

M.Sc. Thesis Research at the Pakistan Forest Institute, Peshawar, 1987 - 89 Course

Raja M. Ashfaq, *Director, Forest Education Division, Pakistan Forest Institute, Peshawar.*

1. Productivity and cost of sawing in the sawmill of Forest Development Corporation, Mansehra, NWFP. Khan, M.A. (1989).

A study was undertaken during 1988 - 89 to determine the productivity and cost of sawing in the sawmill and to estimate the real margin of profit which the FDC was earning from it. Data on different cost items like those of machine, land, building, repair and maintenance, as well as taxes, cost of administration, personal cost, cost of raw material and sale prices of sawn timber were collected from the sawmill and timber sale depot at Havelian. The results of study showed that the average total cost of sawn timber was Rs. 3883.20/m³ (Rs.109.96/cft) against its average sale price of Rs. 3827.76/m³ (Rs. 108.39/cft). Thus the Corporation was running into loss of Rs. 55.44/m³ (Rs. 1.57/cft) involving a total loss of Rs. 301,716/- per annum to the mills. If the cost of entrepreneur (e.g. 5% for risk and 5% for profit) is also included, then the loss is Rs. 444.26/m³ (Rs. 12.58/cft) and a total loss of Rs. 2.3 million per annum.

The above results showed that the sawmill was not an economic proposition for the Corporation. This is due mainly to low capacity utilization. If the production of the sawmill is increased to its capacity of 14158 m³ (500.000 cft) per annum, then a profit could be obtained to the extent of Rs. 300.17/m³ (Rs. 8.50 cft) of sawn timber with total of Rs. 4.273 million per annum. The study suggests a number of measures for utilization of installed capacity. These are:

- Proper lay out of machines.
- Provision of additional machines.
- Proper maintenance and repair of machines to reduce the time loss due to break downs.
- Training of workers.
- Motivation of workers through provision of incentives.

2. Influence of lateral skidding distance on productivity and cost of timber extraction by cable cranes in the high hill forests of NWFP. Siddiqui, M.U. (1989).

This study was carried out to determine the influence

of lateral skidding distance on productivity and cost of timber extraction by cable cranes. A number of criteria were used to compare this purpose. These are; a) time consumed in extraction at various lateral skidding distances; b) cost per m³ and; c) productivity (volume per unit time). The study was conducted in Kalamband reserved forest compartment - 2, Kaghan Valley during October, 1988.

The data was analysed with the help of computer for regression analysis between independent variables and dependent variables of work times and productivity. Results of the study showed that the average working time and productivity/work cycle as 29.9 minutes and 4.7m³/hour for the average lateral skidding distance of 54.5 meters and average transport distance of 224 meters respectively. Multiple linear regression analysis between the dependent variables of work times and independent variables of transport distance, lateral skidding distance and angle of slope indicated that the lateral skidding distance was the strongest determinant of different work time and productivity per work cycle.

In the light of above results the optimum lateral skidding distance was found to be 60 meters for the cable crane system and it was suggested that introduction of improved tools and working methods as well as vocational training of forest workers were very essential for increasing the labour productivity at lower physical work load in timber extraction through cable crane.

3. Bearing Capacity of forest roads in Hazara Civil Division, NWFP: Chaudhry, B.A. (1989).

It is generally realized that the coniferous forests of Pakistan can produce an increased quantity of timber if an intensive management programme is adopted through improvement of biological production and application of improved opening up and harvesting techniques. In this regard, forest accessibility through a net work of forest roads would be pre-requisite. Unfortunately, the present road density in the coniferous forests is very low and is estimated to be only 2.9m/ha of jeep and truck roads.

In mountainous areas, the forest roads are presently being constructed by the forest contractors for the

extraction of timber without consideration of their life and maintenance cost as well as climatic condition, geology, soil and other physiological characteristics of the area. The bearing capacity of such forest roads is invariably very poor resulting in frequent and major failures. The life of such roads is also very short which are completely washed away within a season of their construction.

The present study was conducted to compare the load bearing capacities of two roads, one improved departmentally and another constructed by the contractor. It was found that the bearing capacity of the improved road was 66% higher than that of the contractor's road. The results of the soil tests did not show major differences in the type of soil of the contractor and the improved road. On the basis of results of this study, it was recommended that the technology used in the construction of improved forest roads should be applied by the provincial forest departments and corporations. Further, in order to reduce road surface erosion, an addition of 10 - 15% clay in the construction material was recommended to improve the binding characteristics of the soil.

4. Problems, need and priorities of the residents of village Kokarai in Swat Watershed: Khan, M.J. (1989).

A socio-economic study was carried out to find out the problems, needs and priorities of residents of village Kokarai and their views about Swat Watershed Project on them. The objective of the study was to determine the income, landholdings and number of animals per family and the problems being faced by them as a result of watershed management and soil conservation practices in the area. The data were collected through questionnaire-cum-interview techniques.

It was found out that 37% of the persons, who has no education, were in favour of Watershed Project. Those who opposed the project argued that the project forced them to reduce number of livestock by controlling grazing in watershed areas. People having landholding more than 31 kanals were willing to allow application of watershed measures on their lands. Before the commencement of the project, 60% and 40% fodder requirements were met from the project and agriculture areas respectively. Presently, the fodder is available from agriculture lands only. Awareness to use watershed techniques was also noticed and 56% of the respondents had constructed simple stone walls to control the floods on their lands while 27% had planted trees to control erosion. 57% of the respondents were satisfied with incentives offered to them by the project.

In view of above results, it was suggested that project staff concerned with watershed protection, development and conservation should carry out a vigorous campaign of forestry extension by integrating communication, education, motivation, training in skills, cooperative land development and marketing.

5. Stand level planning in the Chir Pine Reserved Forest at Field Station, Shinkiari: A new approach: Shah, A.M. (1989).

The present study was carried out to introduce a new and broad-based concept in forestry planning-stand level planning of an area of 200 ha of chir pine forest in compartment 8 of Massar R.F. in field Station, Shinkiari, NWFP.

The area of 200 ha was split into 24 different stands on the basis of age class, species composition, regeneration conditions, aspect, site quality and terrain condition. Keeping in view overall objectives of the forest management, an objective was also determined for each stand and various operations with priorities were prescribed in them while evaluating the stands in the field.

The forest inventory was conducted on partial enumeration basis using the Angle Count Sampling method (ACS). A map of the compartment on scale of 1: 5000 was prepared with a quadric grid. 95 sample plots, each of 2 ha area, were laid out on the map. Relascope was used for selection of the sample trees and various other measurements like tree height, slopes and distances. Data for number of stems, basal area, 10 years increment, cover percent, crown density, regeneration, aspect and slope were recorded on a prescribed proforma (Tally sheet) which consisted of three essential parts i.e. description, planning and execution. The data was processed to find site quality, gross volume/ha, stocking degree and number of stems per hectare for each stand. Different stands alongwith their types were illustrated on a stand map. However, a separate map was prepared showing all the prescribed activities and served as a tool to implement the daily work in the field.

Although the application of this method appeared to be more time consuming and laborious but had an advantage over the existing method of planning in terms of intensive investigation, quicker and proper treatment, priority of the operation, implementation, monitoring and control.

6. Survey of agroforestry systems in Peshawar and Charsadda districts, NWFP: Khurshid, M. (1989).

Agroforestry is an age old practice among the

farmers of Peshawar and Charsadda districts. The study was conducted to find out the existing agroforestry systems in them. The major tree species in the area are poplar, willow, shisham, *Ailanthus* and fruit trees raised in different forms i.e. linear, block and scattered and in a variety of combinations. The commonly grown crops are sugar cane, wheat, maize, and vegetables.

A questionnaire was designed as a survey instrument for data collection. The contents of questionnaire were location, name of the household head and his land holdings, tree species, manner, purpose and number grown and type and area of agricultural crops.

Based on composition and function, of three major types of agroforestry systems were found in the area, namely, homestead, agrosilviculture and agrosilvopastoral. These were also classified as subsistence, intermediate and commercial types on the basis of farmers holdings e.g. 2 ha, 2 to 3 ha and more than 3 ha respectively. Linear plantations with intercropping in between them could be termed as hedgerow intercropping type of system. Scattered trees in agricultural fields were mostly found in very small number in barani areas.

In order to improve the present agroforestry practices, following steps need to be taken at different levels.

- to improve marketing of wood for direct benefits to the farmer.
- to supply quality nursery stock of tree species to the farmers for planting on the farm lands.
- to provide technical assistance to the farmers for growing and maintenance of tree plantations on the farmlands.
- to select tree species which are compatible with agricultural crops and provide the same to the farmers.

7. Effect of tree intercropping on agricultural productivity in Peshawar and Charsadda districts, NWFP: Zulfiqar, M. (1989).

The study was conducted to determine quantitative effect of trees, if any, on the productivity in Peshawar-Charsadda districts, NWFP.

Sugar cane, wheat, sugar beet and barseem crops were selected in the study area. All the farms having these crops had tree-rows growing along their boundaries. Poplar, shisham and willow are extensively grown in conjunction with the crops in the area.

Sample plots were laid out in sugar cane and sugar beet crops in the farm of 4 m² and wheat and barseem

crops in 1 m² quadrats at different distances from tree row. Yield of crops from control fields without trees was also recorded for comparison and determining quantitative effect of trees on crop yield.

It was observed that the trees depressed agricultural crops yield in their close vicinity. However the magnitude of this effect varied with tree species and agriculture crop. For instance, the effect of poplar tree rows on the yield of sugar cane were maximum and 17.9% reduction in crop yield per hectare as compared to control plot yield was recorded. It was generally observed that effect of poplar on the yield of different crops was maximum and that of willow minimum. However, with the exception of sugar cane, the reduction in yield of other crops was negligible. Further, fields with north-south tree-rows showed lower yield as compared to east-west rows in all agricultural crops. The losses in crop yields were expected to be compensated by income from sale of trees.

8. Financial analysis of three agro-forestry systems in Peshawar and Charsadda districts, NWFP: Ahmad, Irfannuddin (1989).

Economic analyses were carried out for sugar cane, wheat, sugar beet and barseem crops grown with or without trees of poplar, shisham and willow. All these tree species were of poplar, shisham and willow. All these tree species were grown in the form of rows along the borders of agricultural fields in Peshawar and Charsadda districts. Total net income of the farmer was determined from agronomic crops for one season as well as average income from trees for the same period of time if grown with crops. Maximum increase in the farm income was observed in cases of two crops, e.g., sugar beet with poplar and wheat with poplar. Sugar cane when grown with shisham and willow trees showed a reduction in farm income as compared with control field in which these trees were not grown.

9. The effect of different land uses on the infiltration capacity (permeability) and physical characteristics of soils in dry temperate zone (Kalam): Mehboob, S.R. (1989).

The study aimed at determining the effects of different land uses on permeability and other physical properties of soil in dry temperate areas of Kalam (Swat) where Deodar (*Cedrus deodara*) is the major forest species. For this purpose, samples were taken from surface and subsurface layers of forests, agriculture and range lands. All soils were generally loamy sand results showed that forests soils had highest permeability, porosity and water holding capacity followed by range and agricultural lands. However, higher values of bulk dens-

ity were observed on range and agriculture lands use as compared to forest lands. In terms of texture, the soils did not show any significant differences for different land uses. From watershed management point of view, forestry was found to be the most suitable land use in dry temperate areas.

10. The effect of different land uses on the infiltration capacity (permeability) and physical characteristics of soil in subtropical chir zone at Company Bagh, Murree Hills: Shahid, Ata-ul-Munim (1989).

The objective of the study was to determine infiltration capacity and physical characteristics of soils under different land uses in subtropical chir zone. The land uses under investigation were forestry, agriculture and range/pastures. The infiltration capacity was determined at two levels, surface layer and subsurface layer. Physical characteristics of soil such as texture, water holding capacity, moisture contents, bulk density and porosity of soil were studied.

The study was carried out in Compartment 57 in the Ghoragali Forest Range of the Murree Forest Division in which the soil is generally loamy sand. From each land use, seven soil samples were taken and evaluated. The results showed that maximum infiltration occurred in the forest soils followed by those of agriculture and range-lands. However, whereas moisture contents of soils by volume was maximum under agriculture followed by that under forests and ranges, the water-holding capacity of forest soils was higher than those of range land and agriculture. On the other hand, though, bulk density of the subsurface layer was higher in agriculture as compared to range and forest soils, porosity was lower in the former than the latter types of soils. There was no marked difference in the soil porosity of surface layer under different land uses.

The results of the study indicated that different land uses had important role in controlling the infiltration capacity of the soil. Forestry was the best land use in enhancing infiltration capacity of soil which played an important role in regulating the stream flow i.e. decreasing the surface runoff and increasing the base flow during dry period.

11. The effect of different land uses on the infiltration capacity (permeability) and physical characteristics of soil in Kail Zone of Murree Hills: Muhammad, S.G. (1989).

The objective of the study was to determine the proper land use for the catchment areas through comparison of physical properties of soils under different land

uses. Soil samples were collected from forest, range, and agricultural lands in temperate zone of Murree. Seven soil samples, consisting of three from surface soil and three from subsoil, and one from mixture of surface and sub-soil were randomly collected from the area under each land use. Surface soil under forest was found to have highest permeability and porosity, while the same under grasses had highest bulk density and soil moisture content. On the other hand, sub-soil under forest had highest bulk density and soil moisture content. Permeability and porosity was highest in the sub soil under grasses and agricultural crops. Moisture contents at saturation point was highest both in surface soil and sub-soil under agricultural crops. Forestry was found to be the best land use in the catchment areas of Murree Kail zone. The result had indicated that heavy grazing should be discouraged and ground cover of herbs and shrubs be encouraged.

12. The effect of different land uses on the infiltration capacity and physical characteristics of soil in Himalayan moist temperate (fir/spruce) zone: Ahmad, G. (1989).

The study was conducted to determine physical properties of soils under different land uses (forestry, agriculture and range) in the fir/spruce zone in Galies forests of Abbottabad district. The study parameters were permeability of soil, bulk density, porosity, moisture retention capacity at saturation point and texture.

Seven soil samples were taken from each land use type. Of these, six samples were used to determine the infiltration capacity, bulk density, porosity and moisture retention capability at saturation point and one sample to determine the soil texture. The data was statistically analysed and interpreted. The results showed that the physical properties of soil were more or less similar in forested and agricultural lands but differed significantly from the soils of range lands. It was recommended that forestry should be encouraged in areas where slopes were steep and susceptible to erosion. On the other hand, land should be used for agriculture and range management in a scientific manner.

13. The effect of different land uses on the infiltration capacity (permeability) and physical characteristics of soil in scrub zone in Rawalpindi district. Khan, M.A.M. (1989).

The objective of the study was to determine infiltration capacity (permeability) and physical characteristic of soils under different land uses (forest, range and agriculture) in scrub zone. Permeability was determined for surface and subsurface soil samples. Physical charac-

teristic such as bulk density, porosity, moisture holding capacity and texture were also studied. Potwar area in the Rawalpindi district was selected which is a subcatchment of Indus river through Soan nullah. Seven soil samples were obtained for each land use.

The results indicated that forest land has maximum permeability as compared to those of other land uses. The infiltration capacity (permeability) for surface and sub-surface soil of forest land, range land and agricultural land were 21.8 cm/hr, 2.0 cm/hr and 2.7 cm/hr and 4.0 cm/hr 7.6 cm/hr and 1.9 cm/hr respectively. The higher in-filtration capacity (permeability) of forest land was considered to be due to vegetation cover, litter layer

and micro organism activities. The properties of soil under different land uses were also found to confirm with the permeability results. The bulk density of soil was minimum and its porosity maximum on site under forest as compared to range and agricultural soils. Thus permeability was directly related with porosity and inversely related with bulk density.

The results of the study further indicated that forestry was the best land use in scrub zone for reducing surface runoff, increasing base flow and controlling soil erosion. Cultivation and overgrazing adversely affected the land in this regards.