Mixed Farming and its impact on Farm Income; A study in District Faisalabad, Punjab Pakistan

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Abstract

This study was designed to access the impact of mixed farming on farm income of farmers. Other factors influencing the farm income were also planned to study. Total 120 randomly selected farmers interviewed directly. The double log multiple regression analysis was used to study the effect of mixed farming and some other variables on farm income. About 18 percent farmers were only cropped producers, 16 percent farmers were involved in cattle rearing and 65 percent farmers adopted mixed farming. The farm size, No. of animals, crop intensity, cost related to crops and dairy and mixed farming had a positive effect on farm income. The crop sector contributed US$ 2568.23, dairy sector US$ 3083.40 and mixed farming (Crop and Livestock) US$ 13024.71. The cropping intensity provided more options to farmers for resource allocation. The significant effect of mixed farming on farm income was assessed. Mixed farming system was a better option than the single activity as it generates more income.

Keywords: Mixed Farming; Farm Income; Crop Intensity; Faisalabad; Pakistan

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1. INTRODUCTION

Pakistan economy largely depends on the agriculture sector. The rural families have adopted it as a primary occupation. It is also a major source of poverty alleviation in rural economies of the country. Almost 64 percent population of Pakistan live in rural areas (World Bank, 2014). The agriculture sector has a major contribution in country's gross domestic product by 19.8 percent. Almost 43 percent population is busy directly or indirectly in agriculture (GoP, 2016).

Four sub sectors crop, livestock, fishery, and forestry are practiced in Pakistan. The agriculture mix of the country is profoundly based on main crops (wheat, cotton, rice, maize, and sugarcane) which account for 4.67 percent of GDP and 23.55 percent of the value added in overall agriculture. The minor crops account for 11.36 percent of the value added in overall agriculture and 2.25 percent of GDP. The livestock share in GDP and in value addition is 11.61 percent and 58.55 percent respectively. The forestry and fishery contribute 0.41 and 0.43 percent of GDP of the country. Their contribution in agriculture value addition is 2.06 and 2.17 respectively (GoP, 2016).

In rural areas of the country, families highly depend on the agriculture sector. Unfortunately, the productivity level of farms is constrained by various environmental factors. Some common factors are unexpected heavy or low rain fall, low organic matter's percentage in soil, weather fluctuation, agronomic factors like application of conventional methods, low level of technology adoption, crop rotation, family members are large in relation to land, poor organization setup, inefficient extension system, lack of access to financial resources (Ghafoor *et al*, 2010).

Under these factors and highly fluctuating environment, the agriculture is still a supportive sector for the farmers to get their food and income by selling their products. There is two growing seasons are prevailing in Pakistan "Kharif" and "Rabbi". The farmers are cultivating the crops and getting their income. Major crops require almost six months to be harvested. At harvesting time farmers highly depend on the market situation. On another side, dairy animals are a source of daily income. Farmers can sell their dairy products at the local level and can support his family.

Some important factors mentioned above play a vital role in the low productivity of the farmers. It pushes the farmers at the stake of the market. With low productivity, volatile factors create a vulnerable situation for farmers. This low production leads toward low

income. As result of low income, farmers remain unable to adopt new technology and to invest in the farm. This cycle continues and farmers fail to get rid of the unbearable burden of poverty. Therefore, there is a need of integrated effort of the private sector, NGOs and government to provide a healthy and favorable economic environment to farmers (Hazell, 2005).

Farmers practicing single activity are considered under more risk than those practicing mixed farming under uncertain environment and market situation. So it is considered that animal's rearing with crop cultivation will affect significantly the farm income of farmers. The aim of the study was to measure the effect of key factors and mixed farming on the farm income and to determine the characteristics of respondents. The other minor objectives were assessing the socioeconomic characteristics of respondents and estimation of income of each farming type.

2. MATERIALS AND METHODS

2.1 Study Area

For this study, the Faisalabad district was a good representation of agriculture's activities due to its feature of mixed cropping zone (Hussain *et al*., 2011). Faisalabad District has five tehsils. This study confined to three tehsils of the district Faisalabad (Samundri, Jaranwala, and Tandlianwala).

2.2 Research Data

This study is a primary data based. For the collection of data, we used a well-structured and pre-tested questionnaire. The results of preliminary study facilitated us to reconstruct the questionnaire. We modified our questionnaire later on. After finalizing the questionnaire, we conducted interviews of sampled farmers. We selected three villages from each tehsil. We had conducted a face-to-face interview with randomly selected 120 farmers.

2.3 Calculation of the Agriculture/Farm income

After collection of data, it realized that farmers were busy into three main farm activities, Livestock, crop cultivation and Mixed Farming (Livestock + Crop). Moreover, we had used the following equation to estimate the farm/agriculture income of farmers.

Gross farm/agriculture income is equal to sum of the

- Sales of crops and livestock
- Government payments
- Other farm-related income (receipts from custom work, machine hire, grazing fees,

- Production contract fees, etc.); change in inventories
- Value of commodities consumed on the farm
- Imputed rental value of the farmhouse

Newton (2014) also adopted a similar process in his study. The government had not made payments in the study area. This was the reason that we supposed it zero. For cost calculation of the farm, we asked about quantities and per unit cost of many variables used by the farmers. For income calculation, we asked about the output level and prevailed prices in the market.

2.4 Factors Influencing the Agriculture Income of Farmers

We had observed factors affecting the income of farmers. Double log (Log-Log) linear regression model is used. The scatter plot between dependent and independent variables suggested us to use this model. The similar model had been used by Ghafoor *et al*., (2010) and Parvin and Akteruzzaman (2013) in their studies with the almost similar concept. The dependent variable was agriculture/farm income. So, multiple regression model was used to analyze the effect of variables on agriculture farm income. Following the general form of equation fitted for this regression.

$$\boldsymbol{Y = f(X_i, D_J)}$$

Dependent Variable

Y = Log of Agricultural Income

Independent variables are both qualitative and quantitative variables

X_i=Vector of quantitative variables I = 4

D_J= Vector of qualitative variable j= 4

The specific form of equation is

$$Y = \beta_o + \beta_1 LnX_1 + \beta_2 LnX_2 + \beta_3 LnX_3 + \beta_4 LnX_4 + \beta_5 LnX_5 + \beta_6 LnX_6 + \beta_7 LnX_7 + \beta_8 D_8 + \beta_9 D_9 + \beta_{10} D_{10} + \mu$$

Independent Variables

X_1= Age

X_2= No. of Family Members

X_3= Farm Size

X_4=No. of Animals

X_5= Cropping Intensity

X_6= Sum total of variable cost component of crops

X_7= Sum total of variable cost component of livestock

D_8 = Dummy for Education, 1 if respondent having education greater than five year, otherwise 0

D_9 = Dummy for marital status, 1 if respondent married, otherwise 0

D_{10} = Dummy for Farming Type, 1 if respondent practicing mixed farming (Crop and livestock), otherwise zero

2.5 Estimation of Crop Intensity

The cropping intensity is considered an important index and defined as the area cropped divided by total cultivated area. In Pakistan, two main seasons always exist in the area (Kharif and Rabi). We calculated the cropping intensity for both seasons separately. The sum of crop intensity value from both seasons gave the actual crop intensity value. Shah (2009) described the similar method. The values then were used as one of the explanatory variables in the model.

The following formula was adopted for calculation of crop intensity from Pakistan report named as agricultural census by GoP (2010).

Cropping Intensity = (Total cropped area/Total Cultivated area)*100

3. RESULTS AND DISCUSSION

3.1 Social Characteristics of Respondents

Social characteristics considered as an important variable affecting the respondent's decision making and income of farmers. Social factors like age, education level of respondents, family size, land holdings and animal's inventory were studied.

Table.1 Social Characteristics of Respondents

Characteristics	No. of Respondents	Percentage
Age Groups		
less than 20	7.00	5.83
between 20-40	56.00	46.67
More than 40	57.00	47.50
Total	120	100
Average Age		42.36±1.41
Education Categories		
Illiterate	32.00	26.67
Primary	13.00	10.83
Matriculation	50.00	41.67
F.A	14.00	11.67
Higher	11.00	9.17
Total	120.00	100.00
Average schooling years		6.95±0.45
Family Size		
less than 5	26.00	21.67
Between 5-10	67.00	55.83
more than 10	27.00	22.50
Total	120.00	100.00
Average Family Size		9.11±0.51
Family Type		
Single	75.00	62.50
Joint	34.00	28.33
Extended	11.00	9.17
Total	120.00	100.00

The average age of the respondents was about 43 years. Most respondents (47.50 percent) were aged (more than 40 years). The education was enough but not very high. The illiterate people in the study area were 26.67 percent and most respondents were educated up to matriculation (up to ten schooling years). The respondents with a higher level of education were 9.17 percent. The average level of education was almost 7 years in the study area. The average family size in the study area was almost 9 individuals. Almost 55.83 percent households had five to ten individuals in the study area. Respondents mostly lived as a single-family system. About 28.33 percent respondents were living as a joint family system. While only 9.17 percent preferred to live as an extended family system.

3.2 Average Farm Size and Farm Types of Respondents

The land holdings were 13.38 acres in the study area. Most respondents were working as owner cum tenant. Only 29.17 percent respondents were operating on their own land. Almost more than 17 percent farmers were taking land on rent and were working as a tenant in the study area.

Table 2 Farm Size and Farm Types of Respondents

Land Ownership	No. of Respondents	Percentage
Owner	35.00	29.17
Owner-Cum-Tenant	64.00	53.33
Tenant	21.00	17.50
Total	120.00	100.00
Average farm Size (Acres)		13.38±1.59

3.3 Animal's Inventory of Respondents

The higher portion of adult buffalo was observed at farm level of farmers. Mostly raring of adult buffalo were preferred than a cow. The average number of adult Buffalo was 4.26 and of the cow was 1.51. In small animals, calves with average 2.66 were more in number than bucks. An average number of bulls was 0.72 on a farm just for participating in running competition that is the keen of respondents in rural areas. Adult goats were 1.25 in number.

Table. 3 Farm Size and Animal's Inventory

Animal's Inventory	Average ± Std. Error
Calves	2.66±0.44
Bulls	0.72±0.09
Bucks	0.55±0.18
Buffalo Heifer	1.06±0.21
Buffalo Adult	4.26±1.32
Cow Heifer	0.62±0.29
Cow Adult	1.51±0.42
Young Goat	0.23±0.08
Adult Goat	1.25±0.22

3.4 Gross Incomes over the Farming Type

The total agriculture income consisted of return from activity farmer practicing at the farm. Farmers those were practicing mixed farming, they were enjoying significant high income (13024.71 US $) than other farmers. The crop growers were earning their income just 2568.23 US $. The livestock farmers income was higher than crop growers but low than farmers practicing mixed farming.

Table. 4 Average Gross Incomes over the Farming Type

Activity	Income of Respondents (US $)
Crops Income	2568.23
Dairy Income	3083.40
Crop + Livestock	13024.71

3.5 Factors Influencing the Agriculture Income

Determinants of farm income were presented in table 5. The F–value shows our model was highly fitted over the included variables. The R^2 value was 0.81. This means that 81 percent variation in the farm income covered by variables that were included in the model. The results showed that 8 independent variables out of 10 were affecting farm income at a significant level. The highly significant variable was a marital status that followed by age, the number of animals at the farm, family members, and farm size. Mixed Farming, Crop intensity, cost related to crops and dairy were significant at 10 percent. The education was non-significant.

The effect of age on farm income observed negative. It means as age increased the farm income decreased. It may be of decision-making power in old age than young people as they adopt innovation than older people. The old people may be more risk averse as compared to young people. Similarly, Safa (2005) had concluded in his study. The family size also had a negative impact on farm income. It means the one percent rise in family members the farm income decreased by 16 percent while all other variable held at a constant level. It may be due to a higher number of family members increase the expenditure and required more output to consume at home level that negatively affects the farm income.

If farmers have sufficient level of education like greater than five years of schooling than income tends to increase. The higher education level enables the farmers to use up to date farm activities. It also improves the technical application of crops cultivation activities. The marital status has a negative impact on farm income if farmers are married, it may be due to the division of family labor force. This division reduces the farm management standards. Mabe *et al*., (2010) also explained the negative impact of marital status on farm income.

Table. 5 Factors Influencing the Agriculture Income

	β_s	Std. Error	t-Value	Sig.
Constant	9.50	2.23	4.26	0.00
Age	-0.44	0.17	-2.54	0.01*
Family Members	-0.16	0.08	-1.99	0.05*

1 if respondent having education greater than five year, otherwise 0	0.01	0.08	0.14	0.89^{NS}
1 if respondent not married, otherwise 0	-0.41	0.14	-2.99	0.00*
Farm Size	0.14	0.07	1.97	0.05*
No. of Animals	0.12	0.05	2.54	0.01*
Crop Intensity	0.79	0.48	1.66	0.10**
Cost Related to Crops	0.08	0.05	1.65	0.10**
Cost Related to Dairy	0.09	0.05	1.72	0.09**
1 if respondent practicing mixed farming, otherwise 0	0.27	0.142	1.90	0.06**

(*), (**) means significant at 5 and 10 percent respectively, NS means not significant. R^2 = 0.81 Adjust R^2 = 0.79 F-Value 46.52

Farm size is very important variable in farm activity. The result cited above indicated that one percent increase in acres the farm income would increase by 14 percent if all variables kept at fixed level. Safa (2005), Parvin and Akteruzzaman (2013) and Ghafoor et al., (2010), also concluded the positive effect of farm size. A number of animals also had a significant level and its elasticity coefficient was 0.12 it means if one percent increases in animals number the farm income will rise by 12 percent at fixed level of all other variables. Crop intensity had also a significant effect on farm income as crop intensity increase by one percent the farm income also increase by 79 percent on fixed level of all other variables. Similarly, Adil et al., (2004), had explained positive effect of crop intensity. The cost related to crop cultivation and animal's rearing had a positive effect on farm income. One percent rise in cost related to crops and dairy can increase farm income by 8 and 9 percent respectively. The mixed farming has also a significant effect on the farm income of the farmers. It means if farmers of the area practice mixed activities (Crop and Livestock) their income could be increased by 27 percent.

4. Conclusion and Policy Recommendation

Most of the respondents were almost 42 years old in the study area. A Large portion of the population in selected area was having education level up to matriculation and 26.67 percent respondents were illiterate. The average size of the family was nine. The respondents were preferred to live as a single-family type than joint and extended. The population of buffaloes was high in the study area and average land size was 13.38 acres. Most of the respondents were owner-cum-tenant. The high share of farm income was of dairy income. The farmers practicing mixed farming were getting a higher income than others. The increase in age,

family size, and marital status has a negative effect on farm income. Rest of the variables have a positive effect on farm income. Mixed farming (crop and livestock) improved the farm income as compared to those practicing single activity.

Young and unmarried people have a potential to improve their farm income because of having better vision and potential. They have more resources than the married persons have. They can manage farm resources better than conventional thinkers (old age people) can. The cropping intensity improves the income of farmers by allocating the resources in a way that is more efficient. The mixed farming is suggested to practice that reduces the risk of income fluctuation. Farmers can earn his daily expenditure by mixed farming system. They have an option to allocate the resources in different agriculture enterprises.

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