis spicigera*.

9. This association is statistically significant. For $n = 607$ farm households, $X^2 = 17.5$, $P < .025$.

10. Comparing the acreage categories of ≤ 10 acres and > 10 acres, this association is statistically significant: for $n = 476$ households, $X^2 = 16.0$, $P < .001$.
11. This association is statistically significant. For $n = 592$ farm households, $X^2 = 7.7$, $P < .01$.
12. Fuel was also found to be the major use of existing trees in a recent study in Attock (Mridha 1986: 68-69).
13. Regarding farm size: for $n = 185$ farm households, $X^2_c = 3.8$, $P < .90$; regarding irrigation: for $n = 181$ farm households, $X^2 = .10$, $P < .98$.
14. This compares with a figure of 94% obtained in a recent study in Attock (Mridha 1986: 103).
15. This association is statistically significant. For $n = 174$ farm households, $X^2_c = 21.9$, $P < .005$.

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.
- REPORT #3 Household-level Factors Affecting Interest in Planting Trees and Operating Nurseries: Baluchistan. By Michael R. Dove, 6 July 1987.
- REPORT #4 Village-Level Factors Affecting Interest in Farm Forestry: The Punjab, NWFP, Baluchistan. By Michael R. Dove, 13 August 1987.
- REPORT #5 Prospects for Farm Forestry on Rainfed versus Irrigated Farms: The Punjab, NWFP, Baluchistan. By Michael R. Dove, 7 November 1987.
- REPORT #6 Prospects for Wood-Dung Fuel Replacement Through Farm Forestry: The Punjab, NWFP, Baluchistan. By Michael R. Dove, 7 November 1987.
- REPORT #7 Farmer Preferences for the Timing of Tree-Planting: The Punjab, NWFP, Baluchistan. By Michael R. Dove, Nasrullah Khan Aziz, & Jamil A. Qureshi, 30 November 1988 (rev. ed.).
- REPORT #8 The Fuelwood Supply and Demand in Rural Households: The Punjab, NWFP, Baluchistan. By Michael R. Dove, Nasrullah Khan Aziz, Jamil A. Qureshi, and Zafar Iqbal Marwat & Umar Farooq Marwat, 31 December 1988.