



Food Security and Livestock Linkages in Three Major Livestock Husbandry Districts of Punjab, Pakistan

Bilal Arif¹, Arshad Mahmood Malik², Nasim Akhtar³

¹ Department of Economics and Marketing, Government of Punjab, Pakistan. Email: eada.chakwal@gmail.com

² Assistant Professor, Department of Economics and Agri. Economics, PMAS-Arid Agriculture University Rawalpindi, Pakistan. Email: arshadmm@uair.edu.pk

³ Assistant Professor, Mirpur University of Science and Technology, Mirpur AJK, Pakistan. Email: nasim.eco@must.edu.pk

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ABSTRACT

The basic intention of the current study is to explore the association between livestock husbandry and domestic food security (accessibility) of small farmers in three major districts of province Punjab Pakistan, namely Gujranwala, Narowal and Hafiz Abad, using primary data of 180 respondents collected using structured questionnaire through proportionate stratified random sampling. Livestock is an essential contributor and supplier to the food and nutritional security and works as a vital source of employment and occupation. Livestock has a substantial role in employment generation, cash income generation, a decline of poverty and food safety in rural areas of overall Pakistan and the districts under study. To measure the effectiveness of livestock ownership on rural food security in three major districts of Punjab, Pakistan, the OLS regression model has been utilized along with dependent variable of food security (accessibility) and independent variables of family size, income comes from livestock, education of the head and a total number of earners. The outcomes of this study reveal that independent variables, i.e., incomes from livestock, a total number of earners, education and family size, have a significant positive relationship with the dependent variable of food security (accessibility), which means improvement in all the explanatory variables is a quite helpful tool to boost the food security situation of the area under discussion.



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Corresponding Author's Email: arshadmm@uair.edu.pk

1. Introduction

In the context of developing economies, linkages between food security and livestock can never be ignored due to increasing dependency on livestock (Barros, 2014). Recent pandemics is posing major threat to the national food security of many economies irrespective of developing or developed. Around 900 million individuals directly or indirectly satisfy their essential food requirements globally from livestock. This sector also employs about 1.2 billion individuals residing in developing economies and 70% lived in backward areas of South Asia and South Africa continents and are strongly linked with the livestock sector for financial earning through foodstuff.

Livestock is considered as an essential pillar of food security because it provides 17% kilocalories and 33% of protein consumption for universal consumption (Delgado, Rosegrant, Steinfeld, Ehui, & Courbois, 1999; Hurst, Termine, & Karl, 2005). Moreover, despite the significant dependence on livestock, the people of the Asia and Africa region are still vulnerable. FAO (2010) highlighted that around 0.9 billion individuals are food insecure across the world among these, 88% resides in Africa and Asia continents. In South Asia round about 0.337 billion individuals are food insecure, and over time since last few years, especially in Pakistan, precise numbers have been uplifted despite high economic growth, lower-income disparities and poverty (Bashir, Schilizzi, & Pandit, 2013).

Livestock plays an important role to improve the food security situation of the developing economies located in the South Asia continent through different products like milk, butter, ghee and meat, upsurges in the production of these products not only reduce food insecurity of the society but also at large scale, the business of these products are quite helpful to improve the livestock economy of the developing societies of the world (Sansoucy et al., 1995). The basic food, meat, ghee, butter and milk obtained from the husbandry of livestock is a major source of proteins and nutrients for all human beings; however, ghee and milk have a significant role in the quick nourishment of children. Animal proteins are crucial for the healthy growth and development of the elder and children and the biggest source to reduce stunt growth (GoP, 2018). The livestock segment is an important source of nutrition for rural societies, particularly for small growers and downgraded citizens (FAO, 2010). Pakistan is producing a suitable volume of foreign exchange with the trade of cattle and livestock foodstuffs like beef, peels, furs, ended fur goods, raw fur, rugs, mats and footwear (SDPI, 2009).

A food secure population is explored as "number of households have easy access to a basic food item in both formal and informal ways that are necessarily required to sustain a healthy and active life (Elzaki, Elbushra, Ahmed, & Alajab, 2012). Livestock is important in achieving food and improving household revenue from sale of basic livestock products (Patel, 2013). In the least developed economies like livestock, fishery and poultry are also given much importance to minimize food insecurity by providing meat and eggs (Wakchaure et al., 2016). In Pakistan, the sector of fishery and poultry are contributing about 7% and 16% respectively to overall household food consumption (A. Ali & Khan, 2013). Poultry and fisheries are the key source of vitamins and proteins, which are the initial building blocks of human bodies and living a healthy and active life. Average protein requirements for a healthy human being are 36 grams per adult per day and livestock is contributing 50% i.e. milk, ghee, meat, etc. In Pakistan, the average intake per adult is only 18 grams, a figure staggeringly low and alarming that leads to stunt growth and low body immunity, leading to various diseases. Therefore, to improve the quantity of protein, it is necessary to boost the livestock sector to resolve the food security and malnutrition issues, especially in the rural or backward segment of Pakistan (SDPI, 2009).

In the agricultural state of Pakistan, the predicament of food insecurity can never be ignored because, in advanced regions of the state, around 21 million out of 56 million individuals are facing the challenge of food insecurity. In rural areas, food insecurity is much more terrible than the urban counterpart because out of 80 districts, 38 are observed as extremely food insecure (Khan, Azid, & Toseef, 2012). Similarly, Province wise distribution of food insecure districts shows that 22 districts from Baluchistan, 21 from NWFP, seven from FATA, five from Northern areas, 10 from Punjab and 11 from Sindh are severe victims of food insecurity. However, as per the above discussion, it has been perceived that rural areas of Pakistan are severely victimized by the challenging issue of food insecurity (Khan et al., 2012). The intra-regional analysis indicate that food insecurity is more severe in south Punjab as 53.6% as compared to 43.8 and 30.2% in central and northern Punjab (Yousaf, Zafar, Zafar, Ahmad, & Raza, 2018).

2. Literature Review

Godber and Wall (2014) explored that livestock is an imperative alternative for maintaining a certain level of food security in regions where crop productivity is either too low or not feasible due to hard land and difficult weather conditions. Reynolds, Wulster-Radcliffe, Aaron, and Davis (2015) designated livestock sector had played a vital role in promoting the agriculture sector and provided a continuous supply of nutrition and rich diet to livestock holding farmers that leads to lessening food insecurity among the farming community. Randolph et al. (2007) observed the prominence of livestock development on dietary conditions, food security and poverty alleviation for small farmers and designated that all the above-discussed indicators and livestock development are strongly contiguous. Furthermore, numeric also evaluated that livestock boosting directly correlates with food security improvement and poverty alleviation.

Lammers, Carlson, Zdorkowski, and Honeyman (2009) scrutinized the relationships between livestock husbandry, poverty-reduction and food insecurity among small farming communities residing in rural areas. They found that in the study area, discussing community boost in livestock husbandry declined poverty and food insecurity. Alary, Corniaux, and Gautier (2011) materialized the importance of livestock in poverty mitigation in Mali and demonstrated that livestock boosting in Mali is a helpful tool for poverty alleviation. Khan et al. (2012) examined the interrelation between food security, poultry, fishery and livestock in Pakistan. Numerical outcomes of the study concluded that all three sectors are positively associated with the food security condition of Pakistan. Nabarro and Wannous (2014) inspected the significance of livestock and the role livestock play in food security, revenue generation and safety net for the poor. Measurements evaluated that the livestock sector is the key tool for promoting the economic well-being of people in lower-income strata worldwide.

Furthermore, the study also highlighted that 40% of the world financial earning comes from livestock. Therefore, it is not wrong to say that contribution of livestock has been importance to minimize the food insecurity situation all over the world. Rehman, Jingdong, Chandio, and Hussain (2017) had detailed discuss the impact of the agriculture and livestock sector on the GDP of Pakistan through the Ordinary Least Square model. They revealed that crop productivity along with milk, fat, eggs, skeletons, and mutton has a positive, significant impact on the GDP of Pakistan. Assan (2014) highlighted the effectiveness of livestock farming on food security and continent Africa. An assessment of the study highlighted that the promotion of micro livestock farming in the study area improved the livelihood of a backward area, ultimately reducing food insecurity.

After a detailed description in global and Pakistan context, it has been witnessed that an extensive range of studies are available that explore livestock and food security linkages in a divergent ambiance like Bashir et al. (2013) deliberated livestock and rural food security problem in province Punjab. Jodlowski, Winter-Nelson, Baylis, and Goldsmith (2016) studied the effectiveness of small livestock holder earning on food security in Zambia. Randolph et al. (2007) viewed the importance of livestock on dietary conditions, food security and poverty alleviation for small farmers. J. Ali (2007) explored indirect linkages between livestock and food security by including the financial sector. All these studies and a series of other national and international studies discuss livestock and food security association in different ways for different countries, but very few highlighted the current issue in three livestock holding districts namely Gujranwala, Narowal and Hafizabad of Punjab, Pakistan. The dominant farming system is crop livestock farming system and these districts also lies in wheat rice cropping system based on Agro ecological Zones classification (Ahmed, Ying, Bashir, Abid, & Zulfiqar, 2017). This study is designed to investigate linkages between livestock and food security in study area.

3. Methodology

To explore the effectiveness of livestock on food security, primary data has been collected from three livestock holding districts (Gujranwala, Narowal and Hafizabad) of Punjab from Wheat Rice AEZ. Four villages were selected randomly from each district and fifteen households has been chosen by utilizing proportionate stratified random sampling (Table 1).

Table 1
Study site characteristics and Sample size of the study

Name of district	Location	Area 000 acres	Sample villages	Sample respondents
Gujranwala	Latitude 32° 9'15.76, Longitude 74°11'2.77	892	4	60
Norowal	Latitude = 32.099476, Longitude = 74.874735	1142	4	60
Hafizabad	32°-20'N latitudes and 73°-12' and 73°-46'E longitude	584	4	60

The dependent variable of a percentage of per head food secure is created by summing up the dietary diversity score of households divided by the total number of households surveyed. (Kennedy, Razes, Ballard, & Dop, 2010).

$$Food\ Security = \frac{Sum\ of\ HDDS}{Total\ Number\ of\ Household\ Surveyed} \quad (1)$$

Regression analysis has been done to assess the impact of four key variables, namely income from livestock, the total number of earners, years of education and family size, on food security. The general form of the model is as follow (Field, 2005).

$$Food\ Security = \delta_0 + \sum_{j=1}^k \delta_j X_{ij} + \mu_i \quad (2)$$

δ_0 is the model's intercept, $\sum \delta_j X_{ij}$ show the general class of slope coefficients, and explanatory variables and μ_i is the model's error term. Finally, subscript i, j represents that the current study has more than one explanatory variable, and small 'k' is the representative of slope coefficient of the study (Saboor, Sadiq, Khan, & Hameed, 2017). Specific form of model is as follows;

$$Food\ Security = \delta_0 + \sum_{j=1}^k \delta_j Er_j, Ed_j, Fs_j + \mu_i \quad (3)$$

Where Er represents total number of earning hands in the household, Ed represents years of education and Fs is family size.

4. Results and Discussions

The data was checked for possible multicollinearity problem. Table-2 further validates that the overall model is good fitted because the variables of interest do contain the problem of multicollinearity. However, multicollinearity is predicted through the value of VIF and Tolerance. According to Gujarati and Porter (1999), variables does not contain the problem of multicollinearity if the value VIF is less than 10 and 5 with relaxed and strict criteria. The estimated measure of all variables is less than five which reveals no problem of multicollinearity and predict overall model is good fitted. The VIF value is close to 1, indicating negligible

multicollinearity problem (Table 2).

Table 2
VIF Test to Predict Multicollinearity Problem

Variables	VIF	Tolerance
No. of Earners	1.26	0.793
Education	1.33	0.751
Income from livestock	1.33	0.750
Family Size	1.44	0.695
Mean VIF	1.34	

Source: Authors own calculations from primary data

To predict the actual relationship between variables of the study, a correlation matrix has been drawn. Given measures have two significant advantages. Initially, it predicts that what is the exact relationship between variables. Secondly, it explores how strong a particular relationship is. It is also used to judge the problem of multicollinearity. If the value of any variable is greater than 0.8, then a strong relationship exists and presents evidence of multicollinearity (Asteriou & Hall, 2015). In a current study, the relationship of both correlation matrix and a regression model is the same. Also, no value of correlation matrix is greater than 0.8, which reveals that our model is accurately specified with the exact relationship between the variable of interest. No problem of multicollinearity prevails perfectly and imperfectly.

Table 3
Correlation Matrix's of Variables of the model

Variables	Food Accessibility	Livestock Income	Edu.	HH Size	Head Age	No. of Earners
Food Accessibility	1					
Livestock Income	0.7445	1				
Education	0.0106	0.1709	1			
Family Size	0.2773	0.0986	-0.3073	1		
Age of the Head	0.2103	0.0760	-0.4443	0.5419	1	
No. of Earners	0.4184	0.4535	0.0598	0.0516	0.0412	1

Source: Authors own calculation from primary data

Households of three districts are widely indulged in livestock activity, and the maximum proportion of their earning comes from the selling of livestock products (Table-3). These households raise different categories of animals like cows, buffalos, goats, and sheep, etc. They sell these animals and their different products like milk, butter, ghee, meat etc., to satisfy their wants. In this study, a household is considered food secure if its earning is more than its expenditure. With his livestock earning, he has easy access to the basic food item necessary to sustain life. Food accessibility has strong and positive correlation with income from livestock (0.75) and the number of earners in the family (0.41) (Table 3).

Table 4
Measures of Coefficients of Regression Model

Variables	Coefficients	Std. Errors	T-Values	Probability
No. of Earners	2233.83***	1257.58	1.78	0.077
Education	1432.24	961.009	1.49	0.138
Income from livestock	0.13116*	0.0157	8.33	0.000
Family Size	14852.84*	4658.50	3.19	0.002
Age of Head	247.64	418.03	0.59	0.554
Constant	144258.10*	28669.09	5.03	0.000
R-Squared	0.6104			
F-Statistics	36.39			0.0000

*, **, *** represents 1%,5% and 10% level of significance

To predict the goodness of fit of the model, a very common or well-known measure of R-Squared has been employed. For the current study, results of R-Squared reveal that 61.04 percent variation in total food expenditure (food accessibility) is due to explanatory variables like a number of earners, education of head, income from livestock, family size and age of the head. Higher R-Squared with a maximum number of significance values indicate good fitted model (Table 4).

Like the goodness of fit, to validate outcomes, measurements of F-statistics have also been discussed in the model to predict whether the overall model is accurate or not; for this measurement following hypothesis testing has been done;

$H_0: \delta_0 = \delta_1 = \delta_2 = 0$ All slope coefficients are equal to Zero

$H_1: \delta_0 = \delta_1 = \delta_2 \neq 0$ At least one of the Slope coefficients is not equal to Zero

Under the light of calculated outcomes of F-Statistics, it has been noted that the null hypothesis of all slope coefficient has been rejected, which reveal that at least one of the slope coefficients is not equal to zero because the value of F-statistics (36.39) is greater than tabulated value or probability of F-statistics is less than 0.05 which reveals the evidence that overall model is accurate. All slope coefficients have a significant impact on the dependent variable of food accessibility.

Food accessibility is the quantity of food reaching masses without delay. Non-agriculture households are always victim of impact of food accessibility on dietary quality (Huang & Tian, 2019). Results revealed that number of earners in a household is significantly (10%) on food accessibility. Finding also indicate that one more earning member in a household would leads to increase Rs. 2233.83 on food expenditure which reveals that increase in a number of earning members increases the food accessibility that leads to improving food security situation. However, education and age of head also have a positive but insignificant impact on food security of study area. The family size of rural household has significant (1%) impact on food accessibility. It revealed that adding one more member in a household would leads to increase food expenditure by Rs.14852.82. household income is an important determinant of rural food expenditure (Habib, Malik, Abid, & Khan, 2016). The outcome of the income from livestock is significant at a 1% indicating that income of a household from livestock activities has significant effect on food accessibility. the increase in income from livestock leads to increase food expenditure by Rs. 0.13116. So, increase in income from livestock increase the food accessibility that leads to improving food security situation.

5. Conclusion

The current study was designed to explore the effectiveness of livestock on household food security (accessibility) in three districts of central Punjab, namely Gujranwala, Narowal and Hafizabad. It has been observed that households earn their maximum proportion of income from livestock and its products like Ghee, Butter, Milk and Meat. These earning has been spent on daily baskets of goods to satisfy basic needs necessary to sustain life and consider themselves food secure. Income from livestock, number of earners, and household size, play a vital role in boosting food security in the study area. A food secure household is characterized on the basis of number of livestock, selling of its products, more number of earners and large family size. More livestock and the number of earners leads the households to earn more income and get easy access to necessities of life. A larger family size also leads to increased labour supply for livestock production and profitability in the study area.

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