

## IMPACT OF AGROFORESTRY ON THE LIVELIHOOD OF FARMERS IN DISTRICT BANNU, KHYBER PAKHTUNKHWA

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### ABSTRACT

Agroforestry, a term, involves the deliberate growing of trees and shrubs with crops and/or animals in interacting combinations for a variety of objectives. Historically, farmers often retained trees on their farms to sustain agricultural production, reduce soil erosion, retain water and provide shade, and generate income. The study was conducted in District Bannu. For the comprehensive study of agroforestry both primary and secondary data were obtained. Major portion of secondary data was obtained from Census Report (2017) of district Bannu. Primary data were collected by a well-designed questionnaire, which was developed by keeping in view of the purpose of study. For this purpose, both close-ended and open-ended questions were prepared and key farmers were interviewed. The study was conducted for the purpose to explore the impacts of Agroforestry on livelihood of farmers, and make recommendation for the improvement of Agroforestry. Majority of the population is in favor of that the production of the agricultural crops is increased with agroforestry and they are receiving the benefits in form of fuelwood, timber, aesthetic value, control soil erosion and environmental improvement. The study reveals that, average income from selling the farm trees upon maturity by the framers is Rs 236954 / annum. The study suggests that technical guidance is more important because farmers have no idea which species to plant and how to plant, that can lead to more production. The study also recommends to solve the sale problems, that is wood based industries be established in the rural area to make the efficient use of wood grown on farmlands.

### INTRODUCTION

In Pakistan, the rural population relies heavily on the forests for daily needs. The current forest area is only 4.7% of the country's surface which is too low to meet the environmental and socioeconomic needs of the country (Rahman, 2003). Sindh, Baluchistan, Punjab, Khyber Pukhtun Khawa (KP), Azad Kashmir, and Northern parts of Pakistan have a total forest area of 0.92, 0.33, 0.69, 1.21, 0.42, and 0.66 million ha, respectively (Rahman, 2003). Deforestation and environmental degradation are the major problems of Pakistan. It has a poor forestry resource and one of the lowest proportions of forest area in the world (Green, 2019). Agroforestry is one of the options for reversing the prevalent land degradation. Agroforestry, a term with a broad definition, is the planned cultivation of trees and shrubs along with crops and/or animals to achieve a range of goals (Nair, 2005). In a limited amount of time and space, well-managed agroforestry systems can maximize productivity while delivering advantages like soil stabilization and wildlife habitat. In the past, farmers frequently kept trees on

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their properties to maintain agricultural output, prevent soil erosion, water holding capacity, provide shade, and earn the money (Rehman *et al.*, 2018). In the 1970s, the concept of planting trees was considered as a potential method of meeting local needs and preserving the environment. Many common phrases with "forestry" endings, like social forestry, community forestry, and agroforestry, were originated as a result of the increasing interest in planting and managing trees around the world (Tamale *et al.*, 1995). Farmers all over world have long used the old technique of intimately combining the cultivation of trees with agricultural crops (Nair, 1993). However, this "farming system" is no longer popular in Europe, it was employed extensively in Finland till the beginning of the century and in a few regions in Germany as late as the 1920s. In Africa, situations were a little different. Yams, maize, pumpkins, and beans were mainly grown together in southern Nigeria under a cover of scattered trees (Wilken, 1976). As early as 1944, both theoretical and practical description of agroforestry in Pakistan was presented. All of the country's province's farming systems included the agroforestry as a necessary element. Since the implementation of donor-funded programs and rising awareness of the advantages from such systems led by governmental institutions, these systems have received more focus and importance in recent decades. Pakistan's first national social/agroforestry program, the "Forestry Planning and Development Project" was started in 1985. Later study showed that in semi-arid regions of the nation, intercropping and integrating livestock successfully reduced the consequences of crop failure (Baig *et al.*, 2021). *Dalbergia sissoo* (Shisham) is grown for the same objectives in the Punjab province irrigated areas. Such trees are generally planted as windbreaks or shelterbelts along the edges of agricultural fields (Baig *et al.*, 2021). The Khyber Pakhtunkhwa (KP) Province, which is located in the northern region of the country, is home to the majority of the country's natural forests. Farming practices in the KP Province take into account its higher elevations. Additionally, numerous *Populus* species have been planted in the province (Jamilu *et al.*, 2014).

## MATERIAL AND METHODS

District Bannu came into existence in 1861. Bannu is located in the midst of a circular alluvial plain that is watered by the Kurram River and its tributary, the Tochi, and is surrounded by low hills (Gambila). The district is located between latitudes of 32° 43' and 33° 06' north and longitudes of 70° 22' to 70° 57' east. Its northern boundary is formed by the tribal region, its eastern boundary by Karak district, its southern boundary by Lakki Marwat district, and its western boundary by the North Waziristan district and the tribal region that borders Bannu and Lakki Marwat Districts.

## METHODOLOGY

Primary and secondary data were collected for the detailed study of agroforestry. The majority of secondary information was obtained from the Bannu district census report (2017). Primary data were gathered using a collected well-designed questionnaire created with the study's objectives in mind. Furthermore, to sample respondents, semi-structured and open-ended questions were developed for this purpose, and key farmers were interviewed.

### Sampling Design

There are two stages for the purpose of selecting respondents. At the beginning, ten villages were chosen at random. The union councils provided voter lists for these ten sampled villages in the second stage. Only the names of the family heads were sequentially marked, and the sample was drawn at random for each village's respondents. As a result, 5 respondents were chosen from each village. As a result, 50 respondents were chosen from the sampling universe to interview together about the study's purpose.

The distribution of sample respondents as per sample village is given in Table.

Table: The Distribution of Sample Respondents

S.No	Name of Village	No. of Respondents
1.	Nikum kakki	5
2.	Tore kakki	5
3.	Murad khan kakki	5
4.	Daud shah	5
5.	Mandan	5
6.	Sandu kala Domel	5
7.	Patal khel	5
8.	Kotka Muhammad khan Domel	5
9.	Nian gul khel	5
10.	Wazir kala	5

### Data Collection

The direct interview method was used to collect data. Personal interviews were conducted with respondents at their hujras / farms. The purpose of the research was described to each respondent, and his responses were documented in accordance with the questions posed. The questionnaire was written in English, but the questions were exactly translated and asked in the local language (Pashto) for better understanding and communication with the respondents in order to obtain reliable and accurate information.

## Data Processing and Analysis

The data collected was then graphed, tabulated and percentages were calculated for different variables.

## RESULTS AND DISCUSSION

Ten different villages of Bannu, were selected for the study in district Bannu, Khyber Pakhtunkhwa. This study was conducted to assess the farmer attitude towards agroforestry and know their perception of knowledge regarding agro forestry.

### Age of Respondents

The analysis shows that maximum (52%) respondents of the study belong to the age class of 31-60 years. From these results one can safely conclude that the majority of the information in this study is collected from the respondents having age 31 years and above persons having sufficient experience in farming.

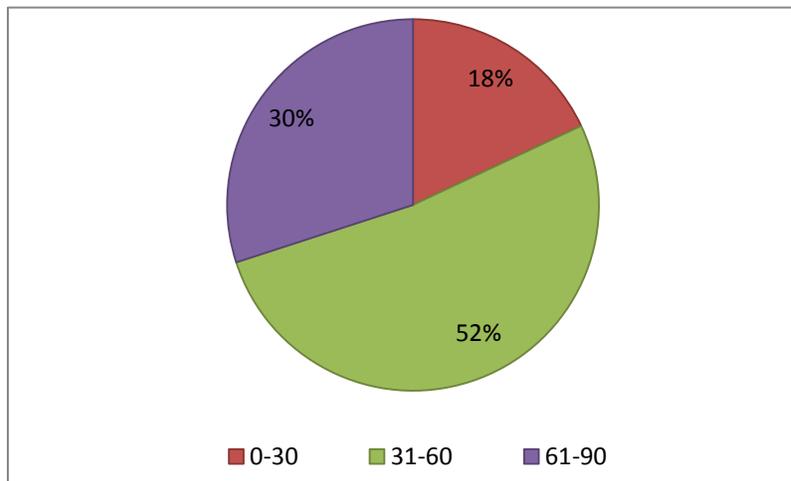


Fig.1. Age of Respondents

### Education Status

The study concludes that almost (62%) of the respondents were illiterate that shows that most of the time is spent in labor and agricultural activities. And a good thing which came in observation during this survey is that maximum of the literate population is also involved in agricultural activities or looking after their farms in leisure time.

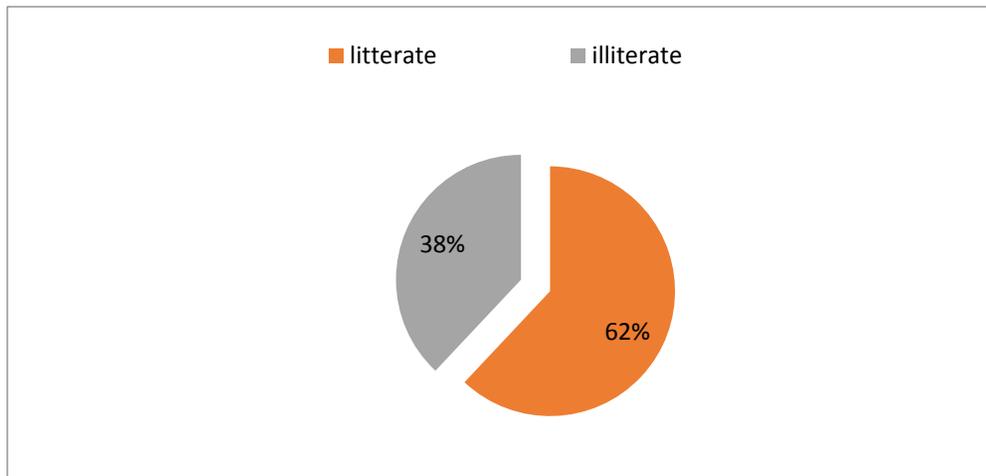


Fig. 2. Education Status of Respondents

**Tenure Status**

The results of the study reveal that maximum respondents (56%) are the own-cultivator of their land and they are also the owners of the land too. Almost there are (24%) of the respondents among the sample are the owner cum tenant, which operate their farms themselves and also works as tenants, and (20%) of the respondents are tenants, which have no land of their own but works in the lands of others. In this study there is no absentee owner, upon asking the locals they told that, there is no any such land present here having no owner in real and is cultivated or managed by some other.

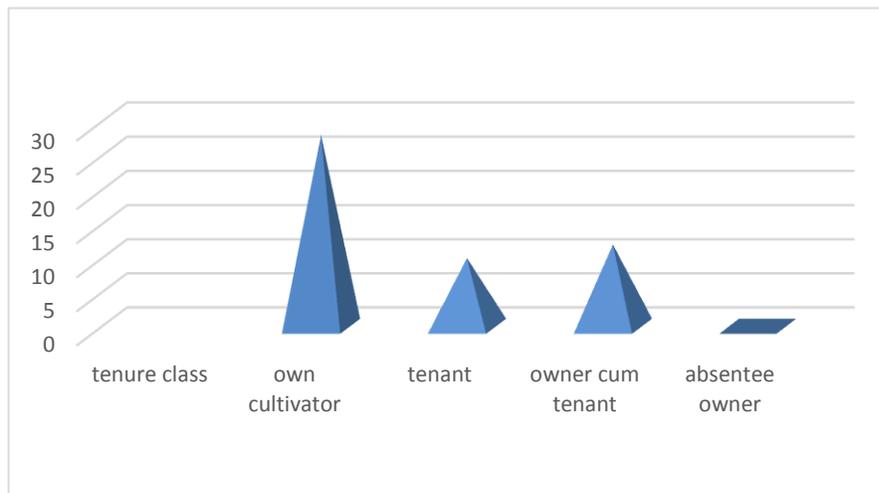


Fig. 4. Tenure Status of Respondents

## Land Holding

Land holding of the respondents were grouped into six classes according to size of lands. The study shows that majority (52%) of the respondents have land holding up to 1-10 acre. 14% of the sample household has landholdings 41-50 acres. 12% of the respondent has landholding of 21-30 acre. 10 percent of the respondents having landholding of 31-40 acre followed by 1% of the respondent's landholding size are 51-60 acre.

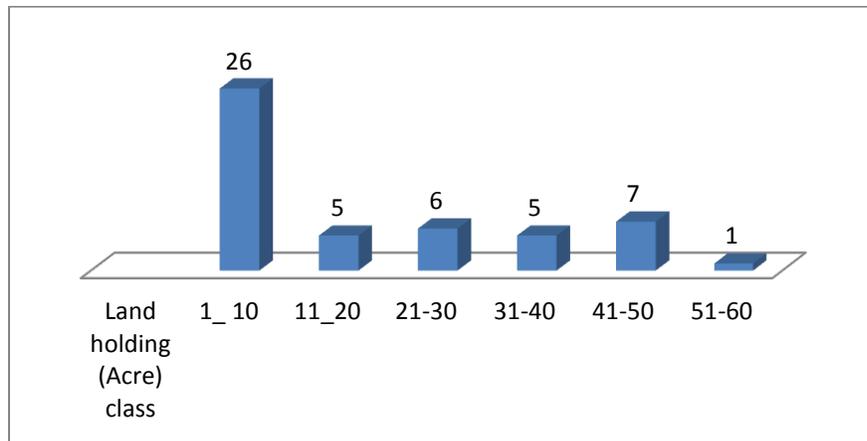


Fig. 5. Land holding (acre)

While the national average is approximately 4.5 ha, Khyber Pakhtunkhwa's average landholding size is less than 3 ha (Ali *et al.* 2011). This landholding is not large enough to support an agroforestry operation.

## Fodder Consumption

The annual fodder consumption by the respondent's animals is grouped into four classes ranging from 1 to 4 ton of fodder. Almost 70% of the respondents consume about 1 ton fodder. Followed by 14% of ranging between 2-ton, 12% respondents' animals' consumption ranging between 3- ton and 4% respondent's animals consume about 4-ton fodder annually. Almost all of the above fodder percentage is collected from their agricultural land.

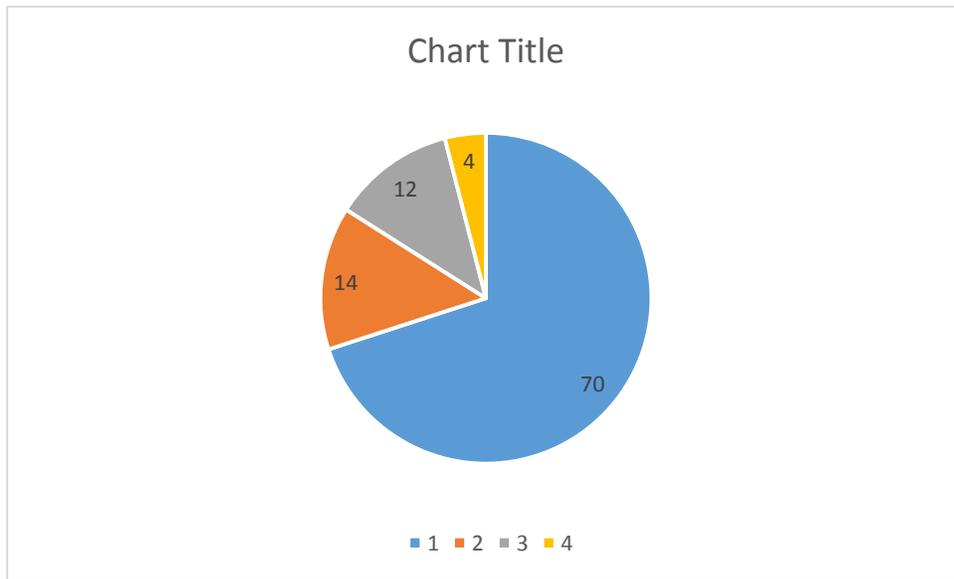


Fig. 6. Fodder consumption

### Annual Domestic Wood

From the data, it is concluded that 76% of the respondent's consumption ranging between 1-200 Mound of fuelwood annually. Followed by 10% having a consumption ranging between 201-400 Mound annually. 8% of respondents are new to agroforestry and have still no experience in collection of wood from their farms.

The study concludes that there is less knowledge about the cutting and collection of wood because of that the consumption is not enough worthwhile.

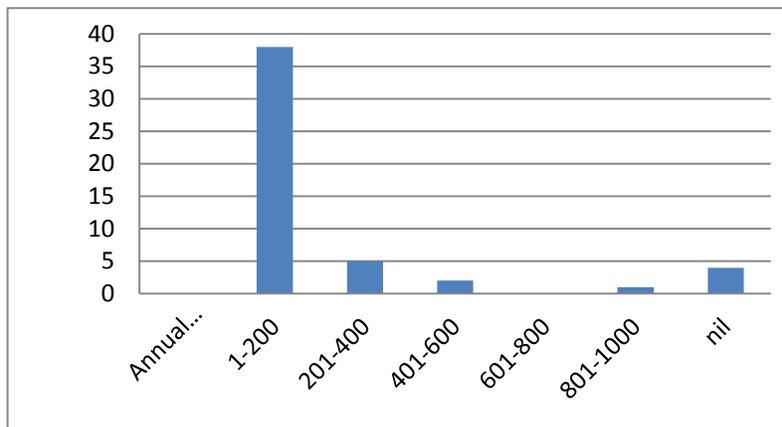


Fig. 7. Annual Domestic Wood Consumption

**Pattern of Tree Planting**

The analysis shows that, the most common and accepted pattern of planting tree in agricultural land followed by 56% of the respondents is linear plantation along with the boundaries of field and canal side, because according to them, planting in such manner occupies less place and second, they provide shelter to the crops. Opposite to this 26% respondents were in favor of scattered plantation over the agricultural land and 14% were in favor of compact trees plantation with the view in mind that they are adding nutrients to the crops.

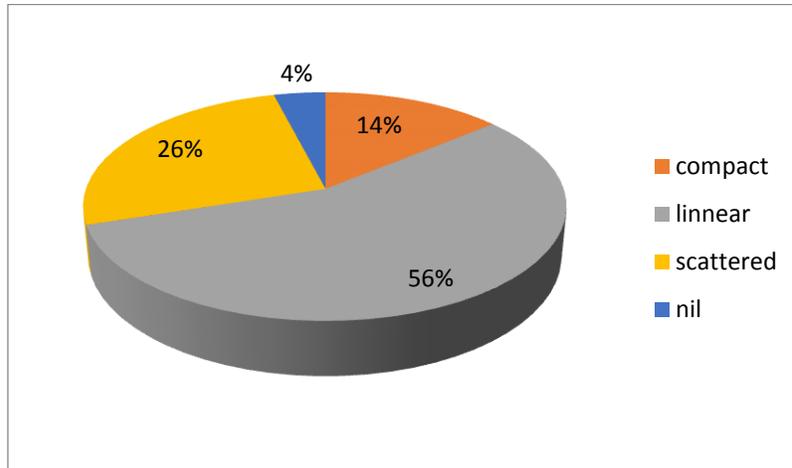


Fig. 8. Pattern of tree planting

**Source of Fuel**

The results of the data shows that, majority of the respondents i.e., 66% use fuelwood as a source of fuel for cooking, heating etc, in their homes. With increase in household most of the respondents 20% are also purchasing LPG (Gas) and the remaining are also using crop residues with fuelwood.

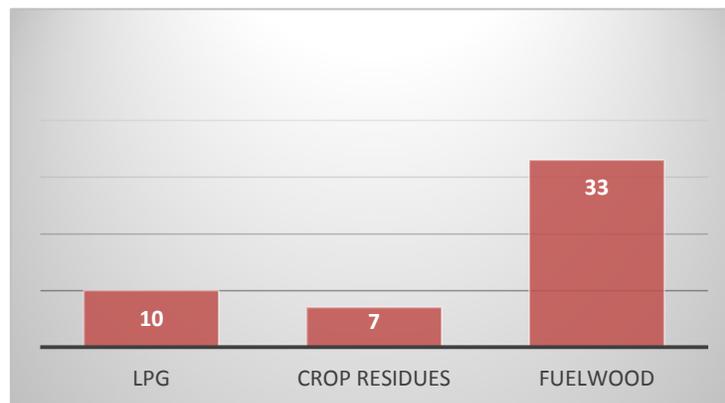


Fig.9. Source of fuel

**Source of Fuelwood**

The study reveals that, most of the respondent population (80%) are getting fuelwood from their farmland, (14%) from market.

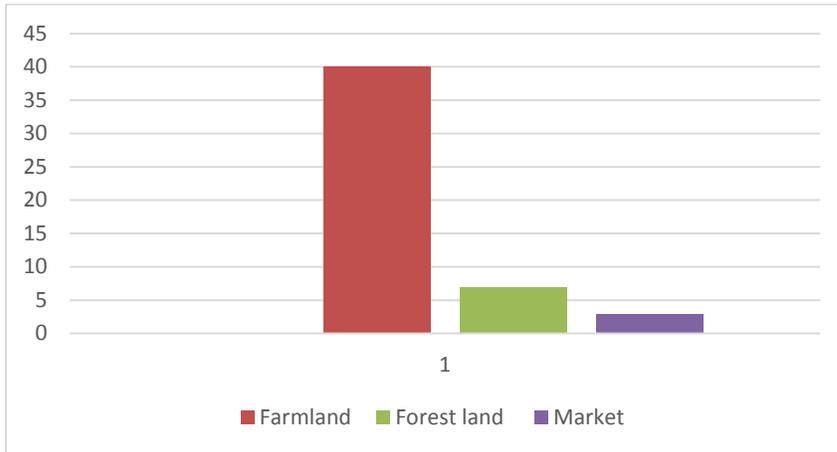


Fig. 10. Source of fuelwood

**Purpose of Mature Trees**

From the study it is concluded that, 58 % of the respondents are raising trees on their farmland for the purpose of sale, to make money so that they can support his family and improve their agricultural land by adding fertilizers. Also, a good percentage of respondents i.e., 36% are using it for domestic use, they said that we are not going to market for purchasing wood.

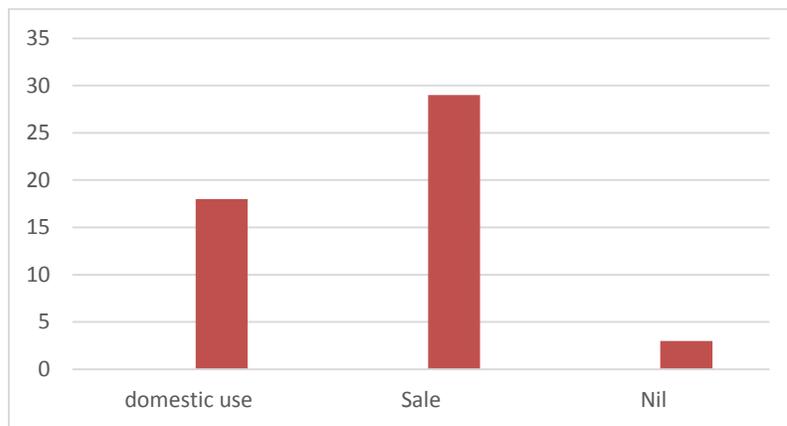


Fig. 11. Mature tree purpose

### Impacts of Farm Trees on Agricultural Production

The analysis of data reveals that, 44% of the respondents were in favor of agroforestry that told that it increases the agricultural production, but it was noted in the survey that every respondent that is in favor of farm trees having tube wells for irrigation. The 40% respondents have added that farm trees decrease agricultural production, because of shed on the crops.

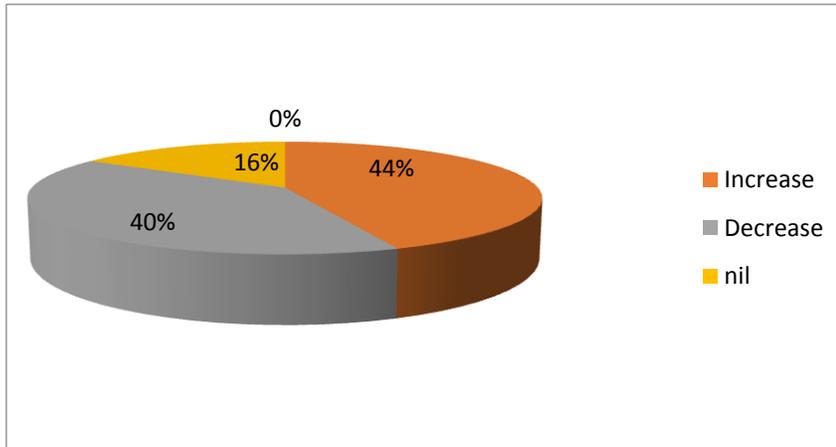


Fig. 12. Impact of farm trees on agricultural production

### Annual Income by Sale of Farm Trees

The results are very impressive, the annual income by the sale of farm trees is ranging from rupees 1 to 9 lacs. 50% of the respondents sell their trees ranging between Rs.1-200,000 annually. Followed by 14% sells ranging from Rs.400,001-600,000. And other remaining population of respondents sells the trees up to 100,000 lacs annually. In district Bannu Average income, a person is earning by selling the farm trees is Rs.236,954.6/annum.

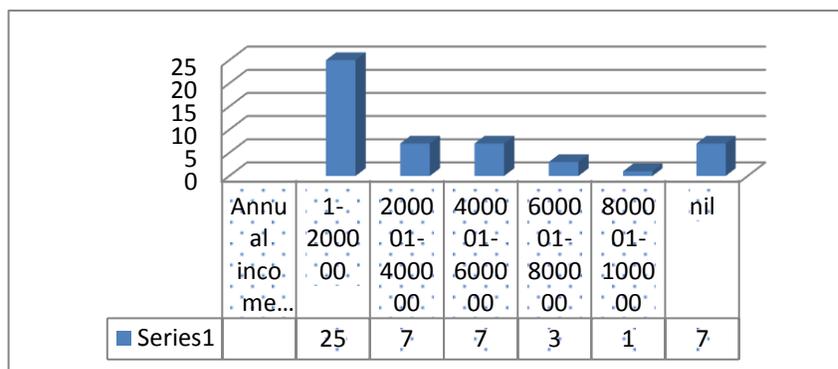


Fig. 13. Annual income by sale of farm trees

After participating in agroforestry for a few years, nearly 66% of farmers with average annual incomes (> 200 000 rupees) before doing agroforestry saw a boost in their earnings of up to 11.42%, while 11.3% of farmers with average annual incomes under 400 000 rupees saw a boost in their earnings of up to 15.34%. After doing agroforestry, the average annual increase in income was 13.87% (Farooq *et.al.*, 2017).

**To Whom Farm Trees Are Sold**

The study shows, that 34% of the respondents sell their trees to the local consumers, followed by 32% to the market where they sell their trees on demand price. And 14% of the respondents still haven't cultivated their trees which have no idea of selling their trees.

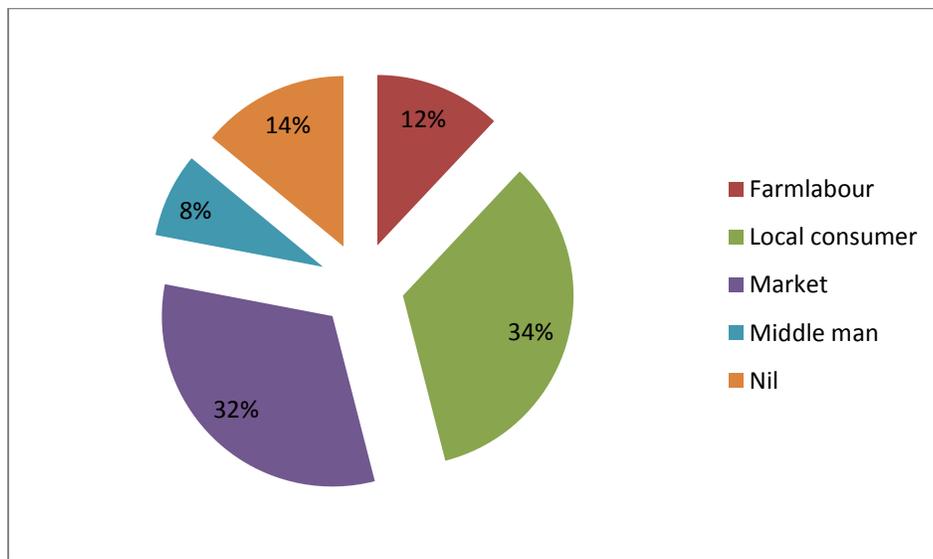


Fig. 14. To whom trees are sold

**How You Came to Know About Agroforestry**

The analysis shows that, forest department is more active in district Bannu in awareness of the people because 30% of the people get to know about agroforestry due to the department. Also, enough percentage of 28% of respondents that have initiated agroforestry by themselves, which is surprising for me. And media is playing a good role in awareness of people and another good thing to know about is that forest department is more active in media too.

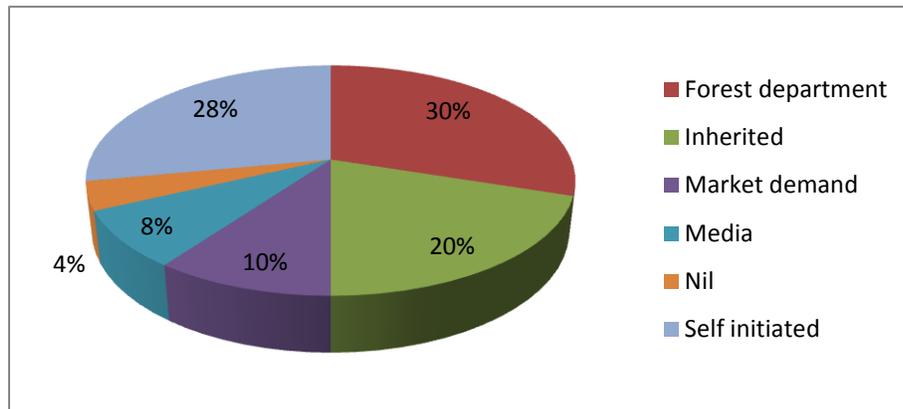


Fig.15. How came to know about Agroforestry

The bulk of farmers (77.3%) got their information from their nearby neighbors. Only 6.0% of farmers said they acquired their data from print media, compared to nearly half (49.3%) who cited electronic media as their source (Farooq et.al. 2017).

**Livestock Class**

Four classes of livestock ranging between 0-19. Large families have many numbers of animals. 38% of respondents have livestock ranging between 1-4 followed by 42% have ranging between 5-9 animals. 16% have livestock ranging between 10-14 animal units. And remaining have 15-19 animals' unit.

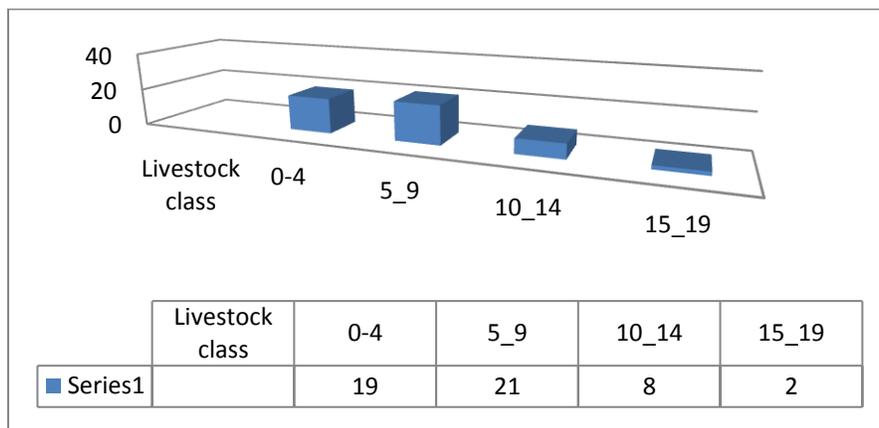


Fig.16. Livestock

## CONCLUSION

The study reveals that the joint family is still common in region. Most (56%) of the respondents are the own cultivator category. Most of the respondents are involved in farming and is the major profession. 62% of the respondents are illiterate. Most of the respondents are planting Farash and Shisham because of the demand in market. The landholding of the respondents is more enough that is average handholds are 16 Acre per family and they are also willing to plant more trees on their lands but they are willing for plantation if Forest department providing the plants for plantation. The study results show that majority of respondents collect wood from their farms i.e.,77%. And some 8% of the respondents are still new to Agroforestry practices having no idea and experience in the collection of wood. Most of the respondents have no technical knowledge about the cutting and collection of the trees due to which their chances of loss of wood and timber.

## RECOMMENDATION

Knowledge and Awareness dissemination to the farmers and locals of the study area can be improved. Technical guidance is more important because farmers have no idea which species to plant and how to plant species, which can lead to more production. Department should provide free plants to the farmers. Irrigation and soil fertility improvement programs can improve the production of agricultural crops and as well as the farm trees production. As majority of the farmers involved in Agroforestry are complaining about pesticides and the disease, they have no idea about the disease and their treatment, they are blindly treating the disease, so seminars should be conducted about the disease of the crops and their treatment. To solve the sale problems, that is wood based industries be established in the rural area to make the efficient use of wood grown on farmlands.

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