

LIVESTOCK OWNERSHIP IN ENSURING RURAL HOUSEHOLD FOOD SECURITY IN PAKISTAN

A. Ali and M. A. Khan

Social Sciences Research Institute, National Agricultural Research Center, Park Road, Islamabad, Pakistan
Corresponding author's email: akhterali205@yahoo.com

ABSTRACT

The current study focuses on the role of livestock ownership in ensuring rural household food security in Pakistan. For the study a comprehensive data were collected from the rice-wheat area of Pakistani Punjab. Three main districts of rice wheat area i.e. Gujranwala, Sheikhpura and Hafizabad were selected for the current study. Poisson regression analysis was carried out to estimate the determinants of livestock ownership. The impact of livestock ownership on household food security was estimated by employing the propensity score matching approach. The empirical results indicate that food security levels were higher in the range of 19-41 percent for the households having livestock ownership as compared to households having no livestock ownership. The policy implications of the study are that livestock ownership needs to be encouraged as it can help in ensuring rural household food security.

Key words: Livestock Ownership, Food Security, Poisson Regression, Pakistan.

INTRODUCTION

Livestock production plays a major role in the life of farmers in developing countries. It provides food, income, employment and many other contributions to rural development. In the Asian region, livestock provides the major additional contribution to agriculture through draught power, manure products such as meat, milk, eggs, while poultry provides daily cash income and much required nutrition to rural population. Livestock play an important role in the economy of the country. Livestock sector contributed approximately 54.6 percent of the agriculture value added and 11.6 percent to national GDP during 2011-12. The gross value added of the livestock sector at constant factor cost has increased from Rs. 672 billion (2010-2011) to Rs. 700 billion during 2011-12. The population growth, increase in per capita income and export revenue is fueling the demand of livestock and livestock products (GoP, 2011-12).

The meaning of food security has evolved since the first World Food Conference of 1974. It is now accepted that it relates to access by all people at all times to enough food for an active healthy life (World Bank, 1986; FAO, 1989). The Livestock can make a major contribution in ensuring rural household food security in Pakistan. In Pakistan the food insecurity and consequently food poverty has been on increase overtime. The term "Food Security" is used to refer the access to adequate amount of food for meeting dietary energy needs that implied for many as self-sufficiency at the national level, producing required food domestically (Prinstrup-Andersen, 2009).

Despite modest economic growth and reasonably enough food available at the national level, a

large proportion of people are extremely poor and suffer from lack of food security in Pakistan due mainly to lack of purchasing power. Even though food in Pakistan is predominately produced in rural areas like other most of the developing countries, a majority of poor who are food insecure as well live in these areas, having lower economic access to food as compared to urban areas (World Bank, 2008; Staatz *et al.*, 2009).

Livestock raising is a subsistence activity to meet food needs and supplement farm income. In Pakistan almost every rural household owns some livestock, with men, women and children engaged in livestock production. The role of women comprises cleaning sheds, collecting farm yard manure, stall feeding, water animals, fodder cutting, chopping and milking. Most valuable are milking animals; animal products such as milk, milk products, meat and eggs contribute 7-16 percent to household energy consumption and the rural household consume milk on daily basis (Unicef, 2005).

Animal based food is major source of proteins and fats for human beings. Animal proteins are essential and indispensable for the healthy growth of human beings. Recommended quantities of protein for a healthy human being are calculated at 36 grams per day per capita. However, in Pakistan only 18 grams are consumed on average, which is alarming lower than the recommended level. The livestock sector is an important source of food for rural communities and especially for small farmers and marginalized inhabitants (SDPI, 2009).

Pakistan is earning a reasonable amount of foreign-exchange with the export of livestock and livestock by-products such as beef, skins, hides, finished leather goods, raw wool, carpets and footwear (SDPI, 2009). Both the crop and animal based food groups are

complementing each other in the farming economy of the country. More districts in Pakistan are producing surplus animal based food compared to crop based food (SDPI, 2009).

Achieving food security at national level does not necessarily guarantee food security at provincial, district or household level. There exists disparity among provinces, districts and households. Even if a household is food secure it does not ensure that each member of the household is food secure due to discrimination in food distribution within household. The geographical, environmental and medical factors of food security are important for their respective fields but social factors are significant for policy making and use by development practitioners (Khan, 2009)

At farm level, the importance of livestock as an income source and the actual sources of income vary across ecological zones and production systems, which in turn determines the species raised and the products and services generated. Cash can be generated from sales of livestock products regularly (milk, eggs) or sporadically (live animals, wool, meat, hides) or from services (draught, transport). Dairy produce is the most regular income generator. Dairy development has been shown to increase income, consumption and repayment capacity in India (Kulkarni *et al*, 1989; Saini *et al*, 1989; Gryseels, 1988; Omiti, 1995; Asamenew, 1991).

The objective of the current study is to estimate the impact of livestock ownership in ensuring rural household food security for that the rest of the article is structured as follows; in section 2 data and description of variables is presented, in section 3 empirical results are presented and the paper finally concludes with some policy recommendations.

Data and Description of Variables: For the current study, cross sectional data set was collected through a field survey from 234 households in the rice-wheat area of Pakistani Punjab. For the study three main districts i.e. Gujranwala, Sheikhpura and Hafizabad of rice-wheat were selected for data collection. For the study a comprehensive questionnaire was developed, information on a number of household and farm level characteristic were included in the questionnaire. For impact assessment relevant socio-economic, human, natural resource/biological and institutional indicators were included in the study A detailed survey was carried out by a team of agricultural economist and rural sociologist to study the impact of crop-livestock interaction on poverty and food security levels of the household. About 46 percent farmers were interviewed from Gujranwala district, 22 percent were interviewed from Sheikhpura district and 32 percent were interviewed from Hafizabad district.

The data and description of variables is presented in table 1. The market distance on average was

about 7 kilometers from the farm. The bank was situated at about 28 kilometers from the farm. The road was at about 2 kilometers from the farm. The mean age of the farmers was about 45 years. The farmers experience was about 24 years. The education level of the farmers was about 6 years of schooling. The caste information was collected as dummy variable i.e. 1 if the farmers belonged to a scheduled caste and 0 otherwise. According to the survey results about 42 percent of the farmers belonged to a scheduled caste and vice versa. Information about farmers' settlement in the study area was also collected and according the survey results about 60 percent of the farmers were settler and rests were migrant. The mean family size was about 7 persons per household. The mean land holding in the study area was 24 acres. Information on a number of household assets, owned by the farmer was also collected. Approximately 42 percent of the households have own refrigerator. About 35 percent of the households have own tractor. About 30 percent of the households have own motorcycle. Only 8 percent of the households have own car. Approximately 28 percent of the households have own tube well. About 30 percent of the household have own radio. Majority of the households i.e. 62 percent have own TV. About 58 percent of the households have own washing machine. The credit access was included as dummy variable and about 76 percent of the households have access to credit facility. The mean number of cattle kept by the household was about 1.56 animals per household. The mean area under fodder crop was 2.92 acres per household. In the study area farmers have also allocated considerable area under food crops e.g. 18.36 acres area was allocated to rice crop and 15.92 acres area was allocated to wheat crop.

Empirical Analysis: The empirical analysis was carried out by using the STATA software. The determinants of livestock ownership are estimated by employing the poisson regression model and the results are presented in table 2. The dependent variable is the number of cattle owned by the household. The coefficient distance to the market is negative and significant at 10 percent level of significance indicating that household own less numbers of cattle as the distance to the market increases. The age coefficient is positive and non significant, indicating that as the age of the farmer increases; he owns more number of cattle and vice versa. The caste was included as dummy variable and the results are positive and significant at 1 percent level of significance, indicating that farmers belonged to a scheduled caste normally own more number of cattle and vice versa. The settler was included as dummy variable and the results are positive and non significant. The results for education are negative and non significant, indicating that educated farmers normally keep less number of livestock and vice versa. The family size coefficient is also negative and non

significant, indicating that larger the family size less are the number of cattle own by the household. The land holding coefficient is negative and significant at 10 percent level of significance, indicating that more the land holding fewer are the number of cattle owned by the household and vice versa. The refrigerator ownership is positive and significant at 1 percent level of significance. The tractor ownership is also positive and significant at 1 percent level of significance. The motorcycle ownership is positive and significant at 10 percent level of significance. Similarly the car ownership is also positive and significant at 1 percent level of significance. The tube well ownership is positive and non significant. The radio ownership is positive and highly significant at 1 percent level of significance. The credit was included as dummy variable and the results are positive and non significant, indicating that households having access to credit normally own large number of animals. The coefficient agricultural extension services are negative and non significant. The income from livestock sale is positive and highly significant at 1 percent level of significance.

The LR χ^2 value is 112 and the value is significant at 1 percent level of significance, indicating the robustness of the variables included in the model. The pseudo R^2 value is 0.2311, indicating that 23 percent variation in the dependent variable is due to independent variables.

The difference in the household poverty and food security levels with livestock ownership and without livestock ownership are presented in table 3. The incidence of poverty is less among households having livestock ownership as compared to households having no livestock ownership. The poverty levels were less up to 16 percent among the households having owned livestock as compared to households having no livestock ownership. The results for poverty are significant at 5 percent level of significance. Similarly the food security levels were higher among the households having livestock ownership as compared to households having no livestock ownership. The food security levels were higher up to 21 percent with livestock ownership as compared to no livestock ownership. The results for food

Table 1: Data and description of variables

Variable	Description	Mean	Std. Dev
Market distance	Distance of market in kilometers	6.897	5.417
Bank distance	Distance of bank in kilometers	28.94	33.34
Road distance	Distance of road in kilometers	1.786	5.797
Age	Age of farmer in number of years	44.918	14.604
Experience	Experience of farmer in number of years	24.008	13.408
Education	Education of farmer in number of years	6.171	4.895
Caste	1 if farmer belongs to scheduled caste, 0 otherwise	0.418	0.494
Settler	1 if farmer is settler, 0 if migrant	0.598	0.491
Family size	Total number of family members in the household	6.568	4.340
Land holding	Land holding of the farmer in number of acre	24.27	16.58
Refrigerator	1 if household owns a refrigerator, 0 otherwise	0.482	0.500
Tractor	1 if household owns a tractor, 0 otherwise	0.358	0.406
Motorcycle	1 if household owns a motorcycle, 0 otherwise	0.299	0.458
Car	1 if household owns a car, 0 otherwise	0.085	0.280
Tube well	1 if household owns a tube well, 0 otherwise	0.282	0.478
Radio	1 if household owns a radio, 0 otherwise	0.299	0.458
TV	1 if household owns a TV, 0 otherwise	0.619	0.486
Washing machine	1 if household owns a washing machine, 0 otherwise	0.581	0.494
Credit (dummy)	1 if household have access to credit facility, 0 otherwise	0.764	0.434
Cattle	Number of cattle kept by the household	1.58	0.146
Fodder	Area under fodder in acres	2.92	0.337
Rice area (acres)	Area under rice in acres	18.36	25.205
Wheat area (acres)	Area under wheat in acres	15.925	24.631
District dummies			
Gujranwala	1 if farmer belongs to Gujranwala district, 0 otherwise	0.457	0.499
Sheikhupura	1 if farmer belongs to Sheikhupura district, 0 otherwise	0.222	0.416
Hafizabad	1 if farmer belongs to Hafizabad district, 0 otherwise	0.320	0.474

Source: Own Calculations

Table 2: Determinants of the Livestock Ownership (Poisson regression estimates)

Variable	Coefficient	t-value
Gujranwala	-0.258	-1.61
Sheikhupura	-0.696***	-3.51
Market distance	-0.021*	-1.81
Age	0.003	0.44
Caste	0.455***	3.29
Settler	0.131	0.94
Education	-0.010	-0.68
Family size	-0.007	-0.55
Land holding	-0.006*	-1.87
Refrigerator	0.481***	3.03
Tractor	0.332***	2.46
Motorcycle	0.254*	1.81
Car	0.495***	2.63
Tube well	0.061	0.49
Radio	0.326***	2.71
Credit	0.146	0.94
Agri. Extension	-0.131	-0.93
Income from livestock sale	0.795***	5.08
Constant	0.281	0.98
Number of Observation	234	
LR χ^2	112.68	
Prob> χ^2	0.000	
Pseudo R^2	0.2315	

Note: The results are significantly different from zero at ***, **, * at 1, 5 and 10 percent levels respectively.

Table 3: Food Security Levels with Livestock Ownership

Indicator	Crops Only	Crop-Livestock Interaction	Difference	t-values
Poverty (Head count index)	0.37	0.21	-0.16**	2.02
Food Security	0.48	0.69	0.21***	2.68

Note: The results are significant at ***, **, * at 1, 5 and 10 percent levels respectively.

Table 4: ATT results for poverty and household food security

Matching Algorithms	Caliper	Outcome	ATT	t-value	Critical level of hidden bias (Γ)	Number of Treated	Number of Control
NNM	0.01	Poverty	-0.11	1.27	--	127	65
	0.07	Food Security	0.19*	1.83	1.60-1.65	136	71
RM	0.02	Poverty	-0.24*	1.77	1.25-1.30	143	74
	0.05	Food Security	0.41***	2.59	1.15-1.20	139	79

Note: NNM stands for nearest neighbor matching and the results are reported for nearest neighbor 2, RM stands for radius matching. ATT stands for average treatment affect for the treated. The results are significantly different from zero at ***, **, * 1, 5 and 10 percent levels respectively.

security are significant at 1 percent level of significance. The results regarding livestock role in ensuring household food security are in line with Haile *et al.* (2005) for Ethiopia. They found that ox ownership play a positive role in ensuring household food in Ethiopia. In Pakistan literacy rates, access to land, markets and employment are important determinants of poverty and food security in Pakistan.

The impact of livestock ownership is estimated by employing the propensity score matching approach. For estimating the impact two different matching algorithms are employed i.e. nearest neighbor matching and radius matching are employed. In case of nearest neighbor matching it matches to the nearest neighbor only, while in case of radius matching it matches to all the matches on the radius. Radius matching is actually a variant of nearest neighbor matching. The average

treatment affected for the treated (ATT) results indicates that household having owned livestock have less poverty levels in the range of 11-24 percent as compared to similar households having no livestock ownership. Similarly the food security levels were higher in the range of 19-41 percent for the households having livestock ownership as compared to households having no livestock ownership. The results are estimated with different calipers as reported in table 4. The critical level of hidden bias vary in the range of 1.60-1.65 indicating that livestock owners and non owners vary in their odds of ownership in the range of 60 to 65 percent. The number of treated and number of control is also presented in the table. The results for food security as in line with the previous studies e.g. Shiferaw *et al.*(2003); Webb *et al.* (1992).The empirical results indicates that livestock ownership plays a positive role in ensuring household food security and poverty reduction. As the food security levels are higher upto 21 percent among the households having livestock ownership as compared to households having no livestock ownership. The current study findings are extremely important in ensuring household food security and poverty reduction. As in the rural areas of Pakistan poverty is the main issue which can be considerably decreased through livestock ownership as the current study findings indicates. Second as the crop and livestock complement each other regarding food security for that livestock ownership needs to be encouraged among rural households in Pakistan.

Conclusions: The purpose of the current study was to estimate the impact of livestock ownership on household poverty and food security in Pakistan. From the theoretical and empirical causes and determinants of food insecurity, it can be generalized that food insecurity is a function of poor assets basis, socio-cultural related issues and poor access to market and infrastructure. The livestock ownership have a positive impact on rural household food security and poverty levels in Pakistan. The livestock ownership can help to reduce poverty in the range of 11-24 percent, similarly the livestock ownership can help in ensuring household food security in the range of 19-41 percent. As the education levels of the household play an important role in ensuring household food security, so the education levels needs to be increased at rural level. As the households can also use a number of livestock products in the food, which can not only diversify the food but can also help in ensuring the household food security. The study finding has important policy implications that for rural household food security and poverty reduction, the livestock ownership needs to be encouraged.

REFERENCES

- Asamnew G. (AAW1991). A study of the fanning systems of some Ethiopian highland vertisol areas. International Livestock Centre for Africa: Addis Ababa, Ethiopia (mimeo).
- GoP (2009-10). Economic Survey of Pakistan. Ministry of Finance, Government of Pakistan. Federal Secretariat, Islamabad, Pakistan.
- FAO. (1989). Methodology for preparing comprehensive national food security programmes: 2nd Ad hoc consultation with FSAS donors, 27 October 1989. Food and Agriculture Organization: Rome, Italy (mimeo).
- Haile, H. K., Z. G. Alemu and G. Kudhlande (2005). Causes of household food insecurity in koredejaja pleasant association, oroniza zone, Ethiopia. Working paper, Department of Agricultural Economics, University of Free State.
- Kulkarni GN, R. Bhatta and N. K. Kumar (1989). Integrated rural development programme in Bijapur: an evaluation of dairy scheme. *Social Change (India)* 5: 72-79.
- Gryseels G. (1988). The role of livestock in the generation of smallholder farm income in two vertisol areas of the central Ethiopian highland. In: Jutzi SC, Haque I, McIntire J and Stares JES (eds) *Management of vertisols in sub-Saharan Africa*. International Livestock Centre for Africa: Addis Ababa, Ethiopia.
- Omiti J. (1995). Economic analysis of crop-livestock integration: the case of the Ethiopian highlands (Ph. D. Thesis). Department of Agricultural and Resource Economics, University of New England: Armidale, Australia.
- Per Prinstrup-Andersen (2009). Food security definition and measurement. *Food Security*,1:5-DOI 10.1007/s12571-008-002-y.
- Saini A. S., R. V. Singh and P. K. Patel (1989). Credit management through dairying. *Financing Agric.* 21: 6-10.
- SDPI. (2009). Food Security in Pakistan. Sustainable Development Policy Institute.
- Shiferaw, F., R. Kilmer and C. Galdwin (2003). Determinants of Food Security in Southern Ethiopia- a Selected Paper Presented at the American Agricultural Economics Association Meeting in Montereal, Canada, *Agricultural Economics* 33: 351-363.
- Staatz, J. M., D. H. Boughton and C. Donovan (2009). Food Security in Developing Countries Department of Agricultural, Food and Resource Economics, MSU, East Lansing, Michigan. Staff Paper 2009-03.

- Unicef (2005). Pakistan Earth quake. Joint WFP/Unicef. Rapid Emergency Food Security and Nutrition Assessment.
- Webb, P., J. Braun and Y. Yohannes (1992). Famine in Ethiopia: Policy Implications of Coping Failure at National and Household levels. *Research Report 92*, IFPRI
- Winrock (1992). *An assessment of animal agriculture in sub-Saharan Africa*. Winrock International: Morrilton, USA.
- World Bank (2008). World Development Report. P.96.
- World Bank (1986). *Poverty and hunger: Issues and options for food security in developing countries*. World Bank: Washington DC, USA.