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ARE THE DETERMINANTS OF FOOD INSECURITY FOR LANDLESS HOUSEHOLDS DIFFERENT FROM THAT OF OTHER RURAL HOUSEHOLDS?

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This paper aims to investigate whether or not the determinants of food insecurity for landless households are different from that of other rural households in the Punjab province of Pakistan. Household level data were collected from 576 landless households representing 12 districts of the province. The data were analyzed in two stages: first, we measured households' food security status by calculating their food consumption; and in a second stage, a binary logistic regression was used to examine the determinants of their food security. The results suggest that about 27% of the sample households were measured to be food insecure. The analysis revealed that level of education of household head had the greatest impact on food security, followed by increases in monthly income. Conversely, family size had the greatest impact on increasing food insecurity, followed by the household head's age. The analysis further reveals that these determinants of food insecurity are similar to those found for the rural households in the same region and other countries of the world, but their relative importance for food insecurity differs for landless households. These results suggest clear priorities for food security policy in the Punjab.
Keywords: landless households, rural food security, determinants, Punjab, Pakistan

INTRODUCTION

Food insecurity is on the rise in developing countries where about 900 million of the world's 925 million undernourished people are living (FAO, 2010). Over 70 percent of such people are living in rural areas and are dependent on agriculture for their livelihoods. Rural areas have some unique characteristics including the limited number of markets, their accessibility and less diversity in terms of available food items which are affecting the food security of people living there (Morris *et al.,* 1992). In many developing countries underinvestment in the agricultural sector, makes them more vulnerable to price instability. Since the late 1980s, a sharp decline was observed in the overall rate of growth in agricultural research and development investment in developing countries. Investment in the agricultural sector has focused largely on exportable crops to generate foreign exchange, forcing countries to rely on continued low international food prices to meet national food demand which failed to fulfill the desired results (IAASTD, 2008).

Pakistan, on the contrary, achieved food self sufficiency in the 1980s (Gera 2004) and maintains its status of food self sufficient country in terms of total production (Bashir *et al.,* 2007, 2012). The economy of Pakistan depends largely on its agricultural sector, which contributes about 22% to the national GDP and employs about 45% of the workforce. Moreover, a significant proportion of total population (65%) still lives in rural areas and about 26% of the population is undernourished despite Pakistan being one of the largest producers of many agricultural commodities in the world and is self sufficient on food at national level(GOP, 2011; FAO, 2010; FAO, 2011).

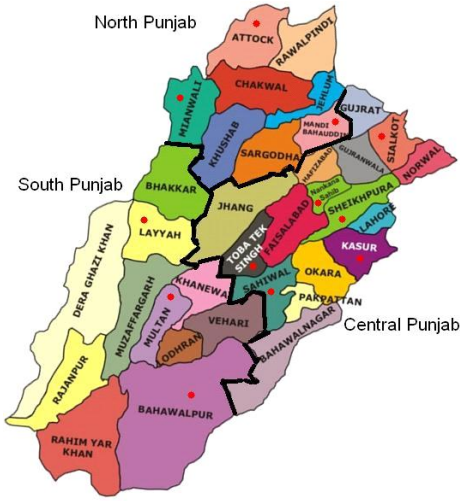
Punjab is the most populated province in Pakistan, a home to more than 73 million people i.e. 55% of Pakistan's population (GOP, 1998). Agriculture is the key economic sector of the province. It has more than 3.8 million farms out of 6.62 million total farms in Pakistan and has the largest share (57%) to agricultural GDP of the country. However, the majority of the households in the province are landless (74%). Such households earn most of their income from non-agricultural sources. They are mostly engaged in informal activities that accommodate a large majority of unskilled, uneducated and less educated individuals. Landless households usually earn their livelihood from paid employment and self employment (Anwar *et al.* 2004). Such households are the most vulnerable ones to food insecurity (Yasin, 2000). This study aims to answer the key question: are the determinants of food insecurity for landless households different from that of other rural households? To answer this critical question we must know the answer to the following research questions:

1. What levels of food security are experienced by the landless households of the province?

2. Which socio-economic factors correlate with and best explain the levels of food security of these households?
3. What is the relative importance of these socio-economic factors for food security of landless households?
4. Results of this study are expected to provide information that will help policy makers to formulate policies that will ultimately lead to food security of landless households in rural areas of Pakistan.

MATERIALS AND METHODS

***Data collection*:** The Punjab province was dub-divided into three regions on the basis of geographical characteristics. Out of its 36 districts, the districts situated in the south that have desert and some mix of desert and plains (i.e. river plains) were kept together to formulate South Punjab region. The districts that are mostly plains were jointly termed as Central Punjab region and those districts that are situated 350-900 meters above the sea level formed the North Punjab region for this study. The regions were asymmetric in terms of district numbers i.e. 11, 17 and 8 in South, Central and North Punjab, respectively. The household level data were collected from one third of the total districts (i.e. 12). A proportionate sampling was adopted to determine the number of districts for each region, which resulted in 3, 6 and 3 districts from south, central and north Punjab, respectively. These districts were selected on basis of homogeneity in population size, number of villages and availability of irrigation water.



- *Selected districts*

Figure 1. Sub-regions and district selection

One percent of the total villages were randomly selected from each district, which resulted in 72 villages (i.e. 6*12) as sample villages. From each village, 8 landless households were randomly selected that lead to a total sample size of 576 households (i.e. 72*8).

Household level information was collected using an interview schedule. Detailed information on various aspects relating to food security including household size, household type, household income, expenditures, ownership of livestock asset and food intake were obtained from the household heads during the interview.

***Data analysis*:** Data were analysed in two stages. In stage 1, we calculate the household food security status; and in stage 2, we examined the data to find determinants of household food security of landless households.

Food security status of the landless households was measured by calculating their per capita calorie intakes using a 7 days recall method. The calculated calories were converted into per capita intakes after adjusting to adult equivalent units to cancel out the impacts of age and gender differences. The calculated per capita calorie intake was, then, compared to a threshold level defined by the Government of Pakistan for rural areas, i.e. 2450 Kcal/capita/day (GOP, 2003). The households whose per capita calorie intake were equal to or above this threshold level were considered as food secure households, otherwise not. Mathematically, it is defined as:

$$Y_i = \sum C_i^{ad} \geq 2450 \qquad (1)$$

Where:

Y_i is the food security status of i^{th} landless household (1 for food secure and 0 for food insecure), and C_i^{ad} are the adjusted calorie intakes of i^{th} landless household.

Despite the criticism on the dietary intake method, the selection is justified because the selected households belong to the lowest income groups who often have to deal with food provisioning uncertainty on a daily basis (Yasin, 2000). For them, it is often more difficult to achieve nutritionally balanced diet (protein and vitamin intake) than having sufficient calories, e.g. bread and rice. To avoid ambiguities due to lack of consensus on thresholds and to ensure maximum precision, the threshold level defined by the Government of Pakistan for rural households is used in this analysis.

The determinants of rural household food security for the selected household were identified using a binary logistic regression model. The binary form of the dependent variable i.e. '0' for food insecure and '1' for food secure, guided us to use this model (see for example Feleke *et al.,* 2005; Babatunde *et al.,* 2007 and Bashir *et al.,* 2010). The probability of the occurrence of an event for more than one explanatory variable is directly estimated using this model (Hailu and Nigatu, 2007). Assuming a linear relationship between food security status and various explanatory variables, the food security status of a household Y_i can be written as:

$$Y_i = \sum^{i=n} \beta_i X_i + e_i \qquad (2)$$

Where, β_i represents the coefficients of the model, X_i represents the vector of socio-economic factors, and e_i is the error term.

As the dependent variable is in a binary form, the model can be re-written in terms of the probability of a household becoming food secure as:

$$\wp_i = \wp(Y_i = 1 | X_i = x_i) + e_i \qquad (3)$$

Where, $\wp_i$ is the probability of i[th] household becoming food secure, x_i is the vector of socio-economic factors, and e_i is the error term.

The general form of logit can be written for equation 3 as:

$$\text{logit}(\wp_i) = \beta_o + \beta_i x_i \qquad (4)$$

Equation (4) can be re-written for the explanatory variables used in the analysis as:

$$\wp_i(Y_i) = \beta_o + \beta_1 HHMI_i + \beta_2 AHHH_i + \beta_3 HHS_i + \beta_4 TEHH_i + \beta_5 HHT_i + \beta_6 OL_{Li} + \beta_7 OL_{Si} + \beta_8 Edu_{Pi} + \beta_9 Edu_{Mi} + \beta_{10} Edu_{Ii} + \beta_{11} Edu_{Gi} \qquad (5)$$

where:

$\wp_i(Y_i)$ = Probability of the i[th] household to become food secure (dummy 0/1)

β_0 = Constant term

β_{1-11} = Coefficients of the explanatory variables

$HHMI_i$ = Monthly income of the i[th] household (Pak Rs)

$AHHH_i$ = Age of the i[th] household head (years)

HHS_i[3] = Total number of members in the i[th] household (numbers)

$TEHH_i$[3] = Total number of earners in the i[th] household (numbers)

HHT_i = Household type (dummy '0' = nuclear and '1' = joint)

OL_{Li} = Ownership large livestock (cows and buffalos) animals by the i[th] household (numbers)

OL_{Si} = Ownership small livestock (goats and sheep) animals by the i[th] household (numbers)

Edu_{Pi} = Educational level of the i[th] household's head, (dummy, '0' = otherwise and '1' = primary i.e. completed five schooling years = grade 5)

Edu_{Mi} = Educational level of the i[th] household's head (dummy, '0' = otherwise and '1' = middle i.e. completed eight schooling years = grade 8)

Edu_{Ii} = Educational level of the i[th] household's head (dummy, '0' = otherwise and '1' = up to intermediate i.e. completed ten or twelve schooling years = grade 10 and/or 12

Edu_{Gi} = Educational level of the i[th] household's head (dummy, '0' = otherwise and '1' = graduation or above

RESULTS

***Household food security*:** Table 1 shows the results for food security situation of the sample households in the Punjab province. According to the results, more than 27% of the sample households are measured to be food insecure.

Table 1. Food security status

	Frequency	Percent
Food insecure	156	27.1
Food secure	420	72.9
Total	576	100.0

Data source: Field survey 2010-11

***Descriptive statistics*:** The results of descriptive statistics are presented in Table 2. A huge diversity has been observed in calorie intake, monthly income, household heads' age and household size of these households. On average, per capita calorie intake remained above the recommended intake (i.e. 2450 Kcal/person/day). Similarly, average monthly income was also above the minimum wage set by the government i.e. Rs 13,000 compared to Rs. 7,000.

***Determinants of household food security*:** The results of the binary logistic regression are presented in Table 3. Based on the results 5 variables are found to be the significant

Table 2. Descriptive Statistics

Variables	Min	Max	Mean	SD
Per capita calorie intake (Kcal/person/day)	590	4980	3006	879
Income (Rs.)	3000	48792	13210	6424
Age (Years)	23	75	45	10
Family size (Numbers)	2	18	6	2
Number of Earners (Numbers)	1	5	1	1
Large livestock animals (Numbers)	0	15	1	2
Small livestock animals (Numbers)	0	10	0.5	1

SD = Standard deviation; Data source: Field survey 2010-11

determinants of food security of landless households which are explained below using odds-ratios (ORs).

***Household monthly income ($HHMI_i$)*:** Household's monthly income is the total monthly income of the household from all sources. The coefficient of this variable is positive and significant implying a positive relationship between food security and monthly income of the household. The magnitude of coefficient is rather small which is converted to the value of the coefficient into OR for an increase in Rs 1000 as; $\exp^{0.0001*1000} = 1.105$. An increase of Rs 1000 in monthly income of a household increases the chances of a household being food secure by about 1.105 times or by 10.5%.

***Age of household head ($AHHH_i$)*:** The age of the household head has a negative sign showing an inverse relationship between the age of household head and household food security status. It indicates that one year increase in the age of household head decreases the chances of household being food secure by about 4.5%. The younger people are stronger than the elders and can perform tougher jobs in field. Moreover, households with older person as head of the household are the multigenerational households having more retired and/ or older persons to feed in the family. This may explain the negative effect of this variable on household food security.

***Household size (HHS_i)*:** Household size also has a negative sign indicating an inverse relationship with food security. The coefficient of this variable suggests that one extra household member decreases the chances of a household becoming food secure by a factor 0.541. The odds-ratio (0.582) indicates that each one-member increase in household size decreases the odds of being a food secure household by 41.8%.

***Education level of household head (Edu_{Mi} and Edu_{Ii})*:** Regression results indicate that the family with household heads having middle (8 years of schooling i.e. grade 8) and intermediate levels of education (10-12 years of schooling i.e. grade 10 or 12) has a positive impacts on household food security. These education levels increases the chances of a household being food secure by 99.9 and 177.1%, respectively. As pointed out in the introduction, the landless people generally lack higher education; they primarily depend on labour market for their income. For such households at least intermediate level of education may serve as a necessary condition to assure food security among landless rural households.

***Model significance*:** In terms of predictive efficiency, the model predicted with about 80% accuracy (see Table 3 above). To check the goodness of fit of a logistic model's outcomes there are two alternatives: one is the two descriptive measures known as Cox and Snell R^2 and Nagelkerke R^2, and second is an inferential goodness of fir test known as Hosmer and Lemeshow (H-L) Test (Peng *et al.* 2002). The values of Cox and Snell and Nagelkerke R^2 indicate that the model explains 27% and 39% of the variations in the data, respectively. These measures are also known as pseudo R^2 and the results cannot be tested in an inferential framework (Menard 2000), hence are not a good measure of goodness of fit (Hosmer and Lemeshow 2000). On the other hand, the result of Hosmer and Lemeshow (H-L) test is non-significant at $p>0.05$, suggesting the acceptance of the null hypothesis that the model fits to the data well.

Table 3. Results of Binary Regression

Variables	β	SE	OR
Household Monthly income ($HHMI_i$)	0.0001***	0.000	1.0001
Age of Household Head ($AHHH_i$)	-0.046***	0.012	0.955
Household Size (HHS_i)	-0.541***	0.070	0.582
Total Earning Household Members ($TEHH_i$)	0.087	0.180	1.091
Household Type (HHT_i)	-0415	0.308	0.660
Ownership of Livestock (large animals) (OL_{Li})	0.097	0.166	1.102
Ownership of Livestock (large animals) (OL_{Si})	0.006	0.211	1.006
Education Level of Household Head (primary) (Edu_P)	0.270	0.264	1.309
Education Level of Household Head (middle) (Edu_M)	0.693*	0.419	1.999
Education Level of Household Head (up to intermediate) (Edu_I)	1.019**	0.423	2.771
Education Level of Household Head (Graduation +) (Edu_G)	0.134	0.489	1.143
Constant	5.217***	0.769	N/A
Model Prediction success		79.9%	
Log-likelihood ratio test statistics		494.142	
Cox & Snell R^2		0.267	
Nagelkerke R^2		0.387	
H-L model significance test results (df = 8)		7.627 (p-value = 0.471)	

**** significant at < 1 %; ** significant at < 5 %; * significant at <10% | Data source: Field survey 2010-11*

DISCUSSION

The incidence of food insecurity among the sample households is alarmingly high compared to an earlier study of Bashir *et al.* (2010) for Faisalabad district of the same province. They found that about 20% the sample households were measured to be food insecure. The incidence of food insecurity among landless households is higher than the average undernourishment in the country i.e. 26% (FAO, 2010).

The results for the determinants of rural household food insecurity of earlier studies from various countries are presented in Table 4 to compare the results of this study. Although we are focusing on a specific household category

Table 4. Results of Earlier Studies

Variables	Study	Economy	Methods	Coefficients	Interpretations*
Household Monthly Income	Bashir *et al.* 2012 [A]	Pakistan (Pak Rupee)	Binary Logistic Regression	0.00005	An increase of 1000rupees in monthly income increases the chances of a household to become food secure by 5%
	Bashir *et al.* 2010[A]	Pakistan (Pak Rupee)	Multivariate Logistic Regression	15.06	Households belonging to the income group of Rs. 5001to Rs 10000 had 15 times more chances to become food secure compared to the households having zero income
	Sindhu *et al.* 2008[A]	India (Ind. Rupee)	Binary Logistic Regression	-0.00036	The chances of food insecurity are decreased by 30% with an increase of Rs 1000 in the monthly income of households
	Onianwa and Wheelock 2006[A]	USA (US $)	Binary Logistic Regression	-0.06	The chances of food insecurity are decreased by 6% with an increase of $ 1000 in the annual income of households with children
	Che and Chen 2002 [A]	Canada (Can $)	Multivariate logistic regression	7.96 (low income)	Households belonging to the lower income group had 8 times more chances to become food insecure as compared to the households in upper middle income group
Age of Household Head	Bashir *et al.* 2012 [A]	Pakistan (years)	Binary Logistic Regression	-0.032	An increase of one year in the age of household head decreases the chances of a household to become food secure by 3%
	Bashir *et al.* 2010 [A]	Pakistan (Years)	Multivariate Logistic Regression	-1.808	Households headed by the heads belonging to 36 to 45 years of age group had 83% less chances of food security compared to the households headed by the heads belonging less than 35 years of age group
	Onianwa and Wheelock 2006[C]	USA (Years)	Binary Logistic Regression	-0.02	The chances of household food insecurity are reduced by 2% with an increase of one year in the age of household head
Household Size	Bashir *et al.* 2012 [A]	Pakistan (Numbers)	Binary Logistic Regression	-0.372	An increase of one household member in household size decreases the chances of a household to become food secure by 31%
	Bashir *et al.* 2010 [A]	Pakistan (Numbers)	Multivariate Logistic Regression	-4.056	Households belonging to having 7 to 9 household members group had 97 percent less chances of becoming compared to those who belong to less household member group
	Sindhu *et al.* 2008 [A]	India (Numbers)	Binary Logistic Regression	-0.6743	An increase of one household member increases the chances of food insecurity by 49%
	Amaza *et al.* 2006 [A]	Nigeria (Numbers)	Binary Logistic Regression	-0.014	An increase of one household member reduces the probability of food security by 1.5%
Education	Bashir *et al.* 2012 [A]	Pakistan (years)	Binary Logistic Regression	0.686	Household heads' Education level of up to intermediate increases the chances of a household to become food secure by 98%
	Bashir *et al.* 2010 [A]	Pakistan (Years)	Multivariate Logistic Regression	1.857 (middle)	Households whose heads were having an education level of middle (8 years of schooling) had 6.4 times more chances of food security
	Ojogho, 2010 [A]	Nigeria (Years)	Multivariate Logistic Regression	-1.503 (secondary)	The chances of food security increased by 78% with an increase of educational level from primary to secondary
	Kaiser *et al.* 2003 [A]	USA (Years)	Binary Logistic Regression	-0.34	The chances of a household to become food insecure were reduced by 29% with the mothers having higher education levels within households

** = Interpretations were made by the authors on the basis of coefficients of variables | [A] = Confirmed | [C] = contradicted*

but we would expect the general thrust of the qualitative results to be the same as in this study. These results have been grouped into two broad categories while comparing with the current results: first, the results that are corroborated by current study (marked as ^{A} in Table 4); and second, the results that are contradicted with current study (marked as ^{C} in Table 4). Almost all the results presented in Table 4 are corroborated except for the age of household head and household type. An earlier study by Onianwa and Wheelock (2006) in the USA found that increase in the age of household head improve the chances of household being food secure by about 2%. This contradiction in result may be due to the social and geographical differences between the countries (i.e. Pakistan and USA). Our results also contradict with an earlier study by Bashir *et al.* (2010) for Faisalabad district of Pakistan where joint family increases the odds of a household to become food secure by 5.287. Usually the joint families have multiple income earners but in our sample, the majority of such households had only one income earner (60% households) that resulted in an extra burden on the limited income of the household resulting in negative impact.

***Relative importance of the factors to food security*:** The governments in developing countries usually operate under limited budget and knowing which factors is relatively important will give insights on prioritizing the limited resources to targeted sector. Also, it will help to initiate the policy debates both at aggregate and disaggregate (i.e. macro and micro) levels. The relative importance of the factors identified above for landless household food security can be explained in terms of the comparison of the magnitudes of their coefficients (Bashir *et al.*, 2012; Omotesho *et al.*, 2007; Mengistu *et al.*, 2009). This will compare these factors in terms of the effects they have on the food security of landless households. Based on this relative importance of factors, we find the rank of the factors in the following order:

1. Education levels of up to intermediate and middle increase the chances for a household to become food secure by 177% and 100%, respectively.
2. Increasing household size decreases the chances of a household to become food secure by 42%.
3. Increase of Rs 1000 in monthly income increases the chances of a household to become food secure by 10.5%.
4. Increasing age of household heads decreases the chances of a household to become food secure by 4.5%.

For rural households of the same region, Bashir *et al.* (2012) found that livestock assets are the second most important factor after education level. While the studies from other countries i.e. Nigeria and Ethiopia, the ranks were totally different than this study. Omotesho *et al.* (2007) found that household size was the most important factor to effect rural household food security in Nigeria. According to them, expenditures on food and access to health facilities were the 2nd and 3rd most important factors, respectively. Similarly, Mengistu *et al.* (2009) in Ethiopia found that livestock assets was the most important determinants of food security followed by marital status, inaccessibility to economic factors, household size and household income. The comparison of these studies based on relative importance of the factors of food security indicates that these factors vary between countries due to their varying socio-geographical conditions. It is also expected that the ranks may vary in different regions within a country and for different groups of households.

***Conclusions*:** Our findings indicate that food insecurity of landless households in rural areas of the Punjab province of Pakistan is on the rise. Monthly income and household heads' education levels improve food security, while it deteriorates with household heads' age and household size.

Table 5. Relative ranks

Ranks	Determinants			
	Landless rural households	Rural households		
	Current study	Bashir *et al.* (2012)	Mengistu *et al.* (2009)	Omotesho *et al.* (2007)
1	Education level (up to intermediate and middle)	Education level (up to intermediate)	Livestock assets (bullocks)	Household size
2	Household size	Livestock assets (small animals)	Marital status *	Expenditure on food
3	Household monthly income	Household size	Inaccessibility to economic factors**	Access to health facilities
4	Age of household head	Household monthly income	Household size	Farm size
5	--	Age of household head	Household income	--

** polygamy or monogamy; ** average distance (in time) to markets (input, output, credit, etc.); -- no ranking*

In addition, this is one of the first studies to rank the factors for their relative contribution to food security, providing policy makers an important 'to do list' for more effective policy design. Our results suggest reforms in the education system, along with improved family planning and income generating opportunities, should be most effective. Results also suggest that the ranking of determinants of food insecurity, as well as the contribution of income earned on other people's farms relative to income earned in towns, needs to be further explored in relation to food security.

REFERENCES

Amaza, P.S., J.C. Umeh, J. Helsen and A.O. Adejobi. 2006. Determinants and measurement of food insecurity in Nigeria: some empirical policy guide. Presented at international association of agricultural economists annual meeting, August 12-18, Queensland, Australia. (Available online at http://ageconsearch.umn.edu/ bitstream/25357/ 1/ pp060591.pdf).

Anwar, T., S.K. Qureshi and H. Ali. 2004. Landlessness and rural poverty in Pakistan. The Pakistan Development Review 43:855-874.

Babatunde R.O., O.A. Omotesho and O.S. Sholotan. 2007. Socio-economic characteristics and food security status of farming households in Kwara State, North-Central Nigeria. Pak. J. Nut. 6:49-58.

Bashir, M.K., M.K. Naeem and S.A.K. Niazi. 2010. Rural and peri-urban food security: a case of district Faisalabad of Pakistan. World App. Sci. J. 9: 403-411.

Bashir, M.K., S. Schilizzi and R. Pandit. 2012. The determinants of rural household food security in the Punjab, Pakistan: An Econometric Analysis, Working Paper 1203, School of Agricultural and Resource Economics, University of Western Australia, Crawley, Australia.

Bashir, M.K., Z.N. Bajwa, K. Bakhsh, A. Maqbool and M.W.A. Chattha. 2007. Food security perspectives in Pakistan. Proceedings of the International Conference on Productivity and Growth in Agriculture: Strategies and Interventions. University of Agriculture, Faisalabad, Pakistan. 150p.

Che, J. and J. Chen. 2002. Food insecurity in Canadian households. Health Reports 12:11-22.

FAO. 2010. The state of food insecurity in the world: addressing food insecurity in protracted crises. Food and Agriculture Organization, Rome, Italy.

FAO. 2011. Country rank in the world, by commodity. Food and Agriculture Organization, Statistics Division. (Available online at: http://faostat.fao.org/site/ 339/ default.aspx).

Feleke, S., R.L. Kilmer and C. Gladwin. 2005. Determinants of food security in Southern Ethiopia. Agric. Econ. 33:351-363.

Gera, N. 2004. Food security under structural adjustment in Pakistan. Asian Survey. 44:353-368.

GOP. 1998. Population census of Pakistan. Population Census Organization, Statistics Division, Government of Pakistan.

GOP. 2003. Economic survey of Pakistan, 2002-03. Ministry of Food and Agriculture. Finance Division, Economic Advisor's Wing, Islamabad, Pakistan.

GOP. 2011. Economic survey of Pakistan 2010-11. Finance Division, Ministry of Finance, Government of Pakistan.

Hailu, A. and R. Nigatu. 2007. Correlates of household food security in densely populated areas of Southern Ethiopia: Does the household structure matter? Stud. Home Comm. Sci. 1:85-91.

Hosmer, D.W. and S. Lemeshow. 2000. Applied logistic regression. John Wiley and Sons, New York, USA.

IAASTD. 2008. Food security in a volatile world. International Assessment of Agricultural Knowledge, Science and Technology for Knowledge. (Available online at: http://www.agassessment.org/docs/ 10505_ FoodSecurity.pdf).

Kaiser, L.L., H.M. Quiñonez, M. Townsend, Y. Nicholson, M.L. Fujii, A.C. Martin and C.L. Lamp. 2003. Food insecurity and food supplies in Latino households with young children. J. Nut. Educat. Beh. 35:148-153.

Menard, S. 2000. Coefficients of determination for multiple logistic regression analysis. The American Statistician 54:17-24.

Mengistu, E., N. Regassa and A. Yusufe. 2009. The levels, determinants and coping mechanisms of food insecure households in Southern Ethiopia: case study of Sidama, Wolaita and Guraghe Zones. DCG Report No. 55, the Drylands Co-ordination Group.

Morris, P.M., L. Neuhauser and C.C. Campbell. 1992. Food security in rural America: A study of the availability and costs of food. J. Nut. Educat. 24:52-58.

Ojogho, O. 2010. Determinants of food insecurity among arable farmers in Edo State, Nigeria. Agric. J. 5: 151-156.

Omotesho, O.A., M.O. Adewumi and K.S. Fadimula. 2007. Food security and poverty of the rural households in Kwarwa State, Nigeria. AAAE Conf. Proceed.: 571-575.

Onianwa, O.O. and G.C. Wheelock. 2006. An analysis of the determinants of food insecurity with severe hunger in selected Southern States. South. Rural Sociol. 21:80-96.

Peng, C.Y., T.S.So, F.K. Stage and E.P. St. John. 2002. The use and interpretation of logistic regression in higher education journals: 1988-1999. Res. Higher Edu. 43:259-293.

Sindhu, R.S., I. Kaur and K. Vatta. 2008. Food and nutritional insecurity and its determinants in food surplus areas: the case study of Punjab State. Agric. Econ. Res. Rev. 21:91-98.

Yasin, M.A. 2000. An investigation into food security situation in rain-fed areas of district Rawalpindi. M.Sc. (Hons.) Thesis, Dept. Agric. Econ., Univ. Agric., Faisalabad, Pakistan.