

**M. Sc. FORESTRY THESIS RESEARCH AT PAKISTAN FOREST
INSTITUTE, PESHAWAR 2002-2004 COURSE**

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**Determination of Range Condition and Trends of Machiara National Park
and Role of Local Community in its Improvement by Ghulam Mujtaba
(Advisor: Dr. Sardar Muhammad Rafique)**

This study was carried out in Machiara National Park with major objective to determine the range condition, its trends and the role of local community in the improvement of range flora in the study area. The data were collected in the last week of August 2004, using line transect and quadrat methods.

For the determination of cover percent and herbage production 160 quadrats, 20 quadrats per transect line of 100m long were laid out in 8 selected compartments. Based upon field data regarding cover percent species composition, herbage production, frequency and social survey, the range condition, range trend and community role were evaluated; giving due consideration to condition rating prescribed for summer ranges of Pakistan.

The study results revealed that the range condition was "poor". The aerial cover was found 44.4% having condition rating point "1". Species composition of class 1 (preference value plants) was 49% in class II and III (medium and low preference value plants) between 51% having point "4". The soil protection cover was 57.1% having rating point "3". Air dried forage production was 556kg/ha (AD) with rating point 3".

Plant base was 13.8%, litter 18.2% and cryptogams cover was 12.7%. The over all rating condition was "14" which indicated condition was poor and the low frequency of decreases reflected the downward range trend. The range condition and trend would further deteriorate if proper and timely measures are not taken.

**Mapping Deforestation of Khairi Murat Reserved Forest district Attock
(Punjab) By Using GIS and RS (1992-1999) by Nowsherwan Zarif (Advisor:
Raja Ghayyas Ahmad)**

Forests cover almost 4.8 percent of the total land area in Pakistan. The meager area and unique environment of forest resources and increasing pressure of population living around makes the practice of forest area

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management and development of resource policy a challenging task. It is common perception that area under forest cover is decreasing day by day because of land scarcity for other uses.

The present study " Mapping of deforestation of Khairi murat Reserve Forest District Attock" was undertaken to judge the usefulness of Geographical Information System (GIS) tools for determining the extent and change in forest area without making traditional physical measurements. The major aim of this study was to determine the assessment of deforestation rate in a given forest area. The study area was an isolated patch covered with trees of lesser heights and associated with grasses. The selected area had ideal topographical and vegetation characteristics that usually hinder the reliability of estimates under different vegetation covers.

The interpretation of images was done by visual classification method. The study relied on color composites to demarcate the existing forest area and classification of vegetation within the bounded limits. The results of classification were then matched with Normalized Difference Vegetation Index (NDVI) created with the help of band 4 and band 3 to judge the reliability of color composite classification.

The study processed satellite images of 1992 and 1999 with the help of ILWIS program. The results indicate that the study area can be easily demarcated and categorized as scrub, grasses, and barren lands. The total area of Khairi murat Forests calculated with the help of images is 4866.24 ha. The actual area reported for Khairi murat Block by the 1957-working plan was 5377.33 ha (13.282 acres). This discrepancy of 511.09 ha in the area can be accounted to encroachment, illicit removal of complete vegetation cover and construction of roads along the boundaries of forest area.

The classified images were crossed to obtain area under different land-uses during 1992 and 1999. The crossing revealed that the tree vegetation in the form of scrub covered only 1979.60 ha out of total 4866.24 ha during the year 1992. But the forest area under scrub declined to 1764.12 ha during 1999. Thus a net decrease of 215.48 ha was estimated during time span of seven (7) years accounting to annual deforestation rate of 2.69 percent. This also supports common belief that the area under tree vegetation is declining. Interestingly the rate of deforestation matches with the annual rate of increase in population for the area.

The effect of factors such as elevation, roads, villages etc. on deforestation was also determined for the specified period. The image analysis

was unfolded that the rates of deforestation were higher near the villages, roads and at lower villages. The finding of study also supports common observation that people do fell trees near the road. In case of villages, the intensity of complete removal of vegetation at the boundary was very high as they wanted to encroach the areas for other uses.

The study also concludes that modern techniques of resource inventory such as GIS could be used efficiently to estimate the extent of area and deforestation rate during desired period with the help of images only. However to identify species and construct their stand and stock tables one has to visit forest areas and measure selected sample plots taken from images in a traditional way.

Influence of Education and Communication on Adoption of Farm Forestry in district Peshawar by Dawood Afridi (Advisor: Saliheen Khan)

The socio-economic conditions of the farmers affect their attitudes towards adoption of innovations. This study deals with two main research objectives: The effect of education and communication on adoption of farm forestry and to evaluate present extension techniques so as to develop a sound base for forestry extension.

This study was conducted in District Peshawar in ten randomly selected villages for collecting data from 100 respondents through the pre-tested questionnaire. The data show that education is an influencing factor in the awareness and adoption of modern practices. The highest percentage of farmers owning radios and televisions, using other channels of mass media, and visiting extension agents in their offices were from families with educated heads or educated members. The owners and the users of mass media have positive attitudes towards tree planting. The personal contacts of farmers with the forest officials are minimal. However, the persons who have contacts with the forest officials are tree minded.

Study of the Biological Threats Causing Die Back to Juniper Forests of district Ziarat, Balochistan by Muhammad Aslam (Advisor: Muhammad Arif Chaudhary)

The study of the "Biological threats to the Juniper Forests of Ziarat" was carried out by selecting 4 localities during 2004. The localities were Chasnak, Kharwari Baba, Bastargi and Kirbee Kach. Three plots each of 3 acre per locality were selected randomly. There were recorded 954 trees in 4 selected localities having diameter > 6 inches. Each individual tree was studied for the presence or

absence of mistletoe, fungus, insect infestation and physical injuries caused by man or any other agent.

Data depicted that the mistletoe attack was only limited to Chasnak valley among the 4 selected localities. Out of 180 trees in that locality 59 (32.77%) trees were found infected by this phanerogamic parasite. Fungal attack was found in all the 4 localities: with varying intensity of 61.59%, 40.55%, 39.56% and 25.04% in Kirbee Kach, Kharwari Baba, Bastargai and Chasnak, respectively. Insect attack was observed on 297 (31.13%) trees out of the total and most of the attack was recorded on the fruit (berries).

The survey results indicated that 410 (42.97%) trees out of total 954 were found injured by various physical agencies like man, fire and drought. Data of 96 respondents selected at the rate of 12/village depicted that 23 (23.59%) people out of 96 were obtaining timber of Juniper for constructional purposes, 86 (89.58%) obtained fuel wood, 41, (42.7%) were graziers, 43 (44.79%) debarked the Juniper for thatching their roofs, 51 (53.12%) obtained medicinal plants as per requirement, 14 (14.58%) obtained fencing material for their agriculture fields, 24 (25%) collected human and 7 (7.29%) enjoyed recreation and wild life of the forest. Most of the respondents were enjoying more than one kind of benefits free of cost.

Inconsequent use of Forest Resources by the Tourists and its Socio-Economic Impact upon Local People of Nathiagali, district Abbottabad. by Muhammad Kabir Afridi (Advisor: Syed Zainul Arifeen)

The study on "Inconsequent use of forest resources by the tourists and its socio-economic impact upon local people of Nathiagali, Abbottabad District" was conducted to find out the socio-economic changes brought about as a result of the development of tourism in the area. Questionnaire cum interview method was used for the collection of data from a random sample, in two villages of fifty respondents in all. For the determination of socio-economic changes as a result of development in tourism, comparison was made between past and present situations of the residents. Since documentary record of the past is not available, therefore the statements of respondents were relied upon for their condition in the past. With the passage of time and improvement of facilities, there will be increase in number of visitors and concomitantly socio-economic changes will also be pronounced.

The analysis of the data indicates that tourism has influenced every sphere of life of the residents. This include increase in literacy ratio, improvement in educational facilities, rise in job opportunities particularly in business and services,

increase in the value of land and local products, introduction of fruit cultivation, increase and improvement in transportation, adoption of new fashions both by male and female residents, improvement in food habits (better balanced diet), adoption of modern etiquettes, increase in awareness about health and hygiene, learning of other provincial languages, replacement of cots by palangs and peris by chairs. The most important change is the use of sin and moral turpitude. Their contact with people from urban centers will further help in the adoption of innovations and socio-cultural changes Nathigali is not simply a tourist resort but a catalyst of positive change.

Demand and Supply Situation of Fuelwood in Jaffarabad district of Baslochistan. By Hizbullah (Advisor: Dr. Kanwar M. Suleman)

Pakistan is facing an acute shortage of fuelwood due to its poor forest resources which cover an area of 4.8 percent of the total area of the country. Government, due to its limited resources, is not able to provide natural gas facility to the whole country, therefore its supply is mostly limited to the urban area only. Situation in Jaffarabad district is not different from the other parts of the country, due to which it was selected as the study area to assess the demand and supply situation of fuelwood. In the rural area, 95.7 percent of the surveyed households used wood as the major source of fuelwood while urban area, due to natural gas supply, only 23.3 percent consumed fuelwood. Use of dung was also very common in the area. It was being consumed by 85.7 percent of the rural households and 16.7 percent of urban, due to the storage of fuelwood in the area. Other sources of fuel energy were electricity, LPG and kerosene oil.

Fuelwood consumption per household was calculated as 7.9 kg/day for the rural area and 8 kg/day for urban area. An average household consumed approximately 2900 kg of fuelwood per year. Projected fuelwood consumption for the year 2005 was estimated to be 324.2 kg/day and 348.6kg/day for the year 2010. A positive correlation was found between fuelwood consumption and income level, and negative between fuelwood consumption and education level. It was observed that with the increase in household size overall fuelwood consumption also increased but per capita consumption decreased.

Gaz (*Tamarix dioca*) was found to be the most abundant species available in the rural area for the purpose of use as fuelwood. Other species were mesquite (*Prosopis juliflora*, *Prosopis glandulosa*), kikar (*Acacia nilotica*) and gaz (*Tamarix aphylla*). However, the preferred species for the said purpose were kikar and kandi (*Prosopis cineraria*). We can, therefore, say that people are

using less preferred wood due to the shortage of desired species. In the urban area, however, mesquite and kikar were found to be the common species available, wood of which was imported from the adjacent areas of Sindh. A poor attitude of people towards farm forestry was observed during the survey, reasons of which being the lack of awareness and non-availability of plants.

Indus Delta Mangrove Forests-Economic Importance and Impact on Local Communities by Iftekhhar Ahmad (Advisor: Ms. Mamoonah Wali Muhammad)

The study was carried out in Indus Delta to assess the economic importance of mangrove forests and their impact on local communities. Among the eight villages in the total of two sub-divisions fifty households were selected randomly; 6-7 from each village. The results indicated that average household size was seven persons per household having 68% of them one earning member and 70% were directly employed in fishery sector. 80% respondents had their own livestock and agriculture land. *Avicennia marina* is mostly fed to the animals as lopped from vicinity forests. Water shortage, erosion and salinity were main problems faced by the agriculturists.

The study revealed that only 8% of the respondents were utilizing mangrove vegetation as a whole for fuel purpose. Responses about importance of mangroves showed that shelter and progress of fish was the first priority then shelter and progress of wild birds, shelter and progress of vertebrates. Fuel wood protection barriers for villages, control on tides and erosion of coastal banks, environment apiculture and eco-tourism, respectively. 100% of the respondents were in favour of social forestry schemes in the area and 92% of them were willing to plant coconut or date palm at their village Otak or house. Only 4% of the respondents reported that mangrove deterioration is severe due to livestock pressure and decreased fresh water flow down stream in Indus Delta; which resulted in high salinity and stunted growth of mangrove trees and animal life. They suggested increased fresh water down stream and control on camels, rotational grazing for livestock, control on cutting for fire purpose and construction of huts for effective regeneration development of mangrove vegetation.

The Role of AKRSP in Human Resource Development (HRD) of Northern Areas (A Case Study of Five Selected Villages of Gilgit district) by Sajjad Ahmad Khan (Advisor: Raja Mohammad Zarif)

The present study was conducted to evaluate the role of AKRSP in Human Resource Development, specifically in the field of agriculture, livestock and forestry in Gilgit sub-division of District Gilgit, Northern Areas. For this

purpose a total of 108 respondents trained by AKRSP in different sectors were randomly selected from the five sampled villages for interview. The data were collected with the help of pretested interview schedule and supplemented with general observations.

The house hold survey of Tehsil Gilgit in Northern Areas of Pakistan revealed that the sample populations were owner cultivators; hence their predominant occupation was farming. The main focus of AKRSP's trainings was on agriculture, livestock, forestry and enterprise development. Literacy rate of the respondents was 72.22 percent as compared to the overall literacy rate of 70 percent in the district of Gilgit. Majority of the respondents 60.18 percent were male whereas 39.81 percent were female. The trainings in forestry sector boosted the tradition of tree plantation in the study area. The respondents were trained in nursery raising, plantation techniques, soil conservation and forest protection, etc.

The change in number of different forest tree species by the sample respondents showed a significant increase in the area after the training initiative taken by the AKRSP. Similarly, fruit plants also showed a significant increase in their number and quality after the AKRSP stated training of growers in the area. The trainings given by AKRSP in all sectors also enhanced the income of the respondent. Prior to AKRSP intervention, 35 percent respondents were falling in the lowest income group with earnings below Rs. 1500 per month. The analysis revealed that the income of 70.37 percent respondents had doubled whereas 29.63 percent respondents have tripled their incomes.

Present Status of *Nannorrhops ritchieana* (Mazri) in districts Kark & Hangu by Alia Abbas Khattak (Advisor: Raja Muhammad Zarif)

Dwarf palm (*Nannorrhops ritchieana*) locally known as Mazri (Trans Indus) Maizary (Pushto), Kilu, Kalium (Salt Range), Patha (Punjabi) and Pesh, Peas, Dohra (Sindh, Baluchistan). Mazri is a gregarious, tufted low growing palm with robust, prostrate and branching stem, reaching a height of more than 6 m.

The plant grows naturally in Makran, Kharan, Khuzdar, Harnai and Sibi in Baluchistan and Kohat (Hangu, Teri, Thal), Kurram agency, North and South Waziristan and Paniala (D.I.Khan) in NWFP. The men, women and children of these areas are utilizing this natural resource for preparing various household and other utility articles such as mats, baskets, brushes, brooms, fans, hats, sandles, ropes and cordage, etc from Mazri leaves to generate income.

The average annual production of Mazri leaves in country during 2003-04

was estimated as 35,000 tonnes. Out of which 2000 tonnes were obtained from NWFP and about 33,000 tonnes from Baluchistan. The traditional uses of Mazri products are diminishing due to increasing labor cost. The production of Mazri can be enhanced by increasing the area under Mazri Plantations at suitable location.

Mostly the businessmen and wholesalers dealing in Mazri raw material and finished products were satisfied, however they complained about the delivery of finished goods, which do not reach to the market in time. The skilled/laborers had also complaints on minimum wages and consequently the young generation is not taking interest in this business. Therefore, the number of skilled people is decreasing gradually, which will effect the production of finished goods and also the whole Mazri business.

The production of Mazri is declining because of lack of regeneration, non-implementation of Mazri rules in their spirits, population pressure, absence of management plan, indiscriminate exploitation by Afghan Refugees and local population and increasing use of Mazri products of household importance. The household manufactures of Mazri products generally consider this process as secondary source of income. Therefore, no improvement could be brought in the production process to undertake large scale and cost effective business.

The study concludes that Mazri is a highly precious biological resource needing proper attention of Forest Department and local communities not only to maintain cottage industry and income level of concerned labor force but also to reduce erosion and keep environmental balance of the area. Efforts are also needed for the rehabilitation of Mazri areas and households gone out of production. Improved technical skill of labor and mechanization of technical process as well as regularization of technical process as well as regularization of marketing channels will have effect on business.

Importance and Utilization of Fast Growing Tree Species in Different Sports Goods Industries at Sialkot by Nisar-UI-Haq (Advisor: Dr. Altaf Hussain)

Sialkot is famous all over the world for its wood based and non-wood based sports goods production. These sport items are playing significant role in international market. The production of wood based sports goods i.e., hockey sticks, cricket bats, wooden rackets, etc. is entirely dependent on sustainable supply of wood of fast-growing tree species namely, poplar, mulberry, willow, bakain, etc. The present study investigates yearly production of wooden

products, yearly consumption of wooden species in different sports goods industries at Sialkot and identification of problems regarding the raw material (wood) supply. For this purpose a survey instrument (Questionnaire) was prepared.

Mulberry (*Morus alba*) is the only species used in hockey sticks manufacturing, which is obtained from Changa Manga, Daphar irrigated plantations and farmlands of NWFP. There is a considerable decrease in demand of wooden hockey stick because of durability and light weight of composite hockey during last few years.

Willow (*Salix alba*) and poplar (*Populus deltoids*) are the fast growing tree species used in hard ball and tennis ball bats manufacturing. Willow is imported from England in the form of cleft due to less availability of this wood in country. Poplar wood is obtained locally from farmlands of NWFP and Rawalakot (Azad Jammu and Kashmir). There is a considerable decrease in poplar wood supply from NWFP because of consumption of poplar in Match Industries in NWFP. In early 1990s there were 23 racket manufacturing industries at Sialkot, but now the number has reduced to 4 because of less demand of wooden rackets in international market.

Role of Medicinal Plants in the Household Economy of Poors in Chail Valley (Swat) by Rubina Noor (Advisor: Shakeel Haider Zaidi)

Medicinal plants play a significant role, not only due to its use as traditional medicines but also as trade commodities, which meet usually the demand of the distant markets. Demand for a wide variety of species collected from wild is increasing with growth in population, human needs and commercial trade.

The main objective of the study was determine household income from medicinal plants and their state of trade in Chail valley (Swat). In order to achieve the study objective, random sampling techniques was adopted and a field survey of 40 households was conducted. The respondents were interviewed from randomly selected villages of the valley. Questionnaire was used as an instrument of survey to obtain desired data.

Livelihoods of many households in the Chail valley are partially dependent upon the trade of medicinal and aromatic plants for centuries. As in the mountainous farming systems much of the agriculture is primarily subsistence. Medicinal plants have been a complementary cash-providing source. Majority of the rural households involved in the medicinal plants collection and sale are living

in abject poverty. Although the products collected have high value yet the collectors are unable to realize its actual value. The collectors not only are unaware of its true value but also are unable to market it in the appropriate form for its potential value.

The analysis of data indicated that average household size of the respondent population was about 9 persons. Lack of education in the area is due to poverty and lack of educational facilities. The average income of the sample population from the medicinal plants per season was estimated about Rs. 13,130 per annum. The average expenditure of the household per annum is approximately Rs. 53,040/-. People preferred medicinal plants collection and marketing than agriculture activity. Mostly those medicinal plants are collected which have market demand as cash income generation activity. In majority of the household both man and children were involved in the collection of medicinal plants during summer months

Studies on the Effect of two Mulberry Varieties on the Larval Growth and Cocoon Characters of Silkworm *Bombyx mori* L by Muhammad Nawaz Rajpar (Advisor: Wali-Ur-Rahman)

Research studies were conducted on the effect of leaves of two mulberry varieties, PFI-1 and Kanmasi, on the larval growth and cocoon characters of C-102, 206PO and 205PO (Chinese) and J-101, 205MKD and 206MKD (Japanese) silkworm strains of *Bombyx mori* L. The effect of PFI-1 mulberry variety was found better than the Kanmasi mulberry variety as it gave over Kanmasi an increased larval weight of 1.442 to 19.016 %, cocoon weight of 2.840 to 7.567 and shell weight of 0.038 to 3.212% of Chinese and Japanese silkworm strains.

The maximum figures obtained per 10 larvae by feeding PFI-1 and Kanmasi mulberry varieties to silkworm strains were larval weight of 33.246gm in 205PO (Chinese) and 33.372gm in 205MKD (Japanese), cocoon weight of 14.061gm in C-102 (Chinese) and 13.908gm in 205MKD (Japanese), cocoon shell weight of 3.088gm in C-102 (Chinese) and 3.035gm in J-101 (Japanese), cocoon shell ratio of 22.002% in C-102 (Chinese) and 22.475% in J-101 (Japanese) and good cocoons of 96.8% in C-102 (Chinese) and 95.2% in 206MKD (Japanese). The minimum larval and pupal mortality was recorded in 205PO and C-102 (Chinese) and J-101 (Japanese) strains when fed on PFI-1 and Kanmasi mulberry varieties.

Mapping Deforestation in Malam Jabba Hills of district Swat during 1992-2001 using GIS and Remote Sensing by Irfan Akhtar Iqbal (Advisor: Raja Ghayyas Ahmad)

The Malam Jabba Valley is famous for its enchanting beauty. The hills of this valley are covered with conifers and serve the conservation of the watershed. The alarming rate of deforestation of these hills may result in degradation of our valuable catchments. The main objective of this study was to detect the change that has taken place during the period 1992-2001. Extensive use was made of the GIS and Remote Sensing techniques to achieve the objective. A 10x10 km² plot was selected as a subset of the total area.

Supervised classification method was employed in this study. The study area was visited and coordinates of the plots were recorded with the help of GPS. Purposive sampling design was used in field data collection. The satellite image was classified with the help of these coordinates and their accuracies were determined.

Results indicate that the total deforestation in the area is 550 hectares with 492 hectares of reforestation. The net deforestation comes out to be 59 hectares. Moreover, there is a significant effect of the distance-to-roads and elevation classes. However, villages do not show any significant effect on the de/reforestation. The deforestation rate of the study area is 2.57% annually, which is less than that prevailing in Pakistan (2.4% to 2.9%). SPOT or IKONOS images can be used for better results as they are of high resolution. GIS and Remote Sensing are powerful and useful tools that can be used for comparative studies, change detection, mapping and planning.

Farmer's Perception towards Private Nurseries/Tree Plantings in the uplift of Rural Communities in Rawalpindi Circle by Junaid Mumtaz (Advisor: Ms. Mamoona Wali Muhammad)

The study was carried out in Rawalpindi and Attock Divisions of Rawalpindi Circle. The objectives were to identify farmers' perceptions towards private nursery/ tree plantings and to determine their role, influencing factors and constraints in the socio economic uplift of the rural communities. A random sampling procedure was adopted to select the five villages per division to collect the relevant data from 50 respondents, according to the tested structured questionnaire.

The study found that average household size was 6 persons with 1-2 earning /hh. 60% were literate including 2% with religious education. 30% of the respondents have agriculture as a sole source of livelihood whereas 70% also have other activities along with agriculture. Majority 94% were landowner with 6% tenants/landless. 54% respondents belonged to middle class (own pacca house and have less than 10 acres) have sufficient land to plant trees. Forest plantation of *Eucalyptus* species, Poplar and *Acacia modesta*, etc were found on 10-12% of land.

Majority 68% respondents use farm trees for mix of uses (timber, fuelwood, fodder) with preferred rotation age, expressed by 80% as 6-10 years. Out of total farm tree produce, 30% consumed for domestic fuel. 12% for roofing windows, poles etc; and 58% sold to get cash for family. 92% used standing sale procedure.

The nursery or tree have proved profitable economic activity for them. The 80-84% respondents perceived that the tree planting trend would increase in future. 78% showed their willingness to continue tree growing on their farms. 100% nursery farmers wanted to continue nursery raising business, about 60% grew nurseries of more than 50000 plants, 50% raised even 1-5 times and 50% upto 15 times. Forest Department was found effective source of information dissemination as expressed by 86% respondents followed by 6% newspapers and 4% TV and Radio media each.

Negative perceptions regarding effects of trees planting on agriculture crops is the major hindrance and be removed by conducting on farm relevant scientific research and disseminating the findings to the farmers.

Role of Agro Forestry/Farm Forestry in Wood Production and Farmers Perception in district Mardan by Muhammad Hussain (Advisor: Ms. Mammona Wali Muhammad)

This research was conducted in Mardan district with the objective to assess the contribution of farm forestry/agro forestry in meeting of the domestic requirements for fuel wood, timber, and fodder and ascertainment of farmer perception about farm tree.

Two stage random sampling was adopted for collection of the required information from fifty respondents through a structured questionnaire. The study revealed that majority of the population own sufficient area to grow trees. Relationship between average number of trees per acre and farmer category was highly significant. Average daily requirement for fuel wood is 13.2kg per

household. Majority of the population use fuel wood with other alternative in various proportion. 84% of the household obtains firewood from the trees growing on their farmlands. Annual timber requirement in 55.3 cft per household.

About 50% population meet their timber requirements from farm trees. Majority of population plant trees for firewood, timber and income purpose. Multi purpose role of farm tree has not been fully understood by the majority of the population. 76% of the farmer plant trees along water courses in linear way. Farmers express their apprehensions of hindrance by tree agriculture crop production. But they still prefer to grow trees on farmland. 50% of the farmers are the owner of the land while rest of the 50% is either tenant or lessee. Majority of population prefer to grow poplar on their fields. Most of the them have no problem in tree growing. Very few people use farm tree for fodder purpose. Relationship between education and preference to grow more trees was found not significant.

Recommendations include expansion of forest extension services, creating awareness regarding the multi purpose role of farm tree, purchase of seedling from progressive farmers and establishment of functional linkages between farmers and forestry research organization.

Role of Village Organization in Sustainable Management of Common Property Natural Resources in Miandam district Swat by Syed Asad Imran (Advisor: Ms. Mammona Wali Muhammad)

In District Swat a project was implemented during 7/96 to 6/2004 in the name of Forestry Sector Project (FSP). FSP aimed at arresting resource depletion in the area. It worked through Village Development Committees (VDCs). Focus of the project was the VDC role in the regulation of use and management of natural resources.

This study was conducted to explore the role of Village Development Committees (VDCs) in the management of Common Property Natural Resources (CPNRs) in the study area (Miandam). Main objectives of the study were: (1) Assess the role of Village Development Committees (VDCs/VOs) in sustainable management of Common Property Natural Resources (CPNR) and compare it with the past management systems. (2) Explore the strength and weakness of VDCs/VOs

The most potential villages of Gujaro Khuwar, Kairabad and Senai were selected for study in Miandam Resource Management Sub unit (RMS). Fifty

respondents were randomly selected in all the three villages amongst the entitled owners, users of the CPNR and VDCs members. Questionnaire, VDC meetings, open ended/ semi-guided interviews and available record were used as tools for exploration.

Three dimensions consist of period, hillside and management systems were major focus of this study. The period have been distinguished as that of the Seat state (upto 1969), post state (1970-96), FSP (1996-June/2004) and post FSP (July 2004 on ward). The hillsides have been differentiated as communal hillside and natural forests. Management system is looked with reference to technical and organizational aspects. Main focus of the study was FSP (1996 - 2004) period as yardstick for comparison with other period is characterized of heavy external (technical and financial) inputs. The VDC has arrived as the governing entity in the management of village resources. Organizationally VDC take care of both privileged (owners) and marginalized (tenants, gujars, etc) segment of the village. Elders and youth are simultaneously included in the decision making process. Transparency in the procedures displayed. VDC works as a bridge between local community and forest department. It resolves the conflicts, provide opportunities for leadership making.

Nagha is the main technical feature in the management. Forest department also supported this Nagha at least unofficially. Qalang system has been banned in communal hillside for controlling the overuse of the resources. No-owners have been shared by the owners in local quota timber from natural forests.

Income generation with local resources like grass cutting passes, membership and monthly subscription fee etc has been innovated. Sustainability of VDC is still a dilemma and potentials of VDC have not been explored till now. Constraints of the VDC's were the lack of technical and financial support, which were required for the full maturity of the VDC's established by FSP. On the basis of analysis, following suggestions have been explored for the improvement.

- Institutional strengthening of VDC.
- Developing innovating mechanisms for fund raising, to ensure sustainability.
- Capacity building of these organizations.
- Effective networking and to ensure legal coverage.
- Exploring possibilities for involvement of VDCs in natural forest protection/management.

Effect of Forest Recreation on Natural Resources and its Improvement in Mingora, district Swat by Shah Nawaz Khan (Advisor: Syed Zainul Arifeen)

The study "Effect of Forest Recreation on natural resources and its improvement in Mingora, District Swat" was aimed at the assessment of effect of development of forest recreation in Mingora on the local natural resources and the ascertainment of the views of local people and visitors about forest recreation potential of Mingora.

For this purpose fifty households in the area and fifty visitors were randomly selected and interviewed through structured questionnaires. The data were analyzed statistically. The analysis of data revealed that the development of forest recreation in the area had positive effects on forest cover and forest cover had increased due to afforestation works. Fuel wood pattern had changed now and people were using LPG and Kerosene oil with firewood thus reducing pressure on local forests.

Among the negative effects of forest recreation on forest resources was the increase in livestock population in the area for supplying milk and meat for consumption of the tourists. The livestock of the area grazed and browsed in the forests resulting in damages to plants and soil. The environment had become more polluted mainly due to vehicular traffic and improper waste disposal by the recreationists. Number of fresh water springs had dwindled over the years due to over use. It was found that wildlife status of the area had been adversely affected due to development of forest recreation.

The forest recreationists were found largely satisfied with the recreation facilities provided in the area and favoured further development of recreation opportunities. On the other hand, the local people neither favoured further development of forest recreation in the area nor opposed it strongly. Their response was mixed.

Population Status, Distribution Pattern and Habitat of Grey Partridge (*Francolinus pondicerianus*) in district Mardan by Said Kamal (Advisor: Mian Muhammad Shafiq)

Grey partridge, a famous game bird, found in all the four provinces of Pakistan. In N.W.F.P. various public, private and community game reserves have been established for the protection and sustainable utilization of this game bird. Regular survey of this bird is important and pre-requisite for ascertaining the harvest level in game reserves.

Grey partridges are widely and evenly distributed throughout the Indus plains penetrating into the major desert tracts as well as in the arid broken foot hills to the west of the Indus, more plentiful in undisturbed tropical thorn forests, lower hills of Makran and Lasbela. Sindh including the Thar desert, Punjab, including the Salt range and Thal desert. In N.W.F.P. district Mardan, Swabi, Kohat, Bannu, Buner and Swat, etc. also found in the irrigated plantations and outer slopes of the Kirthar hill at 900 meters elevation as well as deep into the sand dune desert such as around Yazman in Cholistan (Robert, 1991). Grey partridge is found in Mardan district in foothills of scrub forest, agricultural crop lands and low hills.

Due to increasing human population, habitat destruction, use of pesticides, quarrying, illegal hunting and poaching has declined the population of wildlife in certain areas of Pakistan. Grey partridge was the prominent game bird of Mardan district, but now the number of this bird has decreased to an alarming extent. Study of population status, distribution pattern in various habitats and the most preferred habitat of grey partridge is a pre-requisite to decide any conservation and management strategy of this particular game bird.

For the protection and management of this bird Public and Private community game reserves have been established and some are under proposed, covering about 10.4% area of the total district area (1632 sq.km).

A survey of six selected habitats, present in the study area was conducted by applying sampling method. Four sample blocks, each of (10) hectares were taken in each habitat and vegetation composition, vegetation cover percent, and the number of partridges present in the sample blocks were recorded.

The study indicates that the population status of grey partridge in the whole district was common in the scrub forest adjoining croplands and scrub forest in areas of Peersai Badam, Jalil, Kohibermol and Babozai, due to suitable habitat and un-disturbance. But in areas where there is no suitable habitat the status is rare in habitats of irrigated plantation (Mayar & Pirsaddo), normal croplands (Katlang & Military Farm), cropland adjoining wetland (Oru & Mohib banda), Alkaline waste and cropland (Garhi & Mohabatabad) area. Scrub forest adjoining croplands was found the most favourable habitat due to availability of proper habitat and un-disturbance. The other favorable habitat is scrub-forest where good shelter, food and un-disturbance is available to this bird. For the distribution pattern it was observed that it differs with in each and among various habitats.

Perception of Farmers about Tree Planting in district Karak by Uzma Rehman (Advisor: Mr. Saliheen Khan)

Some decades ago forests used to exist in most parts of the territory now comprising Pakistan. At that time the country's population was small, subsisting mainly on the cultivation along river valleys. Pakistan is one of the poor countries in the world and the meager natural resources particularly forests are being affected due to these conditions. Forests now cover about 4.72 million hectares or 5.4 percent of the total area. (Annual Progress Report 2003) during 1999-2000 where as the average forest percentage in Asian countries is 21, in Africa 32 and in North America 53, of total land area (World resource Institute). Deforestation has taken place at an alarming pace. The roots of problem are felt to be aridity, high rate of population growth and rising social expectations of the rural residents. More than 60 percent of the area of Pakistan comes under arid and semi arid conditions, where precipitation is too low to support vegetation. Rapid increase in population has also brought forests under pressure. Pakistan is one of the most populous countries of the world. According to Population Census organization, the total human population of Pakistan in July 1998 was 131.70 million and is estimated to reach 140.47 million by 2001. (Federal Bureau of Statistics, GoP, 2003), and 149.62 million by 2004. According to this population estimate per capita forest area comes to be 0.03 ha where as the world's average per capita forest area is one hectare. This clearly underlines the need for measure to increase the area under forest and to make most efficient use of the available forests.

The forestry sector contributes only 0.3% to the GNP but this does not include the intangible benefits of forests. The total estimated consumption of industrial wood in 1996 was 3300 thousand cubic meter. The state forests contributed to 363.22 thousand cubic meter. Forest and related industries employ 0.5 million workers in logging, village carpentry and use timber components for the construction industry. Forests also contributes 32% of total energy needs as fuelwood. Ninety percent of rural and 60% of urban households use fuelwood and other forms of biomass as their primary source of energy.

On account of scarcity of wood and high prices the per capita consumption of timber is much constrained. It is estimated around 0.026 m^3 which is among the lowest in the world. For the population of 134.28, 137.69 and 140.95 million in 1997-98, 1998-99 and 1999-2000 the timber demand was 3.49, 3.58 and 3.67 million m^3 respectively. Of this 8.40 percent was supplied by the state controlled forests for the year 1999-2000. Regarding the end uses of the timber, nearly 1/3 is used in building construction, panel products account for another 1/3 and remaining is used in various wood based industries.

The per capita consumption of firewood is estimated at 0.184 m³ per annum. For the population of 134.28, 137.69 and 140.95 million in 1997-98, 1998-99 and 1999-2000 firewood consumption was 24.71, 25.33 and 25.94 million m³ respectively. The contribution of farmlands and wastelands was 24.50, 24.93 and 25.51 million m³ for the year 1997-98, 1998-99 and 1999-2000 respectively, the rest is supplied from the state controlled forests in the form of recorded removals and bio-mass generated during conversion operations. The entire demand for fuelwood is met from indigenous sources, the recorded production from state owned forests being only 0.2 million cubic meters (Annual Progress Report PFI, 2003).

In a developing country like Pakistan, wood still remains the principal source of energy for cooking and heating. Collection of fallen leaves, twigs, branches, roots, greases and shrubs etc. by the rural population is a familiar sight.

This indicates the scarcity of wood for the most basic requirement of the vast majority of the country's population.

Farm forestry is integrated part of agriculture since the time immemorial. People have been cultivating crops along with natural and/or planted trees on farmlands. The pattern of trees growing on farmlands and their number increased or decreased depending upon their beneficial use and income generated by marketing these.

The household and market demand play vital role in the introduction of trees on farmlands. In addition to these the soil fertility and climate or availability of water do play a significant role in the introduction of tree species on the farmlands. The rainfed areas particularly having rainfall less than 20 inches lack tree cover on farmlands. The climatic factors greatly influence the tree cover on farmlands in such regions inspite of household and market demands for timber and fuelwood. Socio-economic conditions of the population also effect the adoption of farm forestry.

Currently approximately 73% of the timber used in Pakistan comes from the farmlands/wasteland within the country. But if the imports are excluded, the contribution of farm forestry to timber consumption in Pakistan jumps to 78 percent. For fuelwood the dependence on farmland is even greater; an estimated 99 percent, with state forest generating the remaining 1 percent. The wood consumption is given in table 1.1.

Perception and Constraints of Farmers in Farm Forestry in district Nawab Shah by Imtiaz Hussain Solangi (Advisor: Raja Muhammad Zarif)

The study was conducted in district Nawabshah and dealt with two main objectives: To determine the influence of major socio-economic factors for adoption of farm forestry and to determine the constraints in the way of tree planting on farmlands:

The study area comprised of three tehsils for which a sample size of 60 respondents was fixed and 20 respondents from each tehsil were selected randomly not exceeding two persons from the same village.

The most common tree growing advantages, enumerated by the farmers other than the income were: fuelwood, timber, fodder, control of water logging and salinity, aesthetic and environmental values, and best use of waste land.

The main disadvantages of trees perceived by the farmers were: reduction in agriculture crop production due to competition and shade, lowering of water table, occupying of space and high initial costs. The farmers perceived that the major constraints to grow trees on farmlands were shortage of water and improper marketing mechanism. The other less important constraints were grazing, non-availability of labor for planting and harvesting, transport, long gestation period and shortage of land. Effective extension is needed to remove miss-concepts and myths prevailing among tree farming communities. The farmers should be encouraged through incentives, research and demonstration plots to grow most profitable and economical species on farmlands. Private investors be attracted to invest in the establishment of plantation on waste lands and farmlands.

Scope of Dry Afforestation Techniques in Quetta and Mastung districts of Balochistan by Abdul Waheed Baloch (Advisor: Siraj-ud-Din)

Rainwater harvesting and dry afforestation techniques were compared with conventional method of planting (simple pit planting) of three species viz. *Pistacia khinjak*, *Elaeagnus angustifolium* and *Atriplex* spp. at Mianghundi Quetta. The above techniques were also compared at Karak valley on *Atriplex canisence*, *A. lentiformis*, *Ailanthus* sp. and *Eucalyptus camaldulensis*. Data on survival of all species and height of *Atriplex canisence* were recorded and analyzed.

The survival of species at Mianghundi was 48%, 43%, 33% and 30%, respectively while in simple pits it was 26%. But at Karak valley it was 55%, 48%,

43% and 38% and in simple plant pits survival was 33%. The average height growth of *Atriplex canescens* under different water harvesting techniques was 1.412m, 1.350m, 1.346m respectively, while in simple pit planting it was 1.270m.

The sand dune at Mastung valley of Balochistan is not only making local lands unproductive and sterile but they are a constant threat to roads, railways and communication and is never ending problem. During storms the sand chocks karezes, pours into houses and covers the roads. At Mastung for sand dune stabilization trenches and simple pits were compared with surface planting on the following species *Tamarix gallaca*, *Calligonum spp.* *Saccharum spp.* and *Arundo donax*. The survival of species at Mastung under trenches and simple pits was 70.5% and 58%, respectively while in surface planting it was only 36.5%.