

Assessing the Actual Status and Farmer's Attitude towards Agroforestry in Chiniot, Pakistan

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Abstract—In Pakistan, major demands of fuel wood and timber wood are fulfilled by agroforestry. However, the information regarding economic significance of agroforestry and its productivity in Pakistan is still insufficient and unreliable. Survey of field conditions to examine the agroforestry status at local level helps us to know the future trends and to formulate the policies for sustainable wood supply. The objectives of this research were to examine the actual status and potential of agroforestry and to point out the barriers that are faced by farmers in the adoption of agroforestry. Research was carried out in Chiniot district, Pakistan because it is the famous city for furniture industry that is largely dependent on farm trees. A detailed survey of district Chiniot was carried out from 150 randomly selected farmer respondents using multi-objective oriented and pre-tested questionnaire. It was found that linear tree planting method was more adopted (45%) as compared to linear + interplanting (42%) and/or compact planting (12.6%). Chi-square values at P-value <0.5 showed that age (11.35) and education (17.09) were two more important factors in the quick adoption of agroforestry as compared to land holdings (P-value of 0.7). The major reason of agroforestry adoption was to obtain income, fodder and fuelwood. The most dominant species in farmlands was shisham (*Dalbergia sissoo*) but since last five years, mostly farmers were growing Sufeida (*Eucalyptus camaldulensis*), kikar (*Acacia nilotica*) and popular (*Populus deltoides*) on their fields due to "Shisham die-back" problem. It was found that agro-forestry can be increased by providing good quality planting material to farmers and improving wood markets.

Keywords—Agroforestry, trees, services, agriculture, farmers.

I. INTRODUCTION

AGRICULTURE is the foundation of Pakistan economy, which is contributing about 22% of the total GDP (Gross Domestic Product) of the country [1] and also providing employment to about 65.9% inhabitants mostly residing in rural areas [2]. Around 22.15 million hectares from the total area of Pakistan is under cropping system, out of that 76% of the cultivated area is under irrigation [2]. Twenty-nine percent of rural community is below poverty line, earning only Rs. 878.64 per adult per month [1]. Therefore, the need of the time is to justify their daily requirements of life by the technical use

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of natural resources such as agriculture, livestock, poultry, and forestry up to their possible potential. Besides livestock and agriculture, the best solution to overcome this lack of income generation and natural resources is tree growing on farmlands.

The current area under forests is only 4.7% of total surface area of Pakistan [2]. Due to several administrative, financial and technical problems, in last decade, Pakistan has lost about 0.21 million hectare of forests with an average of 0.043 hectare per annum [3]. Current deforestation rate is 2.1%, the highest among south Asian countries. Rapid decrease in forest cover has resulted in increased environmental degradation, pollution, land-degradation, loss of bio-diversity and low agriculture yields [4]. According to Forestry Sector Master Plan [5], the annual production of the wood in Pakistan is 7.7 million m³ of which about 4.4 million m³ (53%) is contributed by the farmland trees [6]. However, at the present, farm trees are fulfilling the requirement of 90% fuel-wood and 60% timber-wood at national level [7].

Many tree crop combinations are used in different sites and in different environments to get the maximum benefits from the land. Majority of people value agroforestry and consider that it provides the net positive benefits [3]. The dependence on conventional fuels like firewood (which alone accounts for 50% of the rural fuel needs [8], [9], cow dung, and agricultural residue also highlights the importance of agroforestry trees in solving energy needs of rural communities [10]. Benefits obtained from farm trees include wood used for construction and paper production; wood used for fuel and wide range of non-wood forest products such as fodder, food, pharmaceuticals, dyes, tannins, cosmetics, essential oils, garden plants and resin. Other benefits include conservation of soil, water and biodiversity, protection from natural hazards; and climate amelioration.

Agroforestry is playing an important role in the running and establishment of furniture industry in Chiniot - a recently announced district. In this region, furniture industry prospered vastly and become the major source of employment and revenue generation. Almost 6000 furniture workshops are working in Chiniot, which plays an important role in providing direct employment to over 40,000 people. During 2002-2003, only wooden furniture was exported from Pakistan, having worth of \$8.9 million: 17% furniture was exported to the U.S.A, 15% to the U.A.E, 12% to the Afghanistan, 11% to the UK, 5% to Spain including 40% to other countries [11]. According to Tehsil Municipal Administration (TMA) Chiniot [12], about 80% demands of Pakistani market are met by the Chinioti furniture. However, Shisham tree (*Dalbergia sissoo*) wood, that is the major raw

material, had been under the attack of an unknown disease (commonly referred as dieback disease) for the last few years [13]. Consequently, the quantity of shisham wood is decreasing in the market and its prices are inflating. Moreover, due to lack of Govt. interest, high inflation rate, choice of trees, family pressure, and small land holding size, the people are not willing to grow trees on their farms. In recent times, farmers consider the trees as a barrier to development, as a harbored of pests that prey on livestock and as a heaven for plant pests and diseases. So, it is also the need of time to explore the options of using the wood of alternate trees and future trends of planting the farm trees should be accordingly. In the above mentioned scenario, it is very important to determine the current status, future needs and potentials of agroforestry development in Chiniot district to ensure the survival and growth of furniture industry in the years to come. The objectives of the study were to determine the current status and future trends of agroforestry in Chiniot district, to analyse the economic benefits of agroforestry and to sort out the problems faced by farmers, in the study area, in the increment of agroforestry practices.

II. MATERIAL AND METHODS

A. Study Area

For the identification of socio-economic conditions of farmers, socio-economic factors affecting agroforestry system, to know the current pattern and future trends, to analyze the different problems and for prospects of agroforestry system, Chiniot district was selected. Chiniot district comprises of 3 tehsiles: Chiniot, Lalian and Bhowana. Chiniot is a separate district under division Faisalabad. The city is famous due to its furniture articles. It is also famous for different wooden handicrafts of wood making in it having a good fame all around the world. The land in Chiniot is fertile land; there are many canals which irrigate the farms nearby the districts. This canal water makes land very fertile and productive. Areas near Chenab River are flooded in monsoon season. The climate of district Chiniot is hot summer and short severe winter. The ever highest temperature recorded in the city is 48 °C and the lowest temperature recorded is -1 °C during winter.

B. Data Collection and Analysis

A pre-tested questionnaire was developed through a proper and consultative process, keeping in view the goals and objective of study. Various parameters were included in the questionnaire e.g. preference of tree plantation, relationship of area under agroforestry with family size and income, relationship of area under agroforestry with education of farmer, farmer perception, Species distribution and price variation vs. problems and constraints in marketing. A data from 150 farmers, 50 from each Tehsil out of 3 were collected from different villages. Quantitative data was analyzed through various statistical techniques i.e. univariate descriptive techniques. In univariate analysis such as frequency, percentage and measures of central tendency (mean, standard deviation) were used to describe the data.

III. RESULT AND DISCUSSION

Socio-economic characteristics of the farmers play an important role in determining their attitude towards the adoption or rejection of new ideas [14]. It is thought that characteristics like age, education, size of land holding and annual income of the respondents affect the awareness. In order to determine the relationship between the socio-economic characteristics of the respondents and the awareness and adoption agroforestry practices, chi-square test was used as statistical techniques for better judgment of responses of the respondents divided into three categories (low, medium and high).

TABLE I
ASSOCIATION BETWEEN AGE OF THE RESPONDENTS AND THEIR AWARENESS LEVEL REGARDING AGROFORESTRY PRACTICES

Age (years)	Awareness level of agroforestry practices			Total
	Low	Medium	High	
Young up to 35	12 8.0%	13 8.6%	11 7.4%	36 24.0%
Middle 36-50	12 8.0%	20 13.3%	30 20.0%	62 41%
Above 50	17 11.3%	15 10.0%	20 13.3%	52 35%
Total	41 27.3%	48 32.0%	61 40.6%	150 100%

Chi-Square = 11.35; D. f = 4; P-value = 0.20; Gamma = .332

Chi-square value (011.35) showed a high significant ($p = 0.20$) association between age of the respondent and their awareness about agroforestry practices, the gamma value showed a positive relationship between the variables (Table I). Data clearly indicated that aged farmers had more awareness as compared to young farmers. So, the hypothesis "higher the age of the farmers, higher will be the awareness level regarding agroforestry practices" is accepted. The above mentioned results are matched with [14] who found that the age of respondents had positive association with their awareness level.

The Chi-square value (7.29) showed a non-significant ($P = .788$) Association between size of land holding (acre) of the respondent and their awareness about Agroforestry practices (Table II). The gamma value showed a positive relationship between the variables. Data revealed that large landholding farmers had no more awareness as compare to small farmers. So the hypothesis "Higher the size of land holding of the respondents, higher will be the awareness about agroforestry practices" is not accepted. Similar results were indicated by [3] who found that size of land holding showed positive association with awareness.

Chi-square value (17.099) showed a highly significant ($P = .022$) association between the education of the respondent and their awareness about the agroforestry practices (Table III). The gamma value showed a positive relationship between the variables. Data clearly indicated that educated farmers had more awareness as compare to illiterate farmers. So the hypothesis "Higher the education of the respondents, higher will be the awareness about agroforestry practices" is

accepted. Similar results were obtained by [15], they reported that education was found to have a highly significant positive relationship with awareness.

TABLE II
ASSOCIATION BETWEEN SIZE OF LAND HOLDING OF THE RESPONDENTS AND THEIR AWARENESS LEVEL REGARDING AGROFORESTRY PRACTICES

Size of Land holding (acres)	Awareness level of agroforestry practices			Total
	Low	Medium	High	
Small up to 12.5	11 7.3%	42 28.0%	23 15.3%	72 48.0%
Medium 12.5-25	7 4.6%	32 21.3%	17 11.3%	55 36.6%
Above 25	3 2%	5 3.3%	10 6.6%	23 15.3%
Total	18 14.0%	79 52.6%	49 33.3%	150 100%

Chi-Square = 7.29 D. f=4; P-value = 0.788^{NS} Gamma=0.169

Fig. 1 (a) shows that only 12.6% of respondents have planted only trees in the form of compact block plantations. Other 87.6% of the respondents planted trees with different crops out of which 44.6% planted in the form of linear plantation and 42.5% of the respondents planted trees in linear form as well as inter planting. As shown in Fig. 1 (b), *Acacia nilotica* (Kikar) was the more preferable tree by farmers (33%) in term of financial returns. *Dalbergia sissoo* (Shisham) was preferred after kikar (26.6%) and then *Eucalyptus camaldulensis* (sufeida) and *Populus deltoides* (popular) by 23.4% and 16.7% of respondents respectively.

TABLE III
ASSOCIATION BETWEEN EDUCATION OF THE RESPONDENTS AND THEIR AWARENESS LEVEL REGARDING AGROFORESTRY PRACTICES

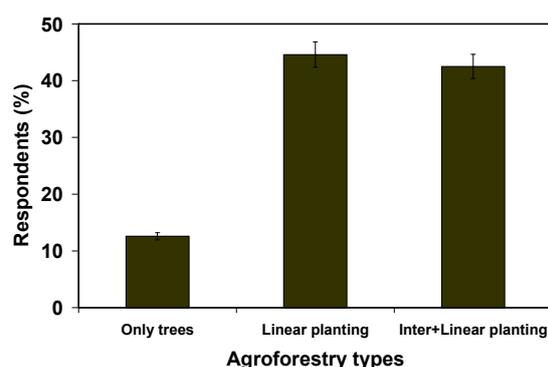
Education	Awareness level of agroforestry practices			Total
	Low	Medium	High	
Illiterate	10 6.6%	12 8.0%	39 26.66%	61 40.6%
Up to Primary	14 9.3%	12 8.0%	8 5.33%	34 22.6%
Up to Matric	14 9.33%	8 5.33%	17 11.3%	39 26.0%
Above Matric	6 4.0%	6 4.0%	4 2.6%	26 17.3%
Total	44 29.3%	38 25.3%	68 45.3%	150 100%

Chi-Square = 17.099; D. f= 6; P-value= 0.02; Gamma= 0.299

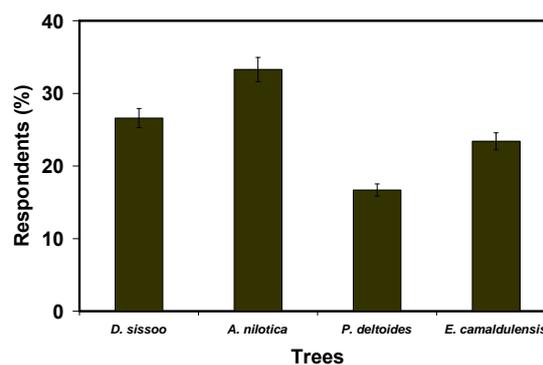
Current status of agroforestry, in the study area was slightly different from preferences as shown in Fig. 1 (c). *Dalbergia sissoo* trees were found the most abundant trees in farm field (35%) followed by *Acacia nilotica* (24%) and *Populus deltoides* (16%). *Morus alba* (10%) and *Melia azedarach* (5%) were also present in the considerable numbers on the farm fields. Other trees (10%) included *Eucalyptus camaldulensis*, *Mangifera indica*, *Ziziphus mauritiana* etc. which were present less than 3%.

Farmers preferred the linear planting of trees either around the crops or along water channels, as in this way the

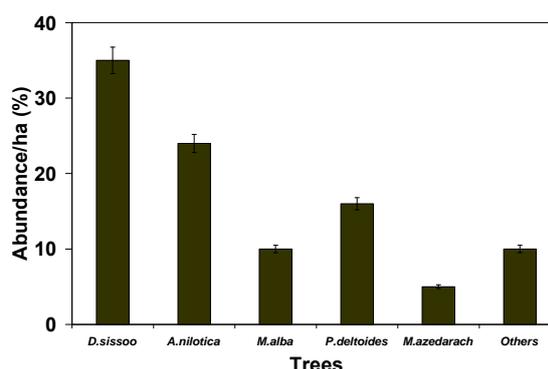
competition between crops and trees were the minimum and revenue generation was the maximum. Fig. 1 clearly showed that, currently, *D. sissoo* is the most abundant tree but farmers preferred more *A nilotica* due to dieback disease incidences in *D. sissoo* mature trees. Both above mentioned hardwood trees are renowned for their timber value in the Pakistan but former one (shisham) has more value in local furniture market and more abundantly was grown in past. Other trees were planted for fuelwood, fruit, manufacturing of boxes (*P. deltoides*) and shade.



(a)



(b)



(c)

Fig. 1 Agroforestry status in the Chiniot district: (a) Tree planting types (b) Farmers' preferences for trees (c) Abundance of trees on farmlands

The data recorded in Table IV shows that half of the respondents (50.0%) were agreed about the positive effects of agroforestry and they thought that agroforestry helped the farmer in financial terms. On the other hand, 37% of the respondents were disagreed. And, they just thought that trees create competition for nutrients with other crops that directly affect the crop yield. These results are more or less similar to [16]. More than half of the respondents (67%) agreed about the positive effects of agroforestry as wind breakers and soil stabilization. They thought that agroforestry helped the farmers by controlling wind erosion. Only 3.2% of the respondents were against this while reasoning same statement that trees compete with crops. Moreover, a vast majority (87%) of the respondents have the opinion that need of wood in future would increase as population is increasing rapidly. Only 3.4% of the respondents were disagreed and they thought that increasing use of steel and plastic in furniture and domestic utilities will result in decrease in future wood demand. Remaining 10.0% of the farmers thought that the need will remain same.

TABLE IV
PERCEPTION OF FARMERS ABOUT AGROFORESTRY BENEFITS AND FUTURE SCENARIO

Benefits	Agree (%)	Disagree (%)	Uncertain (%)
Financial	50	37	13
Environmental	67	3	30
Increment in future wood demands	87	3	10

Fig. 2 (a) shows that maximum number of farmers planted *E. camaldulensis* in the last five years starting from 2008-09 followed by the *P. deltoides*. So, in future both these species are thought to replace *D. sissoo* and *A. nilotica*. Because of dieback disease incidences in *D. sissoo* and knot formation in *A. nilotica*, farmers have no option other than to grow fast growing tree species with straight stems in spite of high market value of previously planted hardwoods. This tree planting trend in the disfavour of *D. sissoo* (shisham) can cause huge loss to Shisham dependent furniture industry in Chiniot. Most of the farmers (60%) thought that financial help in term of subsidies on growing trees, free of cost planting material, interest free loans etc. and improvement in wood market (20%) could boost up agroforestry in this wood deficient country (Fig. 2 (b)). Some farmers also thought there is lack of awareness and training in post tree-planting cares and this could be a cause of hindrance in the promotion of agroforestry in Pakistan.

IV. CONCLUSION

Furniture industry of the Chiniot district is totally dependant on the *D. sissoo* wood extracted from nearby farmlands. However, high incidences of dieback problem in this hardwood have resulted in the replacement of *D. sissoo* with *E. camaldulensis* and *P. deltoides* in previous five years. This replacement can cause huge loss to furniture industry in future if furniture industry could not find the alternative of *D. sissoo* in meanwhile.

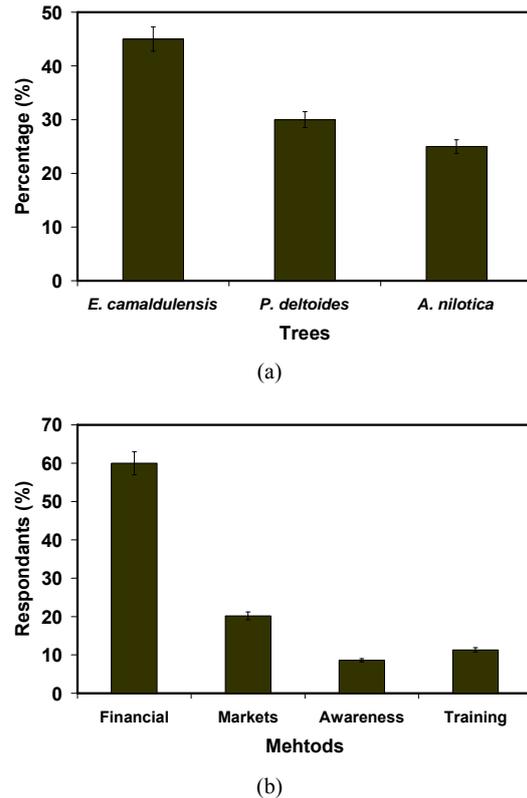


Fig. 2 Agroforestry trends and requirements in Chiniot district: (a) Last five year trends of agroforestry (b) Requirements to promote the agroforestry

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