



## **Factors Influencing The Food Security And Nutrition Expenditures In Farm Households In Punjab, Pakistan**

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### **Abstract**

The study was designed to explore the preventive side of a healthy farming community which depends on better food intake and the patterns of food and its linkages with socio-economic status of the farmers in the province of Punjab. The aim of the study was to identify the important factors that contribute to poverty amongst the farm households. The study also determines the factors responsible for the nutritious food consumption patterns amongst the farm households. In order to find the important determinants of poverty amongst farmers, we have used the binary logistic regression. The results of the study revealed that education, family size, crops diversification, time given to farm activity and farm size are significant factors in determining the poverty status of farming households. The results also depicted that small farmers spend fewer amounts on nutritious food items than big farmers. This study

found a positive impact of diversified cropping patterns on food consumption amongst farmers. The level of education was also found to be significantly affecting the food consumption expenditures. The study recommended that pro-poor policies be implemented to increase labour productivity and improve food consumption among farmers. Educating farm families about the value of a healthy diet will help them make better food choices. Furthermore, the value of crop diversification must be recognized in order to lift farm households out of poverty and ensure their food security.

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**Keywords:** Food Consumption, Crop Diversification, Nutritious Food, Farm Households

### **Introduction**

The food availability and utilization are important components of food security. They are mainly affected by the socio-economic status of the poor communities in developing countries where agriculture has always been an important source of livelihood. In the era of rapid urbanization where agricultural land is being utilized for non-farm activities, increasing the crop production by bringing more land under cultivation is almost impossible. Pakistan is ranked 8th in wheat production, 5th in sugarcane production, 10th in rice production and 4th in milk production but despite these facts, according to UNICEF's National Nutrition Survey and Ministry of health data only 63.1 percent of the households in the country are food secure. Per capita consumption of the food possessing high nutritional value like fish, chicken, beef, milk, vegetables, and fruits is 6 to 10 times lesser as compared to the developed countries (State Bank of Pakistan, 2019).

Addressing the problem of food security is very essential to ensure the availability of a diverse and nutritious food. But when it comes to the food availability to the farmers and their family, only traditional agricultural interventions which focus on increasing food production and raising incomes to reduce malnutrition, hunger and poverty are not sufficient. Although, this remains part of a valid approach, it is now recognized that higher levels of production and income alone have limited impact on improving food consumption expenditure patterns. A more comprehensive approach is required to optimize the food consumption on the part of farming households as they are the ultimate beneficiary of the agriculture. In case of Pakistan especially Punjab, improving the socio-economic status of the farmers can play an important role for a collective goal of poverty reduction and better food intake. Hence, one of the available options to make farmers better off is to intensify the agriculture by adopting different techniques for the crop diversification.

This research is motivated by a number of reasons, firstly, according to Labour Force Survey 2017, in Punjab, the highest proportion (40.1 percent) of labour force is engaged directly with agriculture, out of which rural share is 38.17 percent. Furthermore, the share of the sector in GDP is about 19.5% (Pakistan Economic Survey, 2018) which makes it the main source of livelihood for a large proportion of the population related directly or indirectly with the sector. Despite the major contribution of agriculture in rural economy, the farming communities have low socio economic status that leads to poverty and gives rise to high prevalence rate of stunting in rural areas of Punjab (rural 34.3 percent, urban 26.0 percent). This reflects limited access to adequate food supply to the rural communities specially children (BOS, 2018).

Furthermore, according to the food policy of Pakistan, despite major share of agriculture in the economy of Pakistan the agricultural growth has not benefited the rural communities up to the expectations. On production side wheat, sugarcane and rice being major crops were given more attention in previous policies but despite consistent increases in the production, one third of the rural population is undernourished in Punjab which points towards the issue that in rural communities, policies makers may have given less consideration to the consumption side of the food. Regarding consumption expenditure side, the proper food mix is necessary to guarantee a healthy diet intake which further aids in enhancing the productivity of farming community. Secondly, Pakistan Vision 2025 seeks a Pakistan where “all people, at all times, have physical and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life”. Although for the improvement of agriculture sector, the government keeps on introducing various modern and scientific methods and techniques but most important aspect that has received least attention is the health and well-being of the farmers.

Keeping in view the above discussion, the study was designed to analyze the food expenditure patterns and its determining factors in farm households. The food expenditure patterns can further serve as a major determinant of the nutritional security of the farmers. Both food security and health are strongly linked with the farmers ‘productivity but better food intake is further dependent on the available household income. Increase in production and productivity can raise incomes, which can increase the purchasing power of the farmers to afford more nutritious food (Salazar, Lina, et al., 2015). While better food intake makes farming households to perform better during field work. So, it can be said that there is a synergistic relationship between better food intake and better earning (French, S.A. et al., 2019).

The expenditure approach of assessing food and nutritional security supports in studying the choice or preferences among different food products. When household income decreases, household calories may be maintained

more or less constant through substitutions within and between food groups while the consumption of essential micronutrients may decrease dramatically as households consume less meat, eggs and milk, which are nutritionally rich foods. For instance, a positive correlation between nutrition and productivity may merely reflect the effect of increased worker productivity and thereby income on nutrition. However, there are few studies which test these linkages empirically which broadly analyze the relationship between agricultural production and income on nutritional status of farmers (Muller, 2009; Villa, Barrett, & Just, 2011).

Understanding the link between the nutritional well-being of individuals and their socioeconomic status is important for drawing policies for those who are under nourished. Interest in understanding this relationship dates back to the 1940s and the development of the "minimum cost" diet plans (Senauer, Asp, and Kinsey, 1992). Similarly, Adrain and Daniel (1976) conducted one of the first comprehensive studies on the relationship between nutrient intake and socioeconomic status. Since then, numerous researchers have reexamined this relationship using latest data and more innovative techniques. It is also evident that labour productivity is directly related to better health and better food intake that ultimately leads to better household income and overall growth of the economy. While, poor health and unhealthy food consumption patterns result in reduction of working capacity and absenteeism from work, which also result in output reduction both at micro and macro level. So, elasticity of agricultural output and income with respect to better food consumption is necessary to explore the relationship of productivity-poverty and poverty-nutritional status. Following the literature and importance of spending on nutritious food items, this study takes into account the expenditures on thirteen food items by farm family households.

Farming households can play very important role in the development of human capital, so, the current study is designed to explore the preventive side for a healthy farming community which definitely lies in better food intake and the patterns of food. Its linkages with socio economic status of the farmers in Punjab will provide important insights to intervene for evidence based policy.

### **Objectives of the Study**

1. To identify the important factors which contribute to the poverty of the farm households in Punjab?
2. To determine how many farm households are unable to afford the minimum cost of a nutritious diet based on their current food expenditure.
3. To determine the factors responsible for lower level of food consumption pattern in some farm households in Punjab.

## Methodology

To find the important determinants of farm households' poverty, Logistic regression is used in this study. Dependent variable takes the value "1", if the daily per capita income of family is above poverty line, otherwise "0". Same methodology was also adopted by Iheke and Nwaru (2013), who estimated the relationship between farm productivity and poverty status of rural small farm households in Nigeria. The dependent variable is binary with purchasing power parity.

$y_i = [$ "1", if the daily per capita income of family is above the poverty line,

"0" if the daily per capita income of family is below the poverty line]

The values 1 and 0 are chosen for simplicity. The poverty line used is \$1.90/day

$$Y_i = \beta_0 + \beta_1 Edu_i + \beta_2 lnage_i + \beta_3 FS_i + \beta_4 MFRATIO_i + \beta_5 CROPS_i + \beta_6 LNPV_i + \beta_7 RATIO TIME_i + \beta_8 LNTEPC_i + \beta_9 FSFA_i + \beta_{10} MFTIME_i + D_1 FSIZE_i + \epsilon$$

**Table 1.** Variable Description

EDU	Education of Farmer
LNAGE	Ln of Age
FS	Family size
MFRATIO	Male to female ratio in family
CROPS	Crop diversification
LNPV	Ln of productivity
RATIO TIME	Ratio of time given to farm activity /time to non-farm activity
LNTEPC	Ln total expenditure per capita of family
FSFA	Interaction of family size and average time given to farm activity
MFTIME	Interaction of male female ratio and time given to farm activity
FSIZE	Dummy of Farm Size
2	Medium
3	Large

To further explore how food consumption expenditures are influenced by agriculture productivity, the following econometric model has been used to analyze the impact of different factors on 14 foods and one non-food (education) expenditures of farm family households. Therefore, daily per capita consumption expenditures are taken as the dependent variables in the model. The explanatory variables include poverty status, family size, crop diversification farm size and interaction of family size with farm size are included in model.

$$C_d = C(Edu, Crops, Poverty, FS, FSC, FSFSC)$$

$$Exp. i = \beta_0 + \beta_1 Edu_i + \beta_2 Crop_i + \beta_3 Poverty_i + \beta_4 FS_i + \beta_5 FSC_i + \beta_6 fsfsc_i + \epsilon$$

**Table 2.** Explanatory Variables Used in Model of Consumption

<b>Variables</b>	<b>Description</b>
EDU	Education of Farmer
FS	Family size
Poverty	“0”, family income is below the poverty line otherwise “1”
Crops	Crop diversification
FSFA	Interaction of family size and average time given to farm activity
FSC	<b>Farm Size Code</b>
2	<b>Medium</b>

### Elasticity Analysis of Food Consumption Expenditures

In order to reduce the estimation error and facilitate the elasticity calculation of food demand, percentage change in daily per capita consumption expenditures are calculated from the regression model estimated in previous section. As the model is linear, so following formula is used to compute the elasticity of food expenditures with respect to education, crops and family size. Moreover, interaction term of family size and farm size is also used in elasticity analysis of the model.

$$E_i = \beta_i \cdot \bar{X}_i / \bar{Y}_i$$

$\bar{X}_i$  denotes the average values of explanatory variables, for which elasticities are computed to measure the percentage change in individual food consumption expenditures.  $\bar{Y}_i$  are the average values of individual food consumption expenditures and  $\beta_i$  denotes the coefficient value of explanatory variable for respective food consumption model.

### Data Source

The data source for the study is primary in nature and data have been collected through structured questionnaire. In order to give coverage to all types of heterogeneity in units of rural households in Punjab, stratified sampling was done. At first, the study area i.e. Punjab was divided into two regions on the basis of source of irrigation i.e. Barani region (rain fed) and Irrigated region. The barani region was subdivided into barani and partial barani, while the irrigated region was subdivided into crop ecological zones i.e. cotton-wheat zone, rice-wheat zone and mixed- wheat zone. The sample size of farm households derived was 766 which was proportionately divided according to the proportion of farm households' population in the sample districts, while further distribution of sample farm households on farm size basis was made proportionately on the basis of population of various farm size categories in the sample village as small (Under 5.0 acres), medium (5.0 acres to < 12.50 acres) and large (12.50 acres and above) with 468, 245 and 53 farm households respectively.

## Results and Discussions

This study has developed different models for “Robustness Check” which is commonly used as an evidence of the structural validity of the model (Lu & White, 2014). In first model, socio characteristics of farm households are analyzed. While in model 2, economic indicators are also added along with interaction terms of the ratio of time given to farm activity and non-farm activity with family size while male to female ratios are added in model 3 and 4 respectively. Model 6 controls farm size along with all the other socio-economic indicators. Age of farmer and the composition of male and female household members which is represented by male-female ratio in one farming household has no significant impact on poverty status of farm households (See table 3). These findings are in line with Iheke and Nwaru (2013) who did not find any significant relationship between age of farm household head and poverty status. Some studies also suggest a negative relationship between age of the household head and poverty status especially of the farm families who have no other source of income (Jayne, et al., 2003). While education is significant only in model 1 at 5% confidence interval. One-year increase in an education level of farmer increases the odd of getting above the poverty line by 4 percent. Farm families with more education of the household head are found to be in better socio economic conditions (Iheke and Nwaru,2013).Although in rest of the models we did not find any significant effect of education in determining the poverty of farm households as odd ratio are approximately equal to one in all the other models. However, increase in family size by one person decreases the odds of being above the poverty line by 15-64 percent gradually in respective models (moving from right to left). Literature also demonstrates that large families are more likely to be poorer as large family size serves as a hindrance in the way of family welfare (Orbeta, 2005; Iheke and Nwaru, 2013). But when more time is given to farm activities is interacted with family size then chances of being above the poverty line significantly increase by the odds of 1.10 as in case of developing countries the average farm size is small and in case of small farm size, families effectively use available resources and mostly farm activity is labour intensive so in case of large families the active individuals’ are available to work on farming activities and families tend to hire less labour (Fan & Chan-Kang, 2005) (model 6).

Crop diversification is an important variable of this analysis which is measured by the number of crops a farm family grows in one cropping season. The results show that with more crop diversification the probability of being above the poverty line increases by odds of 2.15. The above-mentioned relationship reveals that may be with more crop diversification, the farm families earn more livelihoods. Literature also shows that diversified cropping patterns and diversified economic activities in Latin America helped small

holder farmers to come out of extreme poverty that contributed in overall socio-economic development of the rural areas (Demie and Zeray, 2015; Reardon, 2001). Furthermore, as a means to utilize the land maximally in order to increase their income, smallholder rice farmers in Thailand undertaken crop diversification by growing rice and sweet corn (Pitipunya, 1995). Similarly, in tobacco growing zones of Brazil smallholding farmers improved their socio-economic status by introducing alternative crops such as fresh vegetables and bananas as a way to adopt diversified cropping pattern (Vargas and Campos, 2005).

The main inputs required in agriculture are land, nutrients, water and work. The work part is delivered either by machinery, livestock or labour. Developing countries usually have labour intensive agricultural systems and with growing population the demand for food increases. This increased demand for food requires more resources to be allocated to the farm activity. The time spent on the on-farm activities by a farmer is an important factor which affects the work part of the required inputs for the agriculture (Ibarrola-Rivas, 2016). The consumption of good and healthy diet increases the labour productivity and hence improves the agricultural production (Lock et al., 2010). Similarly, productivity of farms households and more time given to farm activities also significantly increases the odds of remaining above poverty line by 4.31 and 1.007.

Crop diversification is found to be linked with farming household's food security, income and productivity (Makate, et al., 2016) but in this analysis the crop diversification is also found to be linked with poverty status of the farmers and time spent on farm activity. Usually on small land parcels, the farming activity is labour intensive so with more crop diversification the time spent on farm activities increases but this time can only be utilized if labour productivity is higher. The one way to enhance the labour productivity is to supply a healthy family labour. The consumption expenditures on nutritious food items are assumed to be the way as one of the preventive measures to avoid diseases and keep the farm families healthy that will ultimately reduce the poverty level. Thirtle et al. (2001) and Irz et al. (2001) also found direct relationship between rise in agriculture productivity and decline in poverty at macro level. Total expenditures per capita of farm household also positively correlate with the time given to farm activities with smaller proportion<sup>1</sup> and hence enable the farm households to remain above the poverty line by odds of 2.24 significantly ( $p < 0.01$ ). Moreover, farm households having medium and large size farms have more probability of remaining above the poverty line by odds of 1.18 and 3.50 respectively than

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<sup>1</sup> Correlation between ratio time and Intepc is 0.17, calculated by author

those who have small farms, but this relationship is not much robust ( $p < 0.1$ ) (Babatunde et al., 2007).

**Table 3.**Dependent Variable: Poverty [Poor=0; Above Poverty Line=1]

Variables	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Edu	0.9595** (0.0180)				0.9933 (0.0272)	0.9918 (0.027)
Lnage	1.0296 (0.2642)				1.1094 (0.4331)	1.1353 (0.4483)
Fs	0.8717*** (0.0284)				0.6346*** (0.0339)	0.6061*** (0.0364)
Mfratio	0.9098 (0.0588)				1.0052 (0.1076)	1.0113 (0.1144)
Crops		1.6894** * (0.1544)	1.6710** * (0.1573)	1.7425*** (0.1624)	2.1153*** (0.2245)	2.1455*** (0.2306)
Lnppv		3.5812** * (0.6432)	3.5034** * (0.6363)	3.6657*** (0.6743)	4.7122*** (1.1199)	4.3059*** (1.0946)
Ratiotime		1.0071** * (0.0022)	1.0069** * (0.0022)	1.0152*** (0.0032)	1.0082** (0.0040)	1.0078* (0.0041)
Ln-tepc		4.2119** * (1.1970)	4.3425** * (1.3095)	4.3948*** (1.2952)	2.5384*** (0.7876)	2.2423** (0.7131)
Fsfa			1.0131** * (0.0213)		1.0918*** (0.0287)	1.0951*** (0.0288)
Mftime				0.9941*** (0.00159)	0.9962* (0.0020)	0.9964* (0.0021)
Fsize						
2						1.1769 (0.3584)
3						3.4969* (2.5078)
Constant	8.879283* * (8.767044)	3.59e-11*** (1.03e-10)	3.81e-11*** (1.09e-10)	1.99e-11*** (5.90e-11)	5.52e-11*** (1.96e-10)	3.30e-10*** (1.25e-09)
Number of Observatio n	745	752	752	752	745	745
Wald Chi_2	28.92	118.67	119.60	118.31	142.92	145.27
Probability	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Pseudo R2	0.0402	0.3587	0.3592	0.3743	0.4733	0.4786

As discussed earlier, the lowest cost of nutritious food estimated by the World Bank is Rs 87 per day per person. Cost estimations of nutritious diets

are significant because it reveals the purchasing power of the farming households and gives a snapshot of food affordability by them. Farmers and their families are supposed to be well nourished when they spend the minimum amount of money specified for the basic costs. However, it is considered that spending less than this amount (Rs 87/day/person) increases the risk of not getting all the essential nutrients. Among small farmers, the percentage of households' spending lower than the Rs 87/day/person is about 31 percent. Similarly, by using the per day household expenditure on food, it is estimated that 19 percent of medium farmers and 11 % of large farmers are spending less than the estimated Rs 87 per person per day.

### **Empirical results of Farm Household Expenditures on Different Food Items**

The analyses of food consumption expenditures of overall data are showed in model 1 (see table 4). While in model 2, farm size is also control with other independent variables. Both models reveal that education has no significant impact on the consumption of wheat, rice, maize, milk and Vanaspati ghee ( $p>0.1$ ). Consumption expenditures on desi ghee, meat, eggs, and pulses rise significantly with one-year increase in education of farm household on an average. Similarly, expenditure on fruits and cereal food items also increase significantly by the increase in an education level of farm household head and this relationship is negative at 10% level for consumption expenditures on vegetables and becomes more robust when farm size is control in model 2 ( $p<0.05$ ), which is contrary to the study of Abdel-Ghany (1978) but supports their results in case of milk, fruits and meat.

Farmers with more crop diversification spend more on wheat, maize desi ghee, beef, meat, eggs, fruits, pulses, cereal food items and other cereal food items for consumption expenditures. But relationship of crop diversification with meat, education expenditures and cereal food consumption expenditures are not statistically significant ( $p>0.1$ ) in model 2. Farms households whose daily per capita income lie above the poverty line, spend more on rice, milk, meat, beef, education and overall cereal food items but relationship of poverty status with meat and beef expenditures is not significant ( $p<0.1$ ). While such farm households spend less on Vanaspati ghee. Family size is another important determinant of food consumption expenditure. An increase in one family member of a household significantly reduces the per capita consumption expenditures on wheat per day ( $p<0.01$ ). But when family size interacts with farm size, this relationship becomes positive. With the increase in farm size along with family size, consumption expenditures on wheat also increases by Rs.29 per day of farm household on an average. Similarly, an increase in family size also significantly reduces the consumption expenditures on desi ghee, Vanaspati, beef, milk, eggs,

vegetables and fruits, pulses and overall cereal food items. But when family size interacts with farm size, relationship with meat, eggs, vegetables, fruits, pulses and all type of cereal food consumption expenditures become positive and significant. Findings of family size variable also matched with prior findings of Radchenko and Corral (2018) who found negative relationship with food expenditures.

Medium and large farm households have less per capita consumption expenditures on wheat by Rs. 4.68 and Rs. 0.41 per day than small farm households respectively among crops and consume more on rice as compare to small farmers but relationship is not significant for the rice consumption expenditures ( $p > 0.1$ ). Large farmers significantly spend more on consumption expenditures of meat and beef than small farmers. Farm size was also not seen to be significant on food security of households in North-Central Nigeria (Babatunde et al., 2007).

Lastly, results of the regression analysis also reveal that farmers with more education and above the poverty line significantly spend more on all food and non-food items per capita. Abdel-Ghany and Schrimper (1978) also found positive and significant relationship of income and rise in education level with food consumption expenditures of U.S farm households. Radchenko and Corral (2018) analyzed that food expenditures increase with the rise in level of education. Households with more income were also found to be more food secure in the findings of Babatunde et al. (2007).

Although farmers with more crop diversification are also more nutritious and spend more on total expenditures at individual household level but statistically, this relationship is not significant. Family size is negatively and significantly related to consumption expenditures on food and non-food items of farm households but when family size increases with the increase in farm size, consumption expenditures on both food and non-food items also rises on average by farm households ( $p < 0.01$ ).

**Table 4.** Regression Analysis of Consumption Expenditures (Without Control of Farm Size)

Variables (Coeff./S.E)	Wheat (1)	Rice (2)	Maize (3)	Other Cereal (4)	MILK (5)	GHEE (6)	VENA (7)	MEAT (8)	BEAF (9)
Edu	-0.0233 (0.0566)	0.0148 (0.0223)	0.0007 (0.0025)	-0.0179*** (0.007)	-0.1805 (0.1499)	0.1446*** (0.0529)	0.0173 (0.0198)	0.1308*** (0.0262)	0.0517** (0.0217)
Crops	0.6590** (0.2726)	-0.0103 (0.0915)	0.0514*** (0.0086)	0.1022*** (0.0295)	0.1276 (0.7146)	0.7151*** (0.2242)	-0.0208 (0.0801)	0.114 (0.1404)	0.1935** (0.0839)
Poverty	-0.6719 (1.153)	1.1232*** (0.2643)	0.0155 (0.0224)	0.0020 (0.0675)	8.8573*** (1.9571)	0.3373 (0.5076)	-0.0876 (0.2126)	0.4127 (0.3149)	0.2154 (0.2156)
FS	-0.9127*** (0.1188)	0.0056 (0.0331)	-0.0125*** (0.0044)	-0.0425*** (0.0108)	-1.0001*** (0.3011)	- 0.2947*** (0.1024)	-0.2873*** (0.0356)	-0.0217 (0.043)	-0.085** (0.0342)
Constant	17.0458*** (1.0535)	2.3138*** (0.3902)	0.0100 (0.0366)	0.3824*** (0.0864)	27.6644*** (1.8535)	2.1988*** (0.7753)	7.9142*** (0.3465)	-0.08 (0.4905)	2.0264*** (0.3552)
Number of Obs.	745.0000	745.0000	745.0000	745.0000	745.0000	745.0000	745.0000	745.0000	745.0000
F-Value (4,740)	15.62***	7.59***	16.22***	7.40***	34.91***	5.78***	16.77***	7.71***	5.92***
R-square	0.0776	0.0309	0.0650	0.0621	0.1091	0.0483	0.1236	0.0391	0.0338

**Table 4 continued.....**

Variables	Eggs (10)	Education (11)	Vege (12)	Fruits (13)	Pulses (14)	Cereal (15)	Lntepc (16)
Edu	0.0159*** (0.0047)	0.4374*** (0.0869)	-0.0597* (0.0322)	0.0684** (0.0299)	0.0285*** (0.0093)	0.9437** (0.4608)	0.0154*** (0.0031)
Crops	-0.0258 (0.0167)	0.2051 (0.2592)	0.3723*** (0.1189)	0.2052* (0.1127)	-0.227*** (0.0396)	0.6855 (1.4367)	0.0285** (0.0117)
Poverty	0.0078 (0.0498)	1.7768* (0.9419)	-0.1838 (0.3455)	-0.5696* (0.3189)	-0.0809*** (0.1122)	19.0679*** (5.2007)	0.127*** (0.0365)
FS	-0.0639*** (0.0091)	0.121 (0.1358)	-0.5232*** (0.0683)	-0.4818*** (0.065)	-0.1166*** (0.0175)	-3.7886*** (0.5342)	-0.042*** (0.0058)
Constant	1.1078*** (0.0926)	-0.0671 (1.3139)	10.1533*** (0.5592)	6.4209*** (0.5869)	3.236*** (0.1933)	81.7438*** (4.6551)	4.8176*** (0.056)
Number of Obs.	745.0000	745.0000	745.0000	745.0000	745.0000	745.0000	745.0000
F-Value	14.39***	7.33***	19.34***	14.57***	23.20***	32.89***	28.43***
R-square	0.1167	0.0251	0.1343	0.1430	0.1846	0.0588	0.1593

\*\*\*, \*\* and \* denotes significance level at 1%, 5% and 10% respectively

Source: Authors' own Calculation

**Table 5. Regression Analysis of Consumption Expenditures (With Control of Farm Size)**

Variables (Coeff./S.E)	Wheat (1)	Rice (2)	Maize (3)	Other Cereal (4)	MILK (5)	Ghee (6)	Vanaspati (7)	Meat (8)	Beef (9)
Edu	-0.0299 (0.0558)	0.0116 (0.0227)	0.0011 (0.0025)	-0.0150** (0.0069)	-0.2109 (0.1638)	0.1083*** (0.0518)	0.0076 (0.0196)	0.1123*** (0.0255)	0.0394* (0.0215)
Crops	0.6914*** (0.2573)	-0.0297 (0.0905)	0.0536*** (0.0086)	0.1180*** (0.0299)	-0.0006 (0.7969)	0.5259*** (0.2006)	-0.0632 (0.0799)	0.0179 (0.1403)	0.1289 (0.0822)
Poverty	-1.6491 (1.3117)	1.1206*** (0.2768)	0.0175 (0.0225)	0.0308 (0.0675)	8.0542*** (1.6299)	-0.1446 (0.4960)	-0.3405*** (0.2069)	0.1698 (0.3091)	0.0436 (0.2147)
FS	-2.2603*** (0.2997)	0.0524 (0.0829)	-0.0156* (0.0094)	-0.0483** (0.0211)	-1.6921*** (0.4054)	-0.4008** (0.2041)	-0.4872*** (0.0852)	-0.0808 (0.1153)	-0.1217 (0.0792)
FSC:									
Medium	-4.6795*** (1.1869)	0.2411 (0.3470)	-0.0219 (0.0443)	-0.1164 (0.0961)	-1.5883 (2.0920)	0.8158 (1.0838)	-0.2595 (0.3452)	0.2933 (0.4884)	0.3977 (0.3535)
Large	-0.4121*** (2.0932)	0.8224 (0.6999)	-0.0749 (0.0881)	-0.4225*** (0.1411)	-1.8113 (4.1845)	3.7978 (2.6813)	-0.4940 (0.7240)	1.9564* (1.1768)	1.2196* (0.7067)
FSFSC	0.7318*** (0.1250)	-0.0313 (0.0380)	0.0023 (0.0048)	0.0081 (0.0083)	0.3301 (0.2552)	-0.0025 (0.1291)	0.0943 (0.0398)	0.0011** (0.0585)	-0.0001 (0.0386)
Constant	21.4366*** (1.4686)	2.2625*** (0.4776)	0.0091 (0.0454)	0.3198*** (0.1128)	30.6861*** (2.9786)	3.5400*** (0.9665)	8.7838*** (0.4302)	0.6384 (0.6009)	2.4631*** (0.4511)
Number of Obs.	745.0000	745.0000	745.0000	745.0000	745.0000	745.0000	745.0000	745.0000	745.0000
F-Value (7,737)	12.3100***	4.6200***	10.0100*	5.9900***	20.3300***	6.3500***	14.0700***	5.4700***	6.0100***
R-square	0.1130	0.0328	0.0666	0.0746	0.1144	0.0766	0.1455	0.0702	0.0552

\*\*\*, \*\* and \* denotes significance level at 1%, 5% and 10% respectively

**Table 5 Continued...**

Variables	Eggs (10)	Education (11)	Vege (12)	Fruits (13)	Pulses (14)	Cereal (15)	Lntepc (16)
Edu	0.0133** (0.0047)	0.4193*** (0.0931)	-0.0709** (0.0322)	0.0533* (0.0294)	0.0236** (0.0094)	0.8809* (0.5172)	0.0130*** (0.0032)
Crops	-0.0375** (0.0170)	0.0780 (0.2542)	0.3332*** (0.1161)	0.1464 (0.1118)	-0.2456*** (0.0397)	0.4768 (1.4984)	0.0176 (0.0115)
Poverty	-0.0541 (0.0498)	1.9330* (1.1281)	-0.6362** (0.3367)	-1.0382*** (0.3016)	-0.2361** (0.1108)	17.0093*** (6.0685)	0.0753** (0.0374)
FS	-0.1099*** (0.0236)	0.6917** (0.3170)	-0.9695*** (0.1410)	-0.9279*** (0.1462)	-0.2673*** (0.0403)	-6.1170*** (1.1775)	-0.0779*** (0.0127)
FSC							
Medium	-0.0561 (0.0903)	2.9985* (1.7472)	-0.8377 (0.6127)	-1.1530** (0.5737)	-0.4023*** (0.1612)	-9.7068 (6.2010)	-0.0370 (0.0514)
Large	-0.0631 (0.1872)	6.9458*** (2.5599)	-2.4940** (1.2825)	-1.7518 (1.3039)	-0.6178** (0.3150)	-9.6298 (11.4472)	-0.0053 (0.1008)
FSFSC	0.0211** (0.0101)	-0.3442** (0.1421)	0.2283*** (0.0707)	0.2204*** (0.0704)	0.0748*** (0.0169)	1.1684** (0.5956)	0.0159*** (0.0062)
Constant	1.3196*** (0.1243)	-1.3974 (1.8881)	11.7909*** (0.6389)	8.2421*** (0.7488)	3.8455*** (0.2377)	91.3125*** (7.4466)	4.9924*** (0.0627)
Number of Obs.	745.0000	745.0000	745.0000	745.0000	745.0000	745.0000	745.0000
F-Value	11.3900***	5.3700***	14.9500***	12.9100***	17.8500***	29.1400***	23.3200***
R-square	0.1381	0.0303	0.1571	0.1804	0.2200	0.0627	0.1951

Source: Authors' own Calculation

### Elasticity's of Consumption Expenditures by Farm Households with Respect to Poverty, Education, Family Size and Crop Diversification

Previous section reported the results of regression analysis of food expenditures by farm households. This section elaborates the elasticity of individual food and non-food item with respect to education, family size, crop diversification and interaction between family size and farm size in table 6. One-year increase in education of farmer increases the consumption expenditures on desi ghee, meat, beef, eggs, education, fruits, pluses and cereal food items by 0.18%, 0.55%, 0.10%, 0.13%, 0.10%, 0.05%, 0.04% and 3.28% respectively. Farmers who grow more crops, their household consumption expenditures on wheat, maize, desi-ghee, vegetables fruits and cereal food items increases by 0.20%, 1.50%, 0.49%, 0.03%, 0.07% and 1.02% respectively. Household consumption expenditures on meat and beef also increases by 0.05% and 0.18% respectively by the farm households with more crop diversification but this relationship is not statistically significant.

Family size is negatively and significantly related with household consumption expenditures on all food items except rice, meat and beef which are not significant. Increase in family size alone reduces the consumption of cereal items of farm households and collectively reduces the consumption expenditures on cereal items by 24%. But when farm size also increases along with family size, consumption expenditures on cereal items also rise by 7.33% and this relationship is also robust. Similarly, when family size increases by farm size, individual food consumption expenditures on wheat, meat, eggs, fruits and pulses also rise by 0.63%, 0.009%, 0.33%, 0.32% and 0.21% respectively. In General, it can be concluded that farmers with more crop diversification and farm size spend more on nutritious food.

A comparison of income elasticity of individual food consumption among rural households shows that sensitivity of food consumption expenditures differs with the level of income. For wheat, vegetables, pulses, eggs and Vanaspati, income elasticity of more income group is lesser than low income group. However, elasticity comparison shows that there is positive and significant increase in the consumption of rice, milk and cereal food consumption expenditures by the higher income group and they are sensitive to choose food items.

**Table 6.** Elasticity's of Consumption Expenditures

	Education	Farm Size	Crops	Interaction of Farm Size & Family Size	Poverty
WHEAT	-0.0153	-1.2273***	0.2022***	0.6290***	-0.0929
RICE	0.0233	0.1118	-0.0341	-0.1057	0.2481***
MAIZE	0.0537	-0.8101**	1.4990***	0.1891	0.0943
Other Cereal	-0.2672**	-0.9148**	1.2037***	0.2429	0.0605
MILK	-0.0512	-0.4365***	-0.0001	0.1348	0.2156***

GHEE	0.1750**	-0.6888**	0.4867***	-0.0068	-0.0258
VANA	0.0083	-0.5624***	-0.0393	0.1723	-0.0408***
MEAT	0.5497***	-0.4206	0.0502	0.0091**	0.0917
BEAF	0.0957*	-0.3145	0.1794	-0.0004***	0.0117
EGGS	0.1252**	-1.1000***	-0.2021**	0.3343**	-0.0562
EDU	0.1009***	0.1769**	0.0107	-0.1394***	0.0513*
VEGE	-0.0117**	-0.1700***	0.0315***	0.0634	-0.0116**
FRUIT	0.0463*	-0.8572***	0.0728	0.3223***	-0.0995***
PULSES	0.0388**	-0.4672***	-0.2312***	0.2069***	-0.0428**
All CEREAL	3.2844*	-24.2538***	1.0182	7.3332**	6.9987***

\*\*\*, \*\* and \* denotes significance level at 1%, 5% and 10% respectively

*Source:* Authors' own Calculation

### Concluding Remarks

The purpose of this study was to assess the relationship between food expenditure patterns and its influencing factors among farm households in Punjab, Pakistan. As socio economic status and poverty is one of the major reason shaping the food consumption patterns in a household so the first model was developed to examine the determining factors of poverty in farming households but and second model was developed to examine the impact of poverty status on individual food consumption expenditures. Poverty situation in farm households did not show good picture, as approximately 29 percent of sample farm households were living below the poverty line.<sup>2</sup> Education, family size, crops diversification, productivity, time given to farm activity and farm size are all found as important factors in determining the poverty status of farm households. It might be expected that more family size leads to more active members available for work in fields and hence more time given to farm activities which eventually increase the productivity that ultimately reduces the poverty. On the other hand, consumption expenditures analyses of nutritious food items show that poverty is one of the important factors to determine the consumption pattern of any farm household. Analyses reveal that poor people consume less amount on nutritious items like; rice, milk, meat, beef and all in all cereal food items. Similarly, large family size also leads to reduction in consumption of nutritious items but when increases with the increase in both farm and family size interact with farm size, consumption expenditures on individual cereal items also. Results of the study also reveal that an increase in farm size from small to medium and large, per capita consumption of food items also increases. As we have used the education as a proxy of awareness in this study, so, more educated farmers were found spending more on caloric items than others. Similarly, the farmers with more

<sup>2</sup> Calculated from the data as per \$1.90/capita per day.

education level tend to spend more on rice, desi ghee, meat, beef, eggs, fish and fruits as compared to the farmers with low level of education. Farmers who grow more crops were above poverty line and consume more cereal items on an average. Elasticity of consumption expenditure revealed the positive and significant increase in the consumption expenses of some nutritious food items if there is increase in farmer's income and education.

### **Recommendations**

- The present study demonstrates that more production by farm households leads to more income per capita of family. So, to increase the crop productivity there must be interventions by the government to increase the labour productivity through better health conditions which makes better food consumption a pre-requisite.
- Those farming households should be targeted which are below the poverty line and are not spending according to WHO recommended amount to be spent at a nutritious food basket.
- The farmers with large farm sizes although spent more on food but then it becomes the matter of awareness that further affects the food choice. So, better food choices should be ensured through educating farm families.
- The findings of the study suggest that in order to get farm households out of the circle of poverty and keep them food secured, the farmers should be informed about the importance of crop diversification. The households with larger family size having more active members available to work in fields should be trained to increase their productivity to achieve sustainable growth in agricultural.

### **Areas for Future Research**

Future researchers should dig out the barriers of crop diversification and to study the nutritional security of the farm families and its linkages with the disease prevalence and labour productivity. Food consumption patterns can be assessed with respect to multidimensional poverty index which will provide more detail of the farm household's affordability and choice determinants.

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