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IMPACT OF SOCIO-ECONOMIC CHARACTERISTICS OF RURAL HOUSEHOLDS ON FOOD SECURITY: THE CASE OF THE PUNJAB, PAKISTAN

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ABSTRACT

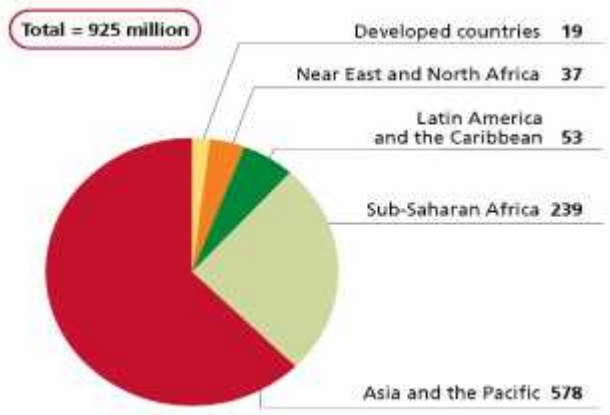
Food security was assessed using the calorie intake method in the rural Punjab of Pakistan using primary data from 1152 households in 12 districts. Results show that 23% of households were food insecure, out of which about half were found to be severely food insecure. Socio-economic correlates were identified by analyzing cross-tabulations and running χ^2 tests. Livestock assets, monthly income, family size, family structure, household head's age and educational levels were identified as major correlates of rural household food security. Furthermore, they were ranked for their relative importance to food security. Livestock assets and monthly income were found to be the most important factors.

Keywords: Food security, rural households, factor identification, factor ranking, Pakistan.

INTRODUCTION

Food insecurity is a global hazard that is threatening every country of the world. It exists when people do not have adequate physical, social or economic access to food (FAO, 2009). In terms of its severity, it is termed as less-severe and severe suggesting that less-severe food insecurity is associated with reduced quality and variety of dietary intakes (Tarasuk, 2001), while severe food insecurity is caused by continuously insufficient food intakes to meet dietary energy requirements (FAO, 2001). Both of these forms are thought to be associated with a range of adverse psychological, developmental and health outcomes, especially in children (Alaimo *et al.*, 2001). It is such a powerful issue that can threat domestic law and order situations (Mustafa, 1996). Therefore, food must not be considered as an ordinary commodity. In fact it is a powerful policy instrument that guides the political and economic decisions of nations (Omole, 1996). Further, it is argued that the right of easy access to food is more important to households (especially, those who are suffering from food insecurity) than any other basic human right including education, health, and political and social participation (Mustafa, 1996). Hence, it can be included in development indicators (Oyakhilome, 1996).

Since the World Food Summit of 1996, almost all countries of the world have attached greater importance to the issue of food insecurity. Despite this emphasis, the problem continues to exist at an increasing pace. Today, more than 900 million people around the world are malnourished (FAO, 2010). Figure 1 shows that more than 88% of these people are in Sub-Saharan Africa (239 million), and Asia and the Pacific (578 million). In South Asia, 337 million people are undernourished, where these numbers have increased in India and Pakistan over the last few years despite the economic growth observed in these countries.



Source: FAO 2010
Figure 1 Undernourished population in the world

Pakistan is a developing country with an average per capita income of $ 1254 per annum. Its economy is heavily dependent on agriculture that contributes nearly 21% to its national income (GDP) and employs 45% of its workforce (GOP, 2011). It also supplies raw material to Pakistan's Industries, notably textile industry, the largest industrial sub-sector of the economy. More than 63% of country's population lives in rural areas and is directly or indirectly dependent on agriculture for its livelihood (GOP, 2011). Pakistan has made significant progress towards food sufficiency since its independence in 1947. This is proved by the FAO's (2011a) statistics for the year 2008 that shows that Pakistan is one of the

world's leading producers of many agricultural commodities[1]. Despite this, 26% of the population is undernourished (FAO, 2011b). Therefore, the aim of this study is to highlight the severity of the food insecurity problem in the rural areas of the Punjab province of Pakistan. For this purpose the objectives are to measure the rural household food security situation in the Punjab province; to examine the socio-economic characteristics of rural households; and to rank them for their relative importance. The underlying research questions are:

1. *What is the food security level, experienced by rural households?*
2. *What are the main characteristics[2] of the rural households relating to their food security status?*
3. *What is the relative importance of these characteristics to rural household food security?*

The rest of the paper is organized as follows: section 2 discusses the methodology; section 3 presents and discusses the results; and section 4 concludes the paper.

MATERIALS AND METHODS

Data collection and analysis: Data were collected from the rural areas of the Punjab province of Pakistan. A stratified sampling technique was used to divide the province into three strata (1= South Punjab; 2 = Central Punjab; and 3 = North Punjab) based on its geographical characteristics. The study area was then formulated by including one third of the total districts of the province. For this, a proportionate number of districts were selected from each stratum using equation 1 (Chaudhry and Kamal, 1997), because of the fact that strata were not identical in terms of district numbers.

$n_i = n.[N_i/N]$ for i = 1, 2 and 3 (Equation 1)

Where;

1, 2 and 3 = selected strata respectively (1=South Punjab, 2=Central Punjab and 3= North Punjab)
n_i = selected number of districts in the i^{th} stratum
n = total number of selected districts from all strata
N_i = number of districts in the i^{th} stratum
N = total number of districts

Equation 1 indicates 3 districts each from south and north and 6 districts from central Punjab as the total number of sample districts. This selection was based on the attributes of districts (total population; total number of villages; irrigated and non irrigated land areas; and per capita and per acre wheat production). Within each district 1% of the villages were randomly selected for detailed study. In terms of the respondents, only small farmers who own up to 5 acres of land and landless rural households were targeted. This selection was based on the fact that more than 80% of the rural households are small land holders or landless households (GOP, 2011). A 10% of the sample households (5% small farmers and landless each) were selected for personal interviews. The total sample size for the study, thus, became 1152 households.

Data were collected through a comprehensively designed interview schedule that recorded different parameters of household food deficiency. Food deficiency is used as a proxy for food security. Food deficiency or security status of the households was defined and calculated using the most common method for this purpose: the calorie intake method using a 7 day recall of food consumption. The calculated calories were then adjusted for adult equivalent units defined by National Sample Survey Organization (NSSO) of India (1999). A threshold level was required for considering a household as food secure or insecure. For this purpose, the threshold defined by Government of Pakistan (GOP) for rural population (2450 Kcal/person/day (GOP, 2003) was used. A household whose daily per capita calorie intake was equal to or greater than this threshold level was considered as food secure. The severity of the problem (food insecurity) was judged on the basis of shortfall in calorie intake at a household level from the recommended intake. For this purpose a shortfall of 500 Kcal/person/day was considered to be the threshold shortfall that can generate severe food insecurity.

It is assumed that there are different characteristics of rural households that are attached to the variations in food security. To identify them, simple analytical technique of frequency distribution, the crosstabs was used. For frequency distribution type of analysis, crosstabs is the most common technique used by the social scientists (see for example Ajani *et al.*, 2006; Amaza *et al.*, 2009; Bashir and Azeem, 2008 and 2009; Kebebew and Urgessa, 2011; and Sharkey *et al.*, 2011). To compare the results of frequencies, Chi-square test is the most suitable and commonly used statistical technique (Ewens and Grant, 2001). Different variations of chi-square (likelihood ratios and linear-by-linear association) were also applied to check the sensitivity of the results.

The hypothesis is thus formed as:

H_0^j: *household's socio-economic characteristics have no relationship with its food security*
H_1^j: *household's socio-economic characteristics have a significant relationship with its food security*

Where;

Superscript 'j' represents the j^{th} variable (livestock assets, monthly income, family size, family

[1] World rank **2nd:** buffalo milk and meat; **3rd:** apricots and chickpeas;**4th:** onions, cotton lint, goat milk and meat; **5th:** sugarcane, dates, chillies and peppers; **6th:** mangoes, guava, okra and pulses; **10th:** wheat, and spinach; **11th:** rice, oranges and pistachios (FAO, 2011a)

[2] The terms correlates and factors are alternatively used for household characteristics of food security

structure, educational level, household head's age, total earners and decision making).

RESULTS AND DISCUSSION

Rural household food security: Table 1 reveals the food security situation of the study area at Government of Pakistan's (GOP) food security line for rural areas (2450 Kcal/person/day). In terms of food insecurity, it was found that landless households were more food insecure as compared to the farmers i.e. 13.5 and 9.4%, respectively. Over all in the study area 888 (77.1%) households were measured to be food secure and 264 (22.9%) households were measured to be food insecure. Out of the food insecure households about 47% (about 11% of the total sample) were severely food insecure whose daily per capita calorie intake fell short of the recommended one by 500 Kcal/person/day. Out of these severely food insecure households a good majority (about 66%) were landless households.

Table 1. Food security situation of the study area

Food Secure			Food Insecure		
Landless	Farmer	Total	Landless	Farmer	Total
420	468	888	156	108	264
(36.5)	(40.6)	(77.1)	(13.5)	(9.4)	(22.9)
			Severely Food Insecure		
			83	42	125
			(7.2)	(3.6)	(10.8)

Figures in parenthesis are the percentages
Source: Field survey

The results presented in Table 1 are representative of the national situation when compared to the current FAO statistics according to which 26% of the population in Pakistan is undernourished (FAO, 2011b).

Identification of the correlates of food security: The comparative analysis of the small farmers and landless households based on their socio-economic characteristics with special reference to their food security status is presented in Table 2. A total of nine characteristics (factors or correlates) were included in the study based on the prior knowledge about the study area and the available literature on food security in the region (especially South Asia). Causality in food security is complex and can "go both ways", so it is better to first get a clear picture of correlations. The frequency distributions of these variables were tested statistically for their relationship with the food security status by applying the χ^2 test. The results were cross-checked using other statistical techniques i.e. likelihood ratio and linear-by-linear association. Statistically, seven of these variables were found to have a strong relationship with food security across all three statistical measures. A detailed discussion of the results for each variable is given below:

Livestock assets refer, in this study, to small (goats and sheep) and large (buffalos and cows) animals owned by the households. It is assumed that having livestock assets assure food security of a household mainly because of three reasons: firstly, they are a source of milk and meat; secondly, the excess milk and meat can be traded for other food items; and thirdly, they serve as a buffer and insurance asset against the risk of difficult years. The results presented in Table 2 are supportive of the above stated assumption because 58% and 65% of the food insecure households did not own small and large livestock, respectively. Landless food insecure rural households who did not own livestock were a majority compared to the food insecure farmers i.e. 56 % (12.8% of the total) vs. 6.5% (0.6% of the total) in case of small animals and 56% (12.8% of the total) vs. 9.6% (2.2% of the total) in case of large animals. The results of the χ^2 test are significant at the 1% significance level, pointing out a strong relationship between livestock ownership and food security. This led us to reject our null hypothesis that livestock assets have no relationship with rural household food security. These results are in line with the results of Thamaga-Chitja *et al.* (2004) who indirectly found a positively significant relationship of livestock ownership with household food security.

Monthly income refers to the monthly earnings of the households both from farm and off-farm sources. The results of the frequency distribution in the form of crosstabs for monthly income and household food security revealed that about 60% of the food insecure households were earning up to a maximum of Rs 15000 per month, while more than 85% of the food secure households were earning up to Rs. 30000 per month. This clearly distinguishes between the relationships of higher income with high frequencies of food secure households. On the other hand, more than 72% of the landless households were only able to earn up to Rs. 15000 per month as compared to more than 60% of farmers who were earning more than Rs. 15000 per month. This implies that being a farmer provides an edge to earn a reasonable income that helps maintain household food security compared to landless rural households. These results also point out that, overall, more than 55% of the food insecure households' monthly income was up to Rs. 15000, implying that the prevailing minimum wage rate (set by the government at Rs. 7000 per month) is not sufficient to ensure food security to the households. The χ^2 result is significant at less than 1% significance level, rejecting the null hypothesis and statistically confirming the above outcomes. From these results it can be concluded that an increase in the monthly income of these households can ensure better food security for them, in terms of improving both their production and

consumption levels. These results are in line with the existing literature that used similar analytical techniques and claimed that income plays an important role in enhancing the food production and in helping households to have greater access to better quality foods (see for example Thamaga-Chitja *et al.*, 2004; Ajanai *et al.*, 2006; and Babatunde *et al.*, 2007).

Family Size refers to the number of total individual members in the household. It is assumed that the food requirements of larger families are greater than small families pointing out a negative relationship with food security. This assumption is confirmed by the results, presented in Table 2, that more than 70% of the food insecure households had a family size of 8 or more members. This explains that the greater the family size, the lower the food security of the household. Among the household categories, more than 40% of the food insecure households having a larger family belonged to the landless household category. This implies that farmers had relatively smaller families and they were more food secure as compared to the landless rural households. This points out that the efforts to keep the population under control must increase the focus on the landless rural households. The χ^2 value is significant at less than 1% significance level, indicating that the relationship of family size with food security is significant. As a result, the null hypothesis that family size has no relationship with household food security is rejected. Similar results were found by Thanaga-Chitja *et al.*, 2004; Ajani *et al.*, 2006; and Hackett *et al.*, 2010 using the same analytical techniques for South Africa, Nigeria and Colombia, respectively.

Family structure refers to the family type that is defined differently in different cultures e.g. single parent / mother, divorced parent / mother, etc. In Pakistani culture family type refers to nuclear family or joint family i.e. if a household head is living alone with his / her children (i.e. Husband, wife and children) it is said to be a nuclear family but when this household head is living jointly with other similar household units under the supervision of a common household head it refers to a joint family. It is generally considered that joint families are more food secure because of the fact that they usually pool their resources under a common household head. This assumption can be wrong, especially when there is only one earning member to feed so many people in the household. The results of this study reject the possibility because more than 55% of the food insecure households belong to the joint family system (i.e. 7.1% landless and 5.7% farmers). The results of the χ^2 test are significant at 1% significance level and confirm a significant relationship between family structure and food security. So, we reject our null hypothesis that family structure has no relationship with household food security.

The household head's age (in years) was assumed to have an inverse relationship with household food security (Bashir *et al.*, 2010). It is evident from the results that a majority of the household heads belonged to the age group of 31 to 45 years (more than 50%). More than 40% of the food secure households were headed by the same aged heads while more than 60% of the food insecure households were headed by the heads from the age group of 46 to 60 years and above. Mostly, the food insecure households that were headed by the older heads belonged to the landless rural households i.e. about 37% as compared to 24% of farmers. This implies that the landless households are headed by the older heads compared to the farmers. The highly significant (at less than 1%) χ^2 value rejects the null hypothesis that head's age has no relationship with household food security. It can be concluded that rural household food security deteriorates with increasing age of the household heads, pointing out a negative relationship. This is because of the fact that younger people are stronger and are expected to perform more laborious jobs both at farm and off-farm levels. Similar relationship of household head's age was found by Sharkey *et al.* (2011) using the same analytical approach for the United States of America.

Educational levels refer in this study to the number of schooling years a household head has attended. Education is assumed to be a social capital that can positively impact the food security of a household by making individual members (of the households) to make good production and nutritional decisions. It was revealed that more than 35% of the food insecure households were illiterate while about 40% of them had attended school for only five years. Among the two household categories, about 48% of the food insecure households were landless with no or up to 5 years of schooling. The χ^2 result is significant at less than 5% significance level, rejecting the null hypothesis and statistically confirming that higher education level of the household head ensures food security to its household. Similar relationship of educational level with household food security was found by Thamaga-Chitja *et al.*, 2004; and Ajani *et al.*, 2006 using the same analytical techniques for South Africa and Nigeria, respectively.

Total earners refer to total number of family members who earn monthly income from farm or off farm labour. It is assumed that household food security is improved with the presence of more earners in a household. However, the results show that about 70% of the sample households had only one income earner. The results of the statistical analysis (χ^2 test) are significant at less than 5% significance level; rejecting the null hypothesis that

Table 2. Correlates of Food Security

Ranks	Correlates of household food security	Household Food Security Categories					χ^2
		Food insecure landless n = 156 (13.5%)	Food insecure farmer n = 108 (9.4%)	Food secure landless n = 420 (36.5%)	Food secure farmer n = 468 (40.6%)	Total n = 1152 (100.0%)	
	Livestock Assets Small Animals (%)						970.3 ***
	No livestock	12.8	0.6	31.3	1.2	45.9	
1	1 to 3	0.1	7.2	1.1	14.2	22.6	
	4 to 6	0.6	1.6	3.2	23.6	29.0	
	7 +	0.1	0.1	0.8	1.6	2.6	
	Livestock Assets Large Animals (%)						647.7 ***
	No livestock	12.8	2.2	31.4	4.8	51.2	
1	1 to 3	0.2	1.4	0.5	5.8	8.0	
	4 to 6	0.1	2.7	2.8	15.1	20.7	
	7 +	0.3	3.0	1.7	14.9	20.0	
	Monthly Income (%)						161.1 ***
	Up to 7000	1.5	0.5	3.1	1.8	6.9	
2	7001 to 15000	8.1	3.1	23.2	12.8	47.3	
	15001 to 30000	3.9	5.2	9.2	21.7	40.0	
	30000 +	0.0	0.5	0.9	4.3	5.7	
	Family Size (%)						136.0 ***
	Two	0.0	0.0	0.6	0.1	0.7	
3	Four	0.9	0.5	7.8	6.1	15.4	
	Six	2.8	2.2	18.0	17.1	40.0	
	Eight +	9.8	6.7	10.0	17.2	43.7	
	Family Structure ^ (%)						101.4 ***
3	Nuclear	6.4	3.6	29.5	26.5	66.0	
	Joint	7.1	5.7	6.9	14.1	33.9	
	Household Head's Age (%)						55.0 ***
	Up to 30	0.6	0.5	2.4	1.0	4.6	
4	31 to 45	4.5	3.2	21.1	21.4	50.3	
	46 to 60	6.9	4.6	11.2	14.9	37.6	
	60 +	1.5	1.0	1.6	3.2	7.5	
	Education (%)						81.1 **
	Illiterate	5.5	2.5	9.4	5.6	23	
5	Primary	5.5	3.6	12.8	13.4	35.2	
	Up to Matric	1.8	2.8	10.0	15.8	30.4	
	Intermediate +	0.8	0.4	4.3	5.8	11.3	
	Total Earners (%)						21.27 **
	One	9.2	6.4	27.6	26.5	69.7	
6	Two	3.1	1.7	6.7	10.4	21.9	
	Three	1.0	0.8	1.9	3.1	6.8	
	Four +	0.1	0.4	0.2	0.6	1.4	
	Decision making (%)						2.7 NS
7	Male	10.0	6.5	27.0	28.4	72.0	
	Female	3.5	2.8	9.4	12.2	28.0	

Source: Field survey |
*** = H_0 is rejected with at least 99 % certainty | ** = H_0 is rejected with at least 95 % certainty | NS = H_0 is accepted (H_1 rejected)|
Primary = 5 years of schooling i.e. grade 5 | Up to Matric = 8 and 10 years of schooling i.e. grades 8 and 10 | Intermediate + = 12 years of schooling i.e. grade 12, and above i.e. graduation
^ family size and family type were strongly correlated, hence they share a common rank

total earning members have no relationship with household food security.

'Decision making' refers to who is responsible for food consumption related decisions or making the 'kitchen rules'. It is a general perception that households where

females make such decisions are more food secure. This is represented by the results as in more than 70% of the food insecure households males make such decisions but statistical analysis (χ^2 test) does not support this argument. Hence we accept our null hypothesis that decision making has no relationship with household food security.

Ranking of the correlates by strength of relationship: The factors can be ranked for the strength of their relationship with food security on the basis of absolute values of the magnitudes of the statistical tests (Omotesho *et al*. 2007; and Mengistu *et al*. 2009), in our case the value of the chi-square test. Following this ranking principle, livestock assets are ranked as the most important correlate in the study area, followed in order by monthly income, family size and family structure. The comparison between the rankings made by the current study and earlier studies is presented in Table 3. Based on this comparison, the most common factors affecting food security are livestock assets, income, and family size. However, these factors are ranked differently in each of these studies except for livestock assets that was ranked at the top of the lists for both the current study and that of Mengistu *et al.,* 2009. Different rankings for other factors in these studies could be due to socio-economic and demographic attributes of these countries (Annex I). In addition, the difference in ranks in the current study has two reasons: first, the current study used a different statistical method than the studies compared with; and second, countries, states and regions have different cultures and demographic structures (for example see UNICEF, 2001).

Table 3. Comparison of ranks

Ranks	Current study	Mengistu *et al.* 2009	Omotesho *et al.* 2007
1	Livestock assets	Livestock assets (bullocks)	Family (household) size
2	Monthly Income	Access to economic factors	Expenditure on food
3	Family size	Marital status	Access to health facilities
4	Family structure*	Rented in land	Farm size
5	Educational level	Family (household) size	
6	Household head's age	Average household income	

*stands for either nuclear family or joint family

On the other hand, family structure (nuclear or joint) specifically reflects the study area's culture (Punjab). It was strongly correlated with family size, hence given the same rank. This factor can be generalized by changing its definition from a nuclear or joint family to whatever definition more appropriate to the culture of the study area, for example, single parent, married couples with children, married couple / in relationship, etc.

Conclusions: Our findings indicate that 23% of the sample rural households were food insecure. It was found that livestock assets, monthly income, family size and family structure are the most important factors affecting food security. The implications of this study are critical for both governmental and non-governmental agencies. They are also useful for those researchers who are interested in assessing rural household food security and socio-economic characteristics of different household categories. In Pakistan, the present study is one of the few primary-data based studies of rural household food security.

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Annex-I. Socio-economic differences amongst Pakistan, Nigeria and Ethiopia

Socio-Economic Indicators	Pakistan	Nigeria	Ethiopia
Ethnic groups	More than 6 ethnic groups: Punjabi 44.68%, Pashtun 15.42%, Sindhi 14.1%, Sariaki 8.38%, Muhajirs 7.57%, Balochi 3.57%, other 6.28%	More than 250 ethnic groups: Hausa and Fulani 29%, Yoruba 21%, Igbo (Ibo) 18%, Ijaw 10%, Kanuri 4%, Ibibio 3.5%, Tiv 2.5%	More than 11 ethnic groups: Oromo 34.5%, Amara 26.9%, Somalie 6.2%, Tigraway 6.1%, Sidama 4%, Guragie 2.5%, Welaita 2.3%, Hadiya 1.7%, Affar 1.7%, Gamo 1.5%, Gedeo 1.3%, other 11.3%
Population	187,342,721 (rank: 6)	155,215,573 (rank: 8)	90,873,739 (rank: 13)
Urbanization	36% of total population (3.1 % annual rate of change)	50% of total population (3.5 % annual rate of change)	17% of total population (3.8 % annual rate of change)
Education (age 15 and over can read and write)	49.9%	68%	42.7%
GDP (PPP)	$464.9 billion	$377.9 billion	$86.12 billion

Source: CIA, 2011