

## Research Article



# Socio-Economic Impacts of Agro-Forestry on Livelihoods of Rural Households in Southern Region of the Punjab, Pakistan

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**Abstract** | Agro-forestry is practiced in many of the developing countries including Pakistan. In order to find out its socio-economic impacts on the livelihoods of rural household in the Southern Punjab, the present study was carried out in 2016 at University College of Agriculture, University of Sargodha. Data were collected from randomly selected 160 rural heads of households using interview schedule. Majority (76.2%) of the respondents were young (26 to 40 years). A significant majority (76.3%) were illiterate and only 23.8% were literate (Having more than five years of schooling). Farming was the major income source for majority (69.4%) of respondents. Small farming is very common as more than 60.0% of the respondents had only up to 5 acres of land. Majority (65.6%) were perceived as poor (having monthly income >7000 PKR). Regarding impact of agro forestry on rural household food security “good source of fuel wood” ranked first (mean=2.95). Small land holding was one of the major constraints (mean=2.62). Decrease in soil loss was the main advantage of agro-forestry as perceived by majority of respondents. There was highly significant relationship between educational status, income source and size of land holding and perceived poverty. It was very much easy to predict the poverty status (dependent variable) of respondents through their physical, financial and human assets/capitals (independent variables).

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## Introduction

Agriculture plays a vital role in Pakistan economy, contributing 21% of its GDP and providing employment to 43.7% people that are mostly living in rural areas (GoP, 2015). Agro-forestry is a collective name, which mostly practiced in both tropical and subtropical regions. Food and fiber produces on the same land with trees and crops, that contribute to food insecurity, support livelihood, reduce poverty and provide grassland environment (Brandle et al., 2014).

Agro-forestry is being practiced on multiple bases, where both crops and trees are grown on the same land. Regarding benefits of agro-forestry, Ajake (2012) and Ingwe et al. (2009) reported that growing of trees on the border of the cropland is a good source of income for farmers on one hand and on the other hand plays an important role in increasing soil fertility, enhances biodiversity and cleans water that ultimately reduces global warming by carbon sequestrations. In addition to that agro-forestry plays also an excellent role in improving livelihoods of rural

communities on sustainable basis by enhancing their income (Hosny, 2004 and Oke, 2001). The same was also reported by Rahman et al. (2008) while reporting the benefits of agro-forestry on livelihoods of poor and small land holders. Regarding expected benefits of growing trees with crops Kalaba et al. (2010) concluded that agro-forestry practices can reduce the cutting of forests especially in tropical and subtropical regions. In addition to that agro-forestry practices help farmers in maintaining their basic needs and also minimizing the risks in case of failure of crops and severe damage to livestock.

The northern areas of Pakistan are the major forest areas that provide fuel wood, timber wood, shelter and fodder for livestock. With the passage of time forest resources in Pakistan are depleting day by day with a fast growing population (1.92% annual growth rate) (GoP, 2015). In this context, Rahim and Hasnain (2010) and Baig et al. (2008) reported that the northern areas of Pakistan contain 80% of the productive forests while some percentage of forests is also present in southern parts of the country. With increasing population demand for forest products has increased due to increase in population whose livelihoods directly or indirectly depend upon forests (Hussain et al., 2003). With dwindling forest areas in Pakistan, adopting agro-forestry practices has become necessity to meet the growing demands of wood for domestic and commercial purposes (Ahmed et al., 2006). Research study conducted by Nouman et al. (2006) concluded that adopting agro-forestry would help in mitigating pressure on forest resources. In addition, agro-forestry provide sustainable solution for rural livelihoods. Although in many of the rural areas of the Punjab province in Pakistan, many people used to adopt agro-forestry, but there is need to assess the socio-economic impacts of agro-forestry on livelihoods of rural households. With this background the present study was designed with following specific objectives:

- To know the socio-economic profile of respondents.
- To determine the impacts of agro-forestry practices on rural livelihoods.
- To assess the advantages of adopting agro-forestry at farm level.
- To assess constraints faced by farmers in adopting agro-forestry.
- To study relationship between selected dependent and independent variables.

## Materials and Methods

The study conducted in the southern region of the Punjab province during 2016. As compared to central and northern region of the Punjab, this region is least developed and mainly rural people are facing a number of socio-economic problems. Out of these problems, widespread rural poverty and food insecurity at household level are the major ones (Ashraf et al., 2013). The whole of the southern region of the Punjab is administratively divided into 11 districts. Out of these, Muzaffargarh was purposively selected as the targeted study area. District Muzaffargarh was the largest district among other districts of southern Punjab (GoP, 2016). As the nature of present study was quantitative, so cross-sectional survey research design was used. A structured interview schedule was designed. The content validity of interview schedule was checked by the panel of experts. The panel of experts comprised of faculty members from Institute of Agricultural Extension and Rural Development, and Department of Forestry, University of Agriculture, Faisalabad-Pakistan. On the other hand, the reliability of interview schedule was through Reliability Analysis using SPSS. Cronbach's  $\alpha$  (alpha) was used for the said purpose. The value of Cronbach's  $\alpha$  (reliability score was 0.68) for all the questions whose responses were on likert scale.

### Sampling procedure

In this research study, purposive as well as simple random were used. For the selection of targeted district as research area, purposive sampling was used. On the other hand, for the selection of final study objects (respondents), multistage simple random sampling was used. The same technique was also adopted by Hussain et al. (2004) and Akram et al. (2011). The district is divided into four (04) sub districts (tehsils) namely Muzaffargarh, Alipur, Jatoli and Kot Adu. From each sub district four (04) villages were randomly selected and from each of the selected village 10 farmers who practice agro-forestry were interviewed. The total sample size of the study was 160 respondents.

### Data analysis and description

Chi-square ( $\chi^2$ ) test of independence was used to find out the statistical significance between different socio-economic characteristics of respondents like educational status, income sources of heads of households and size of land holding with their perceived poverty status. Multiple regression analysis was also used by

taking perceived poverty status – PPS as dependent variable and three (03) independent variables as educational status (ES), income sources (IS), and land holding (LH). Following regression equation was formulated:

$$Y = B^0 + B^1X^1 + B^2X^2 + B^3X^3 + e$$

$$PPS = B^0 + B^1ES^1 + B^2IS^2 + B^3LH^3 + e$$

PPS = Perceived Poverty Status, ES = Educational Status, IS = Income Source, LH = Land Holding

## Results and Discussion

### *Socio-economic characteristics of the respondents*

The socio-economic characteristics (age, education, major income sources, farm size and perceived poverty status) of respondents were studied in this research and the data in this regard is presented in [Table 1](#).

**Table 1:** *Distribution of the respondents according to their socio-economic characteristics n=160.*

Age	Frequency	Percentage
Upto 25 Year	11	6.9
26 to 40 Year	122	76.2
above 40 Year	27	16.9
<b>Education</b>		
Literate (Having more than 5 years of schooling)	38	23.8
Illiterate	122	76.3
<b>Major income sources</b>		
Farming	111	69.4
Business	17	10.6
Job	26	16.3
Labour	6	3.8
<b>Land Holding</b>		
Upto 5 acres	97	60.6
6 to 10 acres	51	31.9
More than 10 Acres	12	7.5
<b>Perceived Poverty status</b>		
Poor (monthly income <7000 PKR)	105	65.6
Better-off (monthly income 7001 to 15000 PKR)	44	27.5
Well-off (monthly income >15000 PKR)	11	6.9

[Table 1](#) shows that the present age of a large majority (76.2%) of the respondents was 26 to 40 years. This showed that majority of the people in the research

area were in the young age category. This implies that the most of the respondent were in active age; these active age respondents are more likely to adopt new technologies and they also have a larger capacity to cultivate larger fields.

Education is one of the significant human capitals and important aspect of human life. Socio-economic development of any country has strong association with education. With investing on education, no country can attain the targets of sustainable development. The data regarding educational status of respondents as Majority (76.3%) of respondents were illiterate. Only 23.8% of the respondents had more than five years of schooling (primary). This shows the poor educational level in rural areas of southern Punjab. Majority (69.4%) of the respondents earned their income from farming. The other income sources of respondents were business, job and labour as reported by 10.6%, 16.3%, and 3.8% of the respondents. This indicate that in rural areas farming is the major livelihood activity, from which majority of the people earn income. This indicates that along with farming activities, rural households in Pakistan also earn income from non-farm sources like labour, job and business. The importance of non-farm income sources in rural poverty reduction and sustainable rural livelihoods in Pakistani context has already been discussed by [Akram et al. \(2011\)](#). Data regarding farm size of the respondents as presented in [Table 1](#) shows that small land holding is very common in the research area as majority (60.6%) of the respondents had up to 5 acres of agricultural land. Only 7.5% of the respondents had land more than 10 acres. Regarding small land holding of farmers in rural areas of Pakistan [Luqman et al. \(2013\)](#) also confirm the findings of present study. Many of the socio-economic problems of farmers are associated with small land holdings of farmers in Pakistan. In adopting agro-forestry practices at large scale small land holding is one of the major problems. Regarding impacts of small agricultural land on livelihoods of farmers [Hosny, \(2004\)](#) concluded that the small farm sizes reduces the efficiency of the crop and also create difficulties in income generation on scale production.

The perceived poverty status of respondents in the research area was measured through monthly of households. The respondents are divided into three categories on the basis of their poverty status as poor (monthly income <7000 PKR), better-off (monthly income 7001 to 15000 PKR) and well-off (monthly



income >15000 PKR) and the data in this regard are tabulated in Table 1. The poverty status of respondents was also assessed by the researcher through their monthly income and other physical capital/assets in the form of land holding and number of livestock possessed by the respondents at the time of interviewing. The data indicates that majority of the respondents (65.6%) were perceived as poor. Only 6.9% of the respondents were perceived as well-off having monthly income of >15000 PKR. The high perceived poverty status of respondents was due to small agricultural land low monthly income of majority of the respondents.

#### *Impact of agro forestry on livelihoods of rural households*

The impact of adopting agro-forestry practices on livelihoods of rural poor was assessed with the help of three (03) point Likert type scale as 1= disagree, 2= neutral, and 3= agree and ranked through mean ( $\bar{x}$ ) value. The mean and SD of different impacts of agro-forestry on rural household food security and on overall livelihoods is presented in Table 2.

**Table 2: Impacts of agro forestry on rural household Food Security.**

Aspects of rural livelihoods	Mean	SD
Good source of fuel wood	2.95	0.226
Provision of timber	2.77	0.571
Increase household income	2.54	0.576
Improve soil fertility/ soil conservation	2.25	0.753
Improve crop yield	1.91	0.735
Medicinal use in the household	1.85	0.566

**Scale:** 1: Disagree; 2: Neutral; 3: Agree.

Table 2 revealed that the impact of agro forestry on rural house hold food security as it is good source of fuel wood ( $\bar{x}$  =2.95/3.00), provision of timber ( $\bar{x}$  =2.77/3.00), increased household income ( $\bar{x}$  =2.54/3.00), improve soil fertility ( $\bar{x}$  =2.25/3.00), improve crop yield ( $\bar{x}$  =1.91/3.00) and medicinal use in the household ( $\bar{x}$  =1.85/3.00). This thing implies that most of the farmers saved money that they have to expense in the form fuel and timber but due to the lack of knowledge and technical guidance they have no idea that agro forestry increased soil fertility and improve crop yield. It can be concluded that agro forestry adoption had a significant impact on rural household food security. It is recognized that the planting of trees create income generation, increase soil fertility, provide employment, provision of food,

provision of timber, provision of timber and provision of wood (Ajake, 2012).

#### *Constraint in adopting agro forestry*

The constraints which are being faced by respondents in adopting agro-forestry practices were assessed on the basis of their self-perception with the help of three (03) point likert scale (1= disagree, 2= neutral, and 3= agree) and also ranked on the basis of their respective mean value. The mean and SD of different constraints are presented in Table 3.

**Table 3: Constraint in adopting agro-forestry.**

Constraints	Mean	SD
Small land holding	2.62	0.552
Water shortage for irrigation purposes	2.57	0.638
Attack of Pests/Insects	2.56	0.596
soil erosion	2.47	0.652
Land fragmentation	2.36	0.762
Problem in performing agricultural practices	2.18	0.519

**Scale:** 1: Disagree; 2: Neutral; 3: Agree.

The data tabulated in Table 3 indicates that among different constraints being faced by respondents in the research area while adopting agro-forestry practices, small agricultural land holdings which is very common in the research area is on the top with highest mean vale ( $\bar{x}$  =2.62/3.00) followed by shortage of water for irrigation purposes, insects/pests attack, soil erosion, land fragmentation and problems in performing agricultural operations with mean 2.57/3.00, 2.56/3.00, 2.47/3.00, 2.36/3.00, and 2.18/3.00, respectively. This is clear from the results that small agricultural land holding is the main problems being faced by majority of the respondents in adopting agro-forestry in the research area.

#### *Perceive advantages of adopting agro forestry practices*

The advantages of adopting agro-forestry practices as perceived by respondents were determined through five (05) Likert type scale (1=strongly disagree, 2=disagree, 3=agree, 4=undecided, and 5=strongly agree) and their mean values were calculated by using descriptive statistics. The mean and SD of advantages of agro-forestry is presented in Table 4.

The respondents reported many advantages of adopting agro-forestry practices. Out of these advantages decrease in soil loss was on the top having highest mean (4.13/5.00). The other perceived advantages

were help in increasing soil organic matter, provision of natural fencing, carbon sequestration, enhanced biodiversity, shelter for livestock and provision of income generation activities with mean 4.12/5.00, 3.54/5.00, 3.21/5.00, 2.94/5.00, 2.70/5.00 and 2.40/5.00, respectively.

**Table 4:** *Advantages of adopting of agro forestry practices.*

Advantages	Mean	SD
Decreases soil losses	4.13	1.141
Help in increasing soil organic matter	4.12	1.013
Provision of natural fencing	3.54	1.087
Carbon sequestration	3.21	0.791
Enhanced biodiversity	2.94	1.301
Shelter for livestock	2.70	1.021
Provision of income generation activities	2.40	0.861

**Scale:** 1: Strongly disagree; 2: disagree; 3: agree; 4: undecided; 5: strongly agree.

#### Chi-square test statistics/cross tabulation

Chi-Square test for independence was used to find out the association between different socio-economic characteristics of respondents; educational status, major income sources and size of land holding with their perceived poverty status. Cross tabulation in this regard is given in Table 5, 6 and 7.

**Table 5:** *Association between educational status and perceived poverty of respondents.*

Educational status	Poverty status			Total
	Poor	Better-off	Well-off	
Literate	7 (6.7)	27 (61.4)	4 (36.4)	38 (23.7)
Illiterate	98 (93.3)	17 (36.6)	7 (63.6)	122 (76.3)
Total	105 (65.6)	44 (27.5)	11 (6.9)	160 (100.0)

$\chi^2_{cal} = 52.262^{***}$ ; Highly Significant; df: 2; Likelihood Ratio: 50.858; Linear-by-Linear Association: 33.720

**Table 6:** *Association between income sources and perceived poverty status of respondents.*

Income Sources	Poverty status			Total
	Poor	Better-off	Well-off	
Farming	90 (85.7)	17 (38.6)	04 (36.4)	111 (69.4)
Business	03 (2.9)	07 (15.9)	07 (63.6)	17 (10.6)
Job	06 (5.7)	20 (45.5)	0 (0.0)	26 (16.2)
Labour	06 (5.7)	0 (0.0)	0 (0.0)	06 (3.8)
Total	105 (65.6)	44 (27.5)	11 (6.9)	160 (100.0)

$\chi^2_{cal} = 83.171^{***}$ ; Highly Significant; df = 6; Likelihood Ratio = 69.488; Linear-by-Linear Association = 12.921

**Table 7:** *Association between land holding size of respondents and their perceived poverty status.*

Size of Land Holding	Poverty status			Total
	Poor	Better-off	Well-off	
Upto 5 acres	86 (81.9)	11 (25.0)	0 (0.0)	97 (60.6)
6 to 10 acres	17 (16.2)	29 (65.9)	05 (45.5)	51 (31.9)
More than 10 Acres	2 (1.9)	4 (9.1)	6 (54.5)	12 (7.5)
Total	105(65.6)	44 (27.5)	11 (6.9)	160 (100.0)

$\chi^2_{cal} = 84.445^{***}$ ; Highly Significant; df = 4; Likelihood Ratio = 74.776; Linear-by-Linear Association = 65.770

The data presented in Table 5 indicate that there is highly significant association between educational status and poverty status of respondents. The cross tabulation shows that an overwhelming majority (93.3%) of the poor people were illiterate. This indicates that illiteracy is the major cause of poverty in the research area. Regarding illiteracy as major cause of rural poverty Islam et al. (2005) and Chaudhary (2003) concluded that in rural areas of Pakistan poor education and illiteracy is responsible for widespread poverty. This also proved the significance of education in poverty reduction from rural areas. By getting education an individual can adopt any profession to earn income for better livelihoods. Education provides better employment opportunities for individuals. The association between employment and poverty in Pakistan was also discussed by Saleem (2007).

In the research area respondents adopt different professions and earn income from different sources as livelihood activities/strategies. Cross tabulation with regard to association between income sources of respondents and their perceived poverty status is given in Table 6.

Cross tabulation and value of chi square (83.171) regarding income sources of respondents and their perceived poverty status shows that there is highly significant ( $P < 0.05$ ) association between income sources and poverty status as perceived by respondents. The data presented in Table 6 also indicate that poverty lies with respondents who were associated with only farm economy as livelihood strategy, as high majority (85.7%) of the respondents who perceived as poor were belong to farming profession. High poverty rate of people who used to earn income from farming sources is due to the small size of agricultural land holding of majority of the respondents (see Table 1). In connection with these findings Sabir (2006) reported high poverty rate in rural areas of the Punjab

**Table 8:** *Summary of Multiple Linear Regression Model.*

R	R <sup>2</sup>	Adjusted R <sup>2</sup>		Standard Error	
.723 <sup>a</sup>	.522	.513		.43135	
a. Independent Variables: Land Holding , Income Source, Educational Status					
ANOVA <sup>a</sup>					
Model	Sum of Squares	Df	Mean Square	F	Sig.
Regression	31.749	3	10.583	56.878	.000 <sup>b</sup>
Residual	29.026	156	.186		
Total	60.775	159			
a. Dependent Variable: Perceived Poverty Status (PPS)					
b. Independent Variables: Land Holding , Income Source, Educational Status					
Coefficients <sup>a</sup>					
Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	1.211	.231		5.234	.000
Income Source	.070	.043	.101	1.630	.105
Educational Status	-.407	.092	-.281	-4.431	.000
Land Holding	.553	.056	.566	9.943	.000
a. Dependent Variable: Perceived Poverty Status (PPS)					

among small-scale farmers. This is also established fact that round the globe and also in Pakistan, poverty is rural phenomenon IFAD (2011), Adeniji, (2010), Godfray et al. (2010) and Luqman et al., 2013.

Land holding plays a significant role in identifying livelihood status of people especially for rural people of those countries where agriculture provides the baseline to overall national economy and where majority of the rural population is engaged in farming operations (Pervaiz et al., 2013). In the present study data regarding land holdings of the respondents is already presented and explained (see Table 1) in the preceding section. Cross tabulation with regard to association between size of land holding of respondents and their perceived poverty status is given in Table 7.

Data presented in Table 7 and chi-square value (84.445) shows the existence of highly significant association between size of land holdings of respondents and their perceived poverty status. This is also very much clear from the cross tabulation given above that a large majority (81.9%) of the poor people had up to 5 acres of land. This indicate that size of land holding in the research area particularly and generally in the whole country is one of the major determinants of rural poverty. These findings show the significance of land holding in poverty reduction. With

this notion Finan (2005) concluded that access to land holding is one of the major poverty reduction strategy. Different research studies like Scott, (2000) and Gunning et al. (2000) also reported the positive association between land holding and income of individuals. In Pakistan also Ram and Ansari, (2011) reported that small growers with small size of land holding are in majority in the whole country and used to do subsistence farming and suffered from problems of poverty and food insecurity.

#### *Regression model description*

Multiple regression model was used to find out the relationship between one depend variable (Perceived Poverty Status-PPS) and three (03) independent variables as Educational Status (ES), Income Sources (IS), and Land Holding (LH). The results of regression model are presented in Table 8.

The results of multiple regression model as presented in Table 8 indicate the value of adjusted R square 0.513, shows that these three independent variables Land Holding (LH), Income Source (IS) and Educational Status (ES) contributes about 51% of variation in perceived poverty status (PPS) of respondents. It clearly means that poverty status as perceived by respondents can easily be estimate through land holding, income source and educational status possessed

by respondents. This showed that it is very much easy to predict the poverty status of respondents through their physical, financial and human assets/capitals. As co-relational coefficient, the value of R (0.723) shows that poverty status as dependent variable had highly positive correlation with size of land holding possessed by respondents, their income sources as livelihood strategies and their educational status, which served as independent variables. Moreover, Analysis of Variance (ANOVA) also showed that all the independent variables were highly significantly ( $p < 0.000$ ) predicting the poverty status of respondents.

## Conclusions and Recommendations

Regarding impact of agro forestry on rural house hold food security “good source of fuel wood” is on the top with highest mean (2.95). Small agricultural land holding is one of the major constraints with highest mean (2.62). Decrease in soil loss was the main advantage of agro-forestry as perceived by majority of the respondents. The results of chi-square test statistics showed that there is highly significant relationship between educational status, income source and size of land holding possessed by respondents with their perceived poverty. The poverty status can be predicted through their physical, financial and human assets/capitals. Keeping in view the results and conclusions following recommendations formulated.

- National level awareness regarding advantages of agroforestry on livelihoods can help in reducing the rural poverty.
- Interaction between farmer's and extension workers should be strengthened and the present extension services should be improved. Trainings should be imparted to farmers regarding different agroforestry system.
- Diversification in livelihood strategies need to be explored and adopted
- In the scenario of rapid deforestation, agroforestry system needs to strengthen.

## Author's Contribution

**Muhammad Luqman:** Conceived the idea of the study and finalized the objective of research.

**Raheel Saqib:** Designed the research and prepared the first draft.

**Mujahid Karim:** Collected the data and entered it in SPSS.

**Khalid Nawab:** Edited the manuscript technically.

**Abdur Rehman:** Analysed the data.

**Muhammad Yaseen:** Collected the data, data entry in SPSS and proofread the manuscript.

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