

Article

LIVESTOCK SECTOR AND FOOD SECURITY SITUATION IN RURAL PUNJAB OF PAKISTAN

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Abstract: Livestock is an important component of the pastoral economy and performs a compassionate role in plummeting hunger and food insecurity. The past empirical literature has focused on the effect of the livestock sector on different aspects of food safety and food security. This study examines the contribution of the livestock sector to the nutritional security and welfare of rural households in Punjab province of Pakistan. Primary data were collected from 350 households using a simple random sampling technique. Nutritional security in nutrients (both, micro and macro) was premeditated on the basis of weekly food intake. In the second stage, binary logistic regression was employed to analyze the role of livestock in nutritional security. The results showed that around 35 percent of the sample households were found food insecure. It was found that the food security situation is greatly improved by the level of education and ownership of livestock. A one-unit increase in both parameters increases the probability of a household becoming food secure by 0.179 percent and 1.9 percent, respectively. Monthly income is also found as an important parameter in this regard. Furthermore, increasing family size and family structure play a negative role on food security.

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INTRODUCTION

The socio-economic development and welfare of rural areas are dependent upon the agriculture and livestock sector. It is a fact that the world is now becoming food self-sufficient, but a significant portion of the world population is still undernourished (Bashir et al. 2012). According to a recent report, 24 percent of Pakistan's population faces food insecurity. Out of this 18 percent of people in Pakistan severely lack access to food (FAO, 2016). A globally accepted definition of food safety is when all persons during a period can have access to necessary, secure, nutritive food to sustain a vigorous and energetic way of living. Nearly 700 million individuals (9.2 percent of the world's inhabitants) are suffering from nutritional insecurity and approximately 18.90 percent of the entire Asians are under this circle (FAO, 2016). Pakistan's data from the financial survey 2018 exhibited a decrease in the poverty index from 50.40 percent to 24.30 percent during the year 2016-17. The poverty in villages and cities showed a decreasing trend with a headcount of 12.50 percent and 30.70 percent correspondingly in 2015 and 2016. This poverty reduction is more prominent in cities than villages (GOP, 2018). The livestock sector is considered to be the best source of earnings and cash income, provides foodstuff, and generates employment opportunities for the rural community (Bettencourt et al. 2015; Sadia et al. 2014).

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In 2017-18, the livestock sector has a major share of more than 58 percent of the agriculture sector and 11.10 percent of the total Gross Domestic Product. Almost 8.00 million households are being indulged in livestock rearing or generating 36 percent of earnings from agriculture and livestock production processes and actions (GOP, 2018). The total livestock population and its products such as meat and milk are given here.

Species	2015-16 (in millions)	2016-17 (in millions)	2017-18 (in millions)
Sheep	29.8	30.1	30.5
Goats	70.3	72.2	74.1
Cattle	42.8	44.4	46.1
Buffaloes	36.6	37.7	38.8
Camels	1.0	1.1	1.1

Table 1: Population of Livestock

(Source: Ministry of National Food Security & Research, Government of Pakistan)

Species	2015-16 (000 tonnes)	2016-17 (000 tonnes)	2017-18 (000 tonnes)
Milk (total production)	54,327	56,081	57,891
Sheep	39	39	40
Goats	867	891	915
Cow	19,412	20,143	20,903
Buffaloes	33,137	34,122	35,136
Camels	873	885	896

Table 2: Livestock Products

(Source: Ministry of National Food Security & Research, Government of Pakistan)

Species	2015-16 (000 tonnes)	2016-17 (000 tonnes)	2017-18 (000 tonnes)
Meat (gross production)	3,873	4061	4262
Beef	2017	2085	2155
Mutton	686	701	717
Poultry Meat	1170	1276	1391

Table 3: Total Meat Production

(Source: Ministry of National Food Security & Research, Government of Pakistan)

Livestock raising and dairy sector development show a vital role and a source of earnings in the life of rural households after crop production in different countries of Asia and Africa. (Randolph et al., 2007). In developing countries like Bangladesh, India, and Pakistan this sector has a significant share in the GDP ranging from 15 percent to 25 percent respectively. This sector performs different functions and provides benefits e.g. sale of animals, sale of meat, animal protein supplements, source of income, and food security (Mahmood et al. 2014).

The livestock sector has a significant place in Pakistan's economy but this sector has been facing some issues. Some of these issues are lack of suitable expertise, management issues, availability of proper irrigation systems, lack of infrastructure facilities, and low availability of credit (Khan et al., 2015). Some other issues are deterioration of rangeland, animal health issues, marketing issues, lack of value addition, and institutional issues. Besides these, there are animal nutrition issues, insufficient extension services, and low productivity of animals, poor development and performance of the livestock sector.

Food security is facing many problems such as growing population, lower food availability, higher urbanization, increasing poverty, global warming, obsolete agricultural practices and management, shortage of rain, and some

natural disasters. Besides these, food security also requires better management practices, but livestock is considered to be a vital source of food and nutrition security. Livestock not only helps in income generation but also has the potential to reduce poverty, malnourishment, and deprivation. In different ways, almost 1300 million deprived people living in the developing world are dependent on this sector for their income and food security (Alvi et al. 2015).

There is missing research on livestock and food security nexus so this study will focus on the role of livestock in food and nutritional security and income generation. Other than the aforementioned problem, the study identifies the socio-economic factors affecting food security keeping in view that livestock has a major impact on food and nutritional security.

LITERATURE REVIEW

As mentioned, livestock is mostly used as a source of food, income, for the cultivation of crops. Limited literature is available on livestock and food security therefore the most suitable literature for this study is given here.

Kazybayeva et al. 2006 studied the livestock's share in human food and income in Senegal. Both primary and secondary data were used from the reports of ESAMI while primary data were collected from 600 respondents. It was finalized that livestock had a positive impact on income and food security. Further results revealed that more than 10 percent of food requirement was fulfilled due to livestock products. The share of livestock in income was ranged from 16 to 38 percent. The study suggested commercializing the livestock sector for food security and earnings.

Bashir et al. 2010 reviewed the contribution of the livestock sector to food security in the rural households of district Faisalabad, Pakistan. 300 households were interviewed using a proportionate sampling method. DIA method was used for food security calculation while the logit model was used for socio-economic factors. They concluded that livestock has a significant impact on achieving food security in households. Food insecure rural households were 18 percent. It was also concluded that female livestock helped the household in terms of their nutrition and economic welfare.

Alary et al. (2011) reported the contribution of livestock to income generation in Mali. A sample size of 600 respondents was selected for the interview through a simple random sampling method. Two approaches were used, the first was the measure-based approach while the second was the financial approach. According to the results of the first approach major part of the income was generated through the livestock sector. But the second approach revealed that there existed a weak relationship between income and livestock ownership. Overall findings suggested that livestock must be encouraged.

Bashir et al. (2012) stated the impact of livestock on the food security of rural households in 12 districts of Punjab, Pakistan. A stratified sampling method was used to collect the primary data from 576 rural households. Binary logistic regression was used for the study. The results showed that more than 19 percent were food insecure in the study area. Furthermore, it was revealed that cows, buffaloes, sheep, and goats had a positive impact on food security conditions. Finally, the research showed that the rise in the number of animals either cows and buffaloes or sheep and goats improved the food security condition by 10 percent and 14 percent respectively. Total monthly income, level of education of households, and earners in a family also had a direct impact on food security. But food security declined due to an increase in family size. It was suggested that by paying attention to the livestock sector food safety can be ensured.

Kumar et al. (2012) showed the role of livestock in food security and poverty reduction in Bihar. This study was conducted in nine districts. Secondary data were used with the help of the Sanjay Gandhi Institute of Dairy Technology, Patna to assess the livestock scenario in Bihar. The survey revealed that dairy contributed, on average, about 22.39 percent to total household income in sample villages. It was also found that 58 percent of protein and 54 percent of calcium were provided by livestock and its products. In this regard, the findings suggested improving the livestock sector in the study area.

Ali and Khan (2013) analyzed the relationship between ownership of livestock and its role in food safety in the province of Punjab, Pakistan. Cross-sectional data from 234 farmers were collected from three main districts i.e. Sheikhpura, Hafizabad, and Gujranwala. The data were analyzed by using Poisson regression. Besides regression analysis propensity score matching method was also used to know the effect of livestock on food safety conditions of rural households. It was indicated that households having livestock were 19-40 percent more food secure as

compared with non-owner of livestock. It was recommended that the livestock sector must be improved because it can help to raise the status of food security.

Biradar et al. (2013) inspected the role of the livestock sector in income generation and food safety. This study was conducted in five taluks in western Maharashtra. Primary data were collected from 100 farmers through random sampling. The results found that livestock had a share in income from 18.50 to 34 percent while it provided almost 35g protein, 1690 mg calcium, and 52.3g fat to the everyday food of people. The study had suggested that the livestock sector must be boosted to improve food security.

Mahmood et al. (2014) examined the share of the livestock sector in the food security of rural households in Pakistan. For this study, secondary data were used from different reports such as SDPI, SDC, and World Food Program 2009 besides these Punjab Development Statistics, Food Insecurity Report 2009, and Agriculture Census Report 2010 were used. To analyze the association between livestock rearing and food security Generalized Linear Model (GLM) was used. The findings revealed that there is a direct impact of livestock ownership on food safety. The results also indicated that male animals had an inverse impact on food safety conditions. The research suggested that food security may be improved by boosting the livestock sector.

METHODOLOGY

Data were collected from district Nankana Sahib of the Punjab province of Pakistan. The district Nankana Sahib was comprised of two tehsils i.e., Shahkot and Sangla Hill (GOP, 2010). The population of these two tehsils was asymmetrical so it was decided to include them according to their population. For sampling 10 villages from tehsil Sangla hill and 15 villages from tehsil, Shahkot were selected based on homogeneity. From each village, 6 respondents were randomly selected. According to this selection procedure, the sample was turned out to be 150 rural households ($25 \times 6 = 150$). Before the collection of data, a pre-testing was done by using a structured questionnaire. After pre-testing, some adjustments had made and a comprehensive questionnaire was formulated. According to the designed questionnaire, several information was obtained on different aspects of food and nutritional security of rural households. The questionnaire was categorized into three parts: socio-economic information, common demographics, and their weekly food consumption items' and different source of income information.

Empirical analysis of data was done in three stages. In the first stage share of livestock in the total income of rural households was calculated. For this purpose, data were collected on different sources of income such as crop sources, livestock income, occupational income, and income from remittances or other sources. Total income was summed up and the percentage of livestock income was calculated.

In the second stage, food security was calculated. There were six different methods to calculate food security. One of the most important methods adopted for the calculation of food security was the dietary intake assessment (DIA) method. This method is very useful for the calculation of food security. For the calculation of food security, seven days recall method was used and this was based on their per capita calory intake. This information was based on their food consumption for the last seven days.

According to Government guidelines (GOP, 2003) per capita calories level for urban households was set at 2350 Kcal/day/person while for rural households was 2450 Kcal/day/person.

$$FS_i = \sum Cal_i - L \geq 0$$

Where FS_i stands for food security status of i^{th} rural household and Cal_i is the calories intake of i^{th} households and L is the GOP's thresholds level for rural areas i.e. 2450 Kcal/person/day. If the value of FS_i is equal to 1 then households were fully food secure while a value equal to 0 showed food insecurity.

This method has some advantages. It measures calorie intake and dietary quality at individual levels. It calculates food ingestion indirect ways but not accessibility. This method is most beneficial to apprehend the agent and extensive spoofing dietary intake forms.

There are some limitations of this method as well. As this method mostly depends on the memory of households so there are chances of a measurement-based oasis of recall methods and estimations, this becomes problematic to calculate the food security and costly method along with the requirement of qualified scientists.

In the third stage of analysis, the binary logistic regression model is employed as follows:

$$FS_i = \sum_{i=1}^7 \beta_i X_i$$

Where X_i shows the socio-economic determinants while β_i indicates the coefficients of the model. The FS_i is a dependent and discrete variable so the above-mentioned equation can be written in the form of its probabilities. The general form of the logit model can be written.

$$\text{Log} \left(\frac{pi}{1 - pi} \right) Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \beta_7 X_7$$

Where;

- Y = Dependent variable (food security)
- β_0 = Intercept (mean value when all independents are equal to zero)
- β_{1-7} = Coefficients of independent variables
- X_i = No. of Independent variables
- X_1 = Total number of buffaloes owned by rural households
- X_2 = Total number of cows owned by rural households
- X_3 = Ownership of livestock of rural households
- X_4 = Level of education from zero education to master and sabine of rural households
- X_5 = Total family members or family size of rural households
- X_6 = Family structure of rural households either joint or nuclear family
- X_7 = Total income of rural households

RESULTS

Information regarding household food security of district Nankana Sahib is given in Table 4. Results show that almost 23 percent of rural households were food insecure. Similar results i.e., 19 percent were presented in the study of Nabarro and Wannous (2014) using the same threshold level in district Faisalabad. While more than 76 percent were food secure. By comparing both results, it is found that the food insecurity situation portrays a terrible situation in the study area. It can be explained in terms of the variations in food security by geographical setting and time interval (Roland-Holst and Otte, 2007). But the overall food security in the vicinity was found better than the overall situation (24 percent) in Pakistan (FAO, 2016).

Food Security Status	Percentage	Frequency
Secure	76.67	115
Insecure	23.33	35
Total	100	150

Table 4: Food Security Status

It is found that on average, each household consisted of 7 members with a calorie intake range from 1,100 to 5,419 Kcal/person/day with an average of 2615 Kcal/person/day. In the sample population, each family owned 0 to 25 buffaloes and cows while 0 to 12 sheep and goats with an average of 5 cows, buffaloes, and 4 sheep, goats, and the mean income: Rs. 20,000 varying from Rs. 12,756 to over Rs 64,234.

Variables	Minimum	Maximum	Mean	Standard Deviation
Total monthly income	20,000	135,000	64,234	12756.1
Buffaloes	0	25	5	4.5
Cows	0	20	4	3.2
Sheep / Goats	0	12	3	1.2
Per capita calorie intake	1,100	5,419	2,615	884
Family size	2	26	7	3.48
Total earners	1	5	2	1.5

Table 5: Descriptive Statistics

Variables	Coefficients	Std. Err	Odds Ratios
Total Monthly Income	0.00025**	0.000	1.00025
No. of Buffaloes	0.071***	0.0508	1.073
No. of Cows	0.051**	0.0359	1.052
Ownership	0.898***	0.0036	2.45
Education	0.679**	0.068	2.011
Status of respondent	1.256**	0.0245	3.490
Family structure	-0.9235**	0.251	0.39
Total family members	-0.110	.031	0.89
Constant	1.183	0.24	

Table 5: Determinants of Household Food Security

Note: ** shows values are significant at $< 5\%$ while *** indicates significant at $< 1\%$

In binary logistic regression, it is difficult to explain the coefficients of variables. So, this study uses the estimates of the probabilities and the odds ratios. The results of this research show that coefficients of six (out of nine) variables are found statistically significant including the ownership buffaloes and cows, monthly income, total family members of a rural household, ownership of livestock, earning the status of respondents, and level of education up to graduation and above. This model was 85% accurate in terms of predictive efficiency.

As discussed nine variables were used but some of them were statistically insignificant so the results of only those variables are given here that were statistically significant. Agriculture and livestock rearing were the most significant factors for the livelihood and earning strategy of rural households in the district of Nankana Sahib. The results of binary logistic regression indicated that having animals like cows, buffaloes, and sheep goats were directly impact rural household food security. As the number of cows, buffaloes, sheep, and goats increase people become more food secure because milking animals contribute more to income and food products. The coefficient of the number of buffaloes is 0.071 and it was converted into its odd-ratio ($e^{0.071}=1.073$) coefficient for the number of cows is 0.051 and converted into its odd-ratio ($e^{0.051}=1.052$). This shows that when there is a one percent increase in the number of cows or buffalo the chance of becoming food secure increases by 1.071 and 1.052 times respectively. Similar results were described by Ali (2007) who found that an increase in small and large livestock enhanced the chances of a household to be more food secure by 2.1 percent in the rural areas of the province of Punjab, Pakistan. Kazybayeva et al. (2006) proposed similar results that whenever there was an increase in animal holding people become more food secure re.

Empirical results of regression model representing ownership of livestock in the food security had statistically significant. The coefficient of ownership of livestock was positive and had a value of 0.898 having an odd ratio ($e^{0.898}=2.45$). It indicated that people that had livestock were more food secure. As people owned more livestock there are chances of people being more secure. Similar findings by Hailu et al. (2005) showed that when there is an increase in one livestock animal the probability of becoming more secure increases by 1.05 times. The results of this study showed that when the ownership of livestock increases then there is the probability to be food secure by 2.45 times. Bashir et al. (2010) found that people having zero animals were less food secure as compared to livestock ownership by 37.03 percent.

The total monthly household income positively contributes toward food security; the estimated coefficient is 0.00025 having an odds ratio ($e^{0.00025}=1.00025$). The results showed that as there is a one-unit increase in income there is a chance of becoming food secured by 1.00025 times. Similar results by (Ali and Khan, 2013) showed that when there was an increase in income were Rs 1000 then food security conditions were improved by five percent in rural areas of Punjab, Pakistan. In a related study, Bashir et al. (2010) investigated that increase in income from Rs 1000-1500 food security increased by fifteen percent. Similarly, using the same method Sindhu et al. (2008) observed an increase in food security status by 30% with an increase in 1000 Indian Rupees (\$20) monthly incomes in India.

The impact of total family members was also analyzed by the regression model. It was found that total family members had a negative sign of -0.110 and an odds ratio of 0.89. Similar results were proposed by a finding by

Herrero et al. (2013) research, where a household faces a risk of food insecurity by 31% with the increase in family size by one member.

Similarly, family structure (joint or nuclear family system) has a negative coefficient of -0.923 with an odds ratio of 0.39. People who lived in a joint family system were less secure than those living nuclear family. Education level also directly impacts the food and nutritional security of rural households. As people got more education there are chances of becoming more secure because they become conscious about their diet. The coefficient of education was positive 0.679. Education plays an important role in the food security status of the household. It positively contributes to the increase food security by 2.011 times. Educated farmers have better understanding of the production technologies and are able to efficiently utilize available information and resources. They have access to agri-extension services and hence have access to new and improved crop varieties.

The presence of Livestock has a significant role in the fulfillment of the nutritional requirement of the human body. After calculating the total food and nutritional security the share of livestock in nutritional security was measured. Food intake of households was divided into different sources such as dairy products, poultry products, cereal-related intake, fats and oils, sugar, sweets and beverages, and similar other products. Total nutritional security was calculated then the share of livestock was analyzed. The share of livestock varied from 10% to 52%. The minimum share of livestock in the form of dairy products, poultry products, chicken, mutton, beef, eggs, milk, yogurt, cheese, butter, and desi ghee was 10% while the maximum share was 52%. On average the share of livestock was 23% of the total nutritional security of rural households.

Livestock substantially adds to the income of rural households and helps in improving overall welfare. In the study area, it was found that some of the households were fully dependent on livestock. Incomes of the others came from different sources, like, non-farm participation, business, or remittances. Results showed that income generated from a source of livestock varies from 2 percent to 73.60 percent. The mean value of a share of income from livestock was 25.76 percent while the minimum share of income from livestock was 2.94 percent and the maximum share of income from livestock was 73.60 percent having a standard deviation of 17.70.

CONCLUSION

The tenacity of the present study was to analyze the contribution of the livestock sector to address the issue of food insecurity and the income generation of rural households. Theoretical as well as empirical analysis generalized that food insecurity arises from lack of ownership and access to assets and resources, the persistence of socio-cultural issues, and absence or poor access to input and output markets, and related infrastructure. 23 percent of households were food insecure while almost 77 percent were food secure. Livestock ownership has a positive impact on food security and income levels in rural households in the study area. According to binary regression, livestock ownership can help to increase food security conditions by 2.4 times. While income generated from livestock ranges from 2 percent to 73.60 percent. As the ownership of livestock plays an important role in ensuring household food security and income generation, the livestock needs to be increased at the rural level.

REFERENCES

- Alary, V., Corniaux, C. and Gautier, D. (2011). Livestock's contribution to poverty alleviation: how to measure it? *World Development*, 39 (9): 1638-1648.
- Ali, A. and Khan, M. (2013). Livestock ownership in ensuring rural household food security in Pakistan. *Journal of Animal and Plant Sciences*, 23 (1): 313-8.
- Ali, J. (2007). Livestock sector development and implications for rural poverty alleviation in India. *Livestock Research for Rural Development*, 19 (2), pp.1-15.
- Alvi, J., Ashraf, I., Ch, K.M., Ifikhar, M. and Ashraf, S. (2015). Impact of livestock in uplifting rural livelihood. *Pakistan Journal of Agricultural Research*, 28 (3).
- Bashir, M.K., Naeem, M.K. and Niazi, S.A.K. (2010). Rural and peri-urban food security: a case of district Faisalabad of Pakistan. *World Applied Sciences Journal*, 9(4): 403-411.
- Bettencourt, E.M.V., Tilman, M., Henriques, P.D.D.S., Narciso, V. and Carvalho, M.L.D.S. (2013). The economic and socio-cultural role of livestock in the wellbeing of rural communities of Timor-Leste.
- Biradar, N., Desai, M., Manjunath, L. and Doddamani, M.T. (2013). Assessing the contribution of livestock to the livelihood of farmers of western Maharashtra. *Journal of Human Ecology*, 41(2): 107-112.
- FAO. (2010). The state of food insecurity in the world: addressing food insecurity in protracted crises. *Food and Agriculture Organization, United Nations Organization, Rome*.

- FAO. (2016). Country rank in the world, by commodity. *Food and Agriculture Organization*, United Nations Organization, Statistics Division.
- GOP. (2003). Economic Survey of Pakistan 2002-03. Finance Division, *Ministry of Finance*, Government of Pakistan.
- GOP. (2010). Economic Survey of Pakistan 2009-10. Finance Division, *Ministry of Finance*, Government of Pakistan.
- GOP. (2018). Economic Survey of Pakistan 2017-18. 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? *Studies on Home and Community Science*, 1: 85-91.
- Herrero, M., Grace, D., Njuki, J., Johnson, N., Enahoro, D., Silvestri, S. and Rufino, M.C. (2013). The roles of livestock in developing countries. *Animal*, 7(1): 3-18.
- Kazybayeva, S., Otte, J. and Roland-Holst, D. (2006). Livestock production and household income patterns in rural Senegal. Pro-Poor Livestock Policy Facility Food and Agriculture Organization-Animal Production and Health Division *Vialedelle Terme di Caracalla* Rome, Italy available at <http://www.fao.org/ag/palpi>. HTML.
- Khan, K., Khan, G., Zahri, M. and Altaf, M. (2015). Role of Livestock in Poverty Reduction: A Case Study of District Lasbela, Balochistan. *Lasbela, UJ Sci. Tech*:153-156.
- Kumar, A., Singh, K.M. and Singh, R. (2012). Role of Livestock Sector in Sustainable Livelihood Security in Bihar: Status and Opportunities. Available at SSRN 2062823.
- Mahmood, H.Z., Hussain, I., Iftikhar, S., Khan, M. and Nisa, F.R. (2014). Role of Livestock in Food Security: An Ascertainment from Punjab Pakistan. *International Journal of Academic Research in Business and Social Sciences*, 4 (8): 2222-6990.
- Nabarro, D. and Wannous, C. (2014). The potential contribution of livestock to food and nutrition security: the application of the One Health approach in livestock policy and practice. *Rev Sci Tech*, 33: 475-485.
- Randolph, T.F., Schelling, E., Grace, D., Nicholson, C.F., Leroy, J.L., Cole, D.C., Demment, M.W., Omore, A., Zinsstag, J. and Ruel, M. (2007). Invited review: Role of livestock in human nutrition and health for poverty reduction in developing countries. *Journal of Animal Science*, 85 (11): 2788-2800.
- Roland-Holst, D. and Otte, J. (2007). Livestock and livelihoods: Development goals and indicators applied to Senegal. *African Journal of Agricultural Research*, 2 (6): 240-251.
- Sadia, A., Azeem, M.M., Khuda, B., Alvina, F. and Abdus, S. (2014). Poverty reduction in Pakistan: the role of agricultural and industrial subsector's growth. *Pakistan Journal of Applied Economics*, 24(2): 143-157.
- 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. *Agricultural Economics Research Review*, 21: 91-98.
- Tembo, G., Tembo, A., Goma, F., Kapekele, E. and Sambo, J. (2014). Livelihood activities and the role of livestock in smallholder farming communities of southern Zambia. *Open Journal of Social Sciences*, 2 (04): 299.