TREE GROWTH ON FARMLANDS OF NWFP

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ABSTRACT

The farmlands of NWFP have about 80 million trees of which two-third are in irrigated areas. The average number of trees per ha is 46 for all areas, 72 in irrigated areas and 27 in un-irrigated areas. Poplar (24%), bakain (18%), shisham (15%), ailanthus (13%) and mulberry (10%) are the pre-dominant species in irrigated areas. Ber (23%) and ailanthus (14%) are the most common trees in un-irrigated areas. The tree stock is mostly concentrated in lower diameter classes. The dia classes 5-9, 10-14 and 15-19 account for 42%, 24% and 13% respectively of the total tree stock. The estimated volume of growing stock is 14 million m^3 of which 10.6 million m^3 (76%) is in irrigated areas. The per ha volume of growing stock is 8.0 m^3, 13.8 and 5.3 m^3 for all areas, irrigated and un-irrigated areas respectively. The growing stock on irrigated areas is mainly accounted for by Khajoor (27%) shisham (19%) mulberry (13%), poplar (12%). On un-irrigated areas, the growing stock is accounted for by ailanthus (21%), ber (15%), mulberry and fig (9%) each. The farmers felled about 10.8 million trees (13.5% of the total trees stock) and removed 2.9 million m^3 volume (21% of the total growing stock) during 1989 to meet their own requirements and for the purpose of sale.

INTRODUCTION

The farmers have been growing trees on farmlands to cater to their requirements of timber, fuel wood and other products for a long time. Recently they have also started planting trees for commercial purpose and have been supplying wood raw material to a number of wood-based industries. However, this resource has developed in scattered form over the years and no information is available on its magnitude and composition. This has seriously hampered effective planning for the promotion of farm forestry in the country. Investment opportunities in wood based industries sector could also not be exploited. The contribution of forestry sector to GDP also could not be realistically assessed. Recognizing the paramount need of this information for sound forest planning, the Pakistan Forest Institute was prompted to survey tree growth on farmlands to collect basic data on its magnitude, species composition and diametre distribution. A "National Wood Resources Inventory Project" was approved by Government of Pakistan in 1988 with the main objectives of collecting requisite information from farmlands in all four provinces of Pakistan through a scientific designed sample survey. The data on tree growth on farmlands of NWFP were collected during 1988-89 under the project (1). This article presents the salient findings of this survey.

METHODOLOGY

A stratified random sampling method was adopted for the survey. On the basis of climatic factors, NWFP was divided into 3 broad zones. North plains (Peshawar-Mardan Civil Divisions), South

plains (Kohat - D.I.Khan Divisions), and hilly zones (Hazara - Malakand Divisions). Each zone was sub-divided into two blocks, irrigated and un-irrigated. Sampling intensity was set at 1.2 per 1000 farms and total sample size at 830 which was allocated to the different zones in proportion to the area falling in each zone. A multi-stage procedure was adopted for selection of sample. Depending upon the number of sample farms in various zones, 1-3 tehsils were selected randomly. From each selected tehsil a number of villages were selected at random. In all 12 tehsils and 84 villages were selected. In each village, 10 sampled farms were selected at random using voter's list. The data were collected through pre-tested questionnaire by enumerators and trees of 5 cm and above were counted and their diameter recorded. Using existing volume tables, volume calculations were made to estimate the growing stock. The cultivated area and number of sampled farms in each stratum is as under (2,3).

RESULTS AND DISCUSSION

The farmlands of NWFP carry a total tree stock of 80 million of which 54 million (68%) is in irrigated areas and the rest 26 million (32%) is in un-irrigated areas. The per ha number of trees is 46 for all areas, 72 and 27 for irrigated and un-irrigated areas respectively. The distribution of tree stock by zone is given in table 1.

The table shows that more than 40% of the tree stock occurs in hilly zone where environment is quite favourable for tree growing. The fertile lands of North plains zone carry 34% of tree stock. The South plains affected with aridity carry only 25% of the tree stock.

Stratum	Cultivated area (thousand ha)	Total Number of farms (thousand)	Number of sampled farms
North plains irrigated	259	147	141
South plains irrigated	218	77	108
Hilly irrigated	293	160	129
North plains un-irrigated	139	22	62
South plains un-irrigated	494	56	239
Hilly un-irrigated	344	254	159
	1747	716	838

Table 1. Distribution of tree stock by zone

Zone	Total tree stock (Number in Million)			Per ha number of tree		
	All areas	Irrigated areas	Un-irrigated areas	All areas	Irrigated areas	Un-irrigated areas
1. North Plains	27	22	5	68	79	33
2. South Plains	20	16	4	28	79	9
3. Hilly	33	16	17	52	58	51
Total	80	54	26	46	72	27

The main species on irrigated areas are poplar, bakain, shisham, ailanthus and mulberry. These species account for 80% of the tree stock. Poplar outnumbers trees of any other species. In un-irrigated areas, predominant species are ber, ailanthus, celtis, robinia, fig, bakain, tamarix and mulberry. Table 2 gives data on species wise distribution of tree stock.

The tree stock is mostly concentrated in lower diameter classes. The first three diameter classes account for 78-81% of the total tree stock both in irrigated and un-irrigated areas. The diameter classes of 5-9, 10-14 and 15-19 cm account for 42%, 24% and 13% of the total tree stock respectively. The distribution of tree stock by diameter classes is given in Table 3.

Table 2. Distribution of tree stock by species

Species	Irrigated areas		Un-irrigated areas		All areas	
	No. in million.	%	No. in million.	%	No. in million.	%
Poplar (Populus spp.)	12.7	24	1.0	3.8	13.7	17.1
Shisham (Dalbergia sissoo)	8.1	15	0.2	0.8	8.3	10.3
Bakain (Melia azadarach)	9.3	18	1.9	7.3	11.2	13.9
Mulberry (Morus alba)	5.2	10	1.4	5.3	6.6	8.2
Ailanthus (Ailanthus glandulosa)	6.9	13	3.6	14.1	10.5	13.2
Willow (Salix tetrasperma)	2.4	5	0.2	0.9	2.6	3.3
Fig (Ficus palmata)	1.8	3.5	2.0	8.0	3.8	4.8
Khajoor (Phoenix sylvestris)	2.9	5.6	-	-	2.9	3.7
Kao (Olea cuspidata)	0.2	0.5	0.6	2.3	0.8	1.0
Kikar (Acacia nilotica)	0.9	2	0.9	3.6	1.8	2.3

continue

Species	Irrigated areas		Un-irrigated areas		All areas	
	No. in million.	%	No. in million.	%	No. in million.	%
Eucalyptus (Eucalptus cammaldulensis)	0.1	0.3	0.7	2.7	0.8	1.0
Ber (Zizyphus jujuba)	0.2	0.4	5.9	22.9	6.1	7.6
Phulai (Acacia modesta)	-	0.1	0.8	3.0	0.8	1.0
Celtis (Celtis australis)	_	0	2.3	8.9	2.3	2.9
Robinia (Robinia pseudacacia)	-	-	2.2	8.4	2.2	2.3
Chinjal (Debregeasia hypoleuca)	-	0	0.2	1.0	0.2	0.3
Tamarix (Tamrix articulata)	0.1	0.1	0.4	1.7	0.5	0.6
Alignus (Elaegnus angustijolia L.)	1.0	1	-	-	1.0	1.3
Others	2.2	1.5	1.7	5.3	3.9	5.2
	54.0	100	26	100	80.0	100

Table 3. Distribution of tree stock by diameter classes

Diameter class (cm)	Irrigated Areas (%)	Un-irrigated Areas (%)	All areas (%)
5-9	42	42	42
10-14	24	24	24
15-19	12	15	13
20-24	7	9	8
25-29	4	4	3
30-34	3	3	3
35-39	5	1.2	4
40-44	2	0.6	1.2
45-49	0.6	0.4	0.5
50-54	0.6	0.2	0.5
55-59	0.2	0.2	0.3
60 & above	0.6	0.4	0.5
	100	100	100

The estimated volume of the growing stock of farmlands is 14.0 million m^3 of which 10.6 million (76%) is in irrigated areas and 3.4 million (24%) in the un-irrigated areas. The per hectare growing stock is 8.0 m^3 for all areas and 13.8 and 3.5 m^3 for irrigated and un-irrigated areas respectively. The data on growing stock by zones is given in table 4. The table shows that about 40% of the growing stock is accounted for by South plains zone; 36% by hilly zone and 24% by North plains zone. The irrigated farms in South plains zone carry the largest per ha growing stock which is perhaps due to the predominance of shisham and Khajoor species in this zone.

The growing stock on irrigated areas mainly consist of khajoor (27%), shisham (19%), mulberry (13%), poplar (12%), willow (5%) and bakain (4%). These species account for 80% of the total growing stock in irrigated areas. In un-irrigated areas, ailanthus, ber, fig, mulberry and bakain are the main species accounting for 60% of the growing stock. The distribution of growing stock by species is given in table 5.

Table 4. Distribution of growing stock by zone

Zone	Total tree stock (Million m^3)			Per ha number of tree (m^3)		
	All areas	Irrigated areas	Un-irrigated areas	All areas	Irrigated areas	Un-irrigated areas
1. North Plains	3.3	3.2	0.1	8.3	12.3	0.7
2. South Plains	5.6	4.9	0.7	7.9	22.5	1.4
3. Hilly	5.1	2.5	2.6	8.0	8.5	7.6
Total	14.0	10.6	3.4	8.0	13.8	3.5

Table 5. Distribution of growing stock by species

Species	Irrigated areas		Un-irrigated areas		All areas	
	Vol	%	Vol	%	Vol	%
Poplar	1.3	12	0.1	3	1.4	10
Shisham	2.0	19	0.1	3	2.1	15
Bakain	0.4	4	0.2	6	0.6	4
Mulberry	1.4	13	0.3	9	1.7	12
Ailanthus	0.3	3	0.7	21	1.0	7
Kikar	0.1	1	0.1	3	0.2	1
Willow	0.5	5	-	-	0.5	4
Fig	0.2	2	0.3	9	0.5	3
Khajoor	2.9	27	-	-	2.9	21
Celtis	-	-	0.1	3	0.1	1
Kao	-	-	0.1	3	0.1	1
Phulai	-	-	0.04	1	0.04	0.3
Chir	-	-	0.08	2	0.08	0.6
Tamarix	0.01	-	0.09	3	0.10	0.7
Robinia	0.02	-	0.2	6	0.22	1.6
Ber	0.02	-	0.5	15	0.50	3.6
Eucalyptus	0.06	-	0.1	2	0.16	1.1
Chinar	0.03	3	-	-	0.3	2.1
Walnut	0.03	3	0.1	2	0.4	3.0
Others	0.8	8	0.3	9	1.1	8.0
Total	10.6	100	3.4	100	14.0	100

The farmers fell trees to meet their own requirements of fuelwood and small timber as well as for purpose of sale so as to have extra income. The farmers in NWFP felled 10.8 million trees of which 6.3 million were in irrigated areas and 4.5 million in un-irrigated areas. They removed about 2.9 million m^3 of wood. The data on felling of trees by zone is given in table 6.

The number of trees felled per ha varies considerably between irrigated and un-irrigated areas. In irrigated areas, the number is 8.1 against 4.6 in un-irrigated areas. However, the volume removed is the same i.e. 1.7 m^3 per ha both in irrigated and un-irrigated areas. The per ha number of trees felled and volume removed are highest in North plains zone and lowest in South plains

Table 6. Distribution of trees felled and volume removed by zone (thousand)

Zone	Irrigated areas		Un-irrigated areas		All areas	
	No.of trees	Vol (m^3)	No.of trees	Vol (m^3)	No.of trees	Vol (m^3)
1.North plains	5252	1076	370	42	5692	1118
2.South plains	302	86	383	276	685	362
3.Hilly	700	108	3727	1338	4427	1446
	6254	1270	4480	1656	10804	2926

zone. The former has favourable environment for fast growing species like poplar, bakain and ailanthus. The later has mainly slow growing trees like shisham and khajoor. The data on per ha number of trees felled and volume removed in various strata are given in Table 7.

Of the 6.3 million trees felled in irrigated areas, poplar accounted for 74%, bakain 8%, ailanthus 6% and willow 4%. In un-irrigated areas, ailanthus accounted for 38%, robinia 22% and bakain 11%.

Table 7. Per ha number of trees felled and volume removed in different strata during 1989-90.

Strata	Per ha Number of trees felled (No.)	Per ha volume removed (m^3)
1. North plains irrigated	20.3	4.1
2. North plains un-irrigated	2.7	0.3
3. South plains irrigated	1.4	0.4
4. South plains un-irrigated	0.8	0.6
5. Hilly irrigated	2.4	0.4
6. Hilly un-irrigated	10.8	3.9
All irrigated areas	8.1	1.7
All un-irrigated areas	4.6	1.7
All areas	6.1	1.7

In irrigated areas, volume removed totalled 1.27 million m^3 of this, poplar accounted 70%, bakain 7%, shisham and willow 6% each and the rest 11%. Of 1.656 million m^3 volume removed in un-irrigated areas, ailanthus accounted for 43%, kikar 11%, robinia 12%, mulberry 8%, fig 7% and the rest 19% consisted of

miscellaneous species. The data on distribution of trees felled and volume removed by species is given in Table 8.

Table 8. Distribution of trees felled and volume removed by species during 1989-90.

Species	No.of trees felled in irrigated areas %	No.of trees felled in un-irrigated%	Irrigated areas Volume per ha (m^3)	%	Un-irrigated areas Volume per ha (m^3)	%
Poplar	74	1	1.156	70	-	-
Shisham	2	-	0.089	6	-	-
Bakain	8	11	0.119	7	0.126	7
Kikar	2	5	0.045	3	0.178	11
Mulberry	2	3	0.055	3	0.137	8
Willow	4	-	0.094	6	-	-
Ailanthus	6	38	0.051	3	0.728	43
Fig	-	6	-	-	0.127	7
Ber	-	9	-	-	0.064	4
Tamarix	-	3	-	-	0.071	4
Robinia	-	22	-	-	0.198	12
Others	2	2	0.032	2	0.064	4
Total	100	100	1.651	100	1.695	100

Table 1-8 (Source; Tree growth on Farmlands of NWFP, 1991)

CONCLUSION

The existing growing stock on farmlands of NWFP consists of 80 million trees with estimated volume of 14 million m^3. The basal area of tree stock is about 1.93 million m^2 on this basis the growing stock is roughly equivalent to 0.193 million ha of plantation forests. The annual wood removals amount to 2.9 million m^3. There is ample scope for increasing tree-growth on farmlands both on irrigated and un-irrigated areas. In order to realize the potential, it is imperative to provide proper incentives to the farmers.

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