

Research Article



Financial Contribution of Livestock at Household Level in Federally Administered Tribal Areas of Pakistan: An Empirical Perspective

Shaista Naz* and Noor Paio Khan

Institute of Development Studies, The University of Agriculture, Peshawar, Khyber Pakhtunkhwa, Pakistan.

Abstract | Livestock is important due to its multidimensional contributions at the household level. To highlight the contributions of livestock at household level the present study is conducted in Mohmand Agency of Federally Administered Tribal Areas (FATA) of Pakistan. The study used a dataset of 323 households collected through face to face interviews from women respondents. The collected data were analysed using descriptive statistics, percentages and rank orders. The results revealed that livestock was the second major source of household income with 19 percent share. Among the livestock types, cattle were the major one followed by goats and sheep. Livestock was found significant at household level in two aspects of income provision and of lowering household and farm budget. Livestock income was derived from the sale of milk, milk products (such as yogurt, butter and butter oil), other products (like farm yard manure and dung cakes) and animals which included calves, goats and sheep mainly. The major share of livestock income was accrued from the animal's sale followed by milk and milk products, respectively. The domestically consumed livestock products comprised of milk, milk products and other products. Milk was the major domestically consumed livestock product followed by milk products. The value of domestically consumed livestock products (64 percent) was high as compared to sold products (34 percent) due to lack of market in the study area. The significant share of livestock income was received by women (73 percent) in a household which ultimately show their contribution to livestock rearing. The study recommends that development of the livestock industries in Pakistan focus on establishing a viable market for dairy products, expanding the asset base for livestock production, and introducing a number of policy interventions focused on women.

Received | February 18, 2017; **Accepted** | November 09, 2017; **Published** | December 17, 2017

***Correspondence** | Shaista Naz, Institute of Development Studies, The University of Agriculture, Peshawar, Khyber Pakhtunkhwa, Pakistan; **Email:** shaista_268@yahoo.com

Citation | Naz, S. and N.P. Khan. 2018. Financial contribution of livestock at household level in federally administered tribal areas of Pakistan: an empirical perspective. *Sarhad Journal of Agriculture*, 34(1): 1-9.

DOI | <http://dx.doi.org/10.17582/journal.sja/2018/34.1.1.9>

Keywords | Livestock's contribution, Household level, FATA, Livestock income

Introduction

Agricultural development is essential for sustainable economic development and poverty reduction due to high dependence of extremely poor households in the agriculture sector. About 75 percent of the World's, 1.2 billion extremely poor people (living on less than US\$ 1 a day) live in rural areas

and depend on the agriculture sector directly (World Bank, 2008; Herrero et al., 2012). Agriculture plays a significant role in poverty reduction especially in the rural areas which are deprived of resources (Ahmad, 2014).

Agricultural development and poverty reduction require progressive growth in the agricultural economy

and the ability of poor households to participate in the growth process (Christiansen et al., 2006). It is estimated that three-quarters of poorer households kept livestock as part of their livelihood portfolios (Smith et al., 2013). Livestock mixed with crops are an important component of farming systems to strengthen and ways of improving their operation and management for long-term productivity, profitability and sustainability in developing countries across the world. In mixed farming, 6 to 67 percent of total household income is derived from livestock and its related products. Similarly, in small scale farming, households keep livestock for various reasons including increased productivity from integrated farming systems, sustainability of agricultural practices, environment benefits, and enhancing rural and social stability (Nirmala et al., 2012).

Households involved in many different farming systems and even landless people keep livestock for multiple benefits as they provide cash income, food in the form of milk, milk products, meat, and eggs etc, manure, and draft power. In addition, livestock can be a source of savings and insurance against difficult times, as well as providing social status and financial security (Moll, 2005; Thornton, 2010; Biradar et al., 2013). Small ruminants like goats, sheep, and poultry, can provide emergency funds to mitigate the social and economic uncertainties that households face (Nirmala et al., 2012). It shows that livestock is both a source of financial security and income and it makes a significant contribution to overall livelihoods of the livestock keepers.

Likewise, in the developing countries like Pakistan, livestock reared in the shape of small and large ruminants by households which make a vital contribution to their livelihoods. At the national level, livestock accounts for 11.6 percent of GDP with approximately 58.6 percent of the value added to agricultural products are coming from the processing of livestock products (milk made into butter, livestock processed into meat, etc). Nationwide, about 8 million families are involved in livestock rearing and derived more than 35 percent income from livestock production activities (GoP, 2015-16). Like other parts of the country, particularly in Khyber Pakhtunkhwa, a large number of households are involved in livestock rearing. It makes a significant contribution to their livelihoods and the household level, livestock is tended by women along with their other domestic chores (Khan et al., 2009; FAO, 2015).

Similarly, the Federally Administered Tribal Areas (FATAs) of Pakistan are rural in nature and livestock are extensively reared with the active involvement of rural women. Livestock and poultry are essential components of FATA's economy. A diversity of animals is reared in the areas including; cattle, buffalo, goats, sheep, donkey, horse, camel, mule and poultry. Various studies show the importance of livestock to the economy of FATA (FAO, 2015) but no study highlighted the role of livestock in the dimensions of income provision and of lowering household and farm budget by quantifying the domestically consumed livestock products. Moreover, the aforementioned studies also highlighted the role of women in livestock rearing in FATA, however, no study mentioned the reward of women in the shape of retaining a proportion of the livestock income.

Keeping in view the above research gaps, this study focuses on the financial contribution of livestock to household incomes in the Mohmand Agency, FATA to assess the study objectives. Specifically, this study seeks to answer the four research questions: **1)** How much is livestock contributing to household income; **2)** What are the major types of livestock in the study area; **3)** To what extent the livestock is contributing towards household income and budget; **4)** How much women is receiving/retaining from the livestock income?

Materials and Methods

Study area description

The study was conducted in Mohmand Agency of the Federally Administered Tribal Areas (FATA) of Pakistan. FATA is comprised of seven Agencies (Mohmand, Khyber, Kurram, Bajaur, Orakzai, North Waziristan and South Waziristan) and six Frontier Regions (FRs) including FR Peshawar, FR Kohat, FR Bannu, FR Lakki Marwat, FR Tank and FR Dera Ismail Khan. FATA is the most underdeveloped and impoverished region of Pakistan with only 34 percent of households had a sustainable living standard above the poverty line (Markey and Daniel, 2008). There are few livelihood opportunities available to the people of FATA which mainly include agriculture, livestock rearing, overseas employment and small scale business. Agriculture and livestock rearing have remained the main source of subsistence for over two-thirds of the population (FAO, 2015). The Mohmand Agency was selected as the study area because it is mainly



Figure 1: Sample study area in FATA, Pakistan (Shah et al., 2017).

rural and livestock is extensively reared at the household level. Women are very active and predominantly involved in livestock rearing because it is a source of livelihoods, social protection and income that can be used for supporting their families. Women are performing almost all the livestock activities including, feeding, watering, shed cleaning, milking, milk products processing etc. (FAO, 2015). By performing various livestock activities, women not only provide various livestock products such as milk, yogurt, butter, butter oil, dung cakes and farm yard manure for the use at household and farm but also some of its proportion sold out to generate cash. The Mohmand Agency shares a border with the Bajaur Agency to the north, the Dir district to its east, the district of Peshawar to its south-east and Afghanistan to the west. The agency had two administrative units i.e. Lower Mohmand and Upper Mohmand. Lower Mohmand consists of four Tehsils namely Yakka Ghund, Pindiali, Utman Khel, and Prangharwhile, Upper Mohmand comprises of three Tehsils i.e.; Safi, Halimzai, and Upper Mohmand (Figure 1).

Sampling and data collection

The primary data collection was done between February and May 2016. Using the formula of Cochran

(1963) a sample size of 323 women respondents was selected from the total 8057 households. Through multistage sampling technique, the study site and sampled households were selected. In the first stage of sampling, Mohmand Agency was selected as mentioned earlier. In the second stage, two tehsils i.e. Halimzai and Pindiali were selected randomly. In the third stage, three sub-tribes were selected randomly from each tehsil. In the fourth and final stage, households from the selected sub-tribes were selected through simple random sampling technique using the list of households provided by Planning and Development Department of FATA. The aforementioned sample size was proportionally distributed among the sampled sub-tribes as seen in Table 1.

Data were collected through a pretested semi-structured questionnaire from women respondents through face to face interview method. Women were selected as respondents of the study due to their active involvement in livestock management. All interviews were conducted in the context of shared research principles and research ethics (Shah et al., 2017). Formal permissions were sought before initiating interview explaining the purpose and objectives of the study and usage of data for the research

purpose. The respondents who refused to provide any answer at the briefing stage were replaced with the other households. The questionnaire included the information of households regarding income accrued from various sources like crops, employment, overseas employment, business including livestock, major types of livestock, income derived from the various livestock products and animal's sale, consumption of various livestock products and sub-division of livestock income between men and women. Income from the various sources including livestock of the households was recorded on monthly basis and then converted into annual basis. To check the validity of data key informants interviews were also conducted which included government officials of the livestock department, elder women's of the community who had decades of experience in livestock rearing and Tehsildars (local elders) of the study area.

Table 1: Distribution of sampled households in the selected sub-tribes.

Name of Tehsil	Selected Sub-Tribes	Total Number of Households	Sampled Households
Halimzai	Kachi Khel	1189	48
	Hamza Khel	448	18
	Kuz Kadi Khel	2654	106
Pindiali	Isa Khel	2100	84
	Bar Burhan Khel	1000	40
	Kuz Burhan Khel	666	27
Total		8057	323

Sources: Planning and Development Department (FATA), 2014 and own calculations.

Table 2: Annual household income of the sampled households.

Income sources	Average Annual Income (Rs.)	Percentage	Ranking
Crop sector	59600	15	4 th
Livestock	75961	19	2 nd
Employment	80949	38	1 st
Business	24059	8	5 th
Overseas employment	56743	18	3 rd
Others*	4691	2	6 th
Total/All sources	302003	100	--

*Others: property rents, land rented out.

Data analysis

For data analysis Statistical Package for Social Sciences (SPSS) software version 20 was used. The data were analysed using descriptive statistics, percentages and

rank orders. To quantify the livestock income share to total household income, mean values, percentages and rank orders were employed. All the livestock types were made sheep equivalent (1 cattle=6 sheep) and percentages and rank orders were used for its reporting. For the quantification of livestock income and the value of domestically consumed livestock products and the livestock income shares of men and women again mean values and percentages were used. All the values of the products were estimated at current local market prices. Moreover, all the calculations about income were made at the household level, annualised, and then reported in Pakistani currency.

Limitations of the study

The study focused on the financial contribution of livestock at household level in the two tehsils of the Mohmand Agency due to limitations associated with time, resource constraints and infrastructure. In this regard, the results cannot be representative of the whole tribal area or the entire country due to the small sample size. Some respondents were skeptical about revealing accurate figures relating to numbers of livestock; which was avoided by emphasizing the confidentiality of information during the interviews. Many of the questions in the questionnaire were based on the recall ability of the respondents who may not have given very accurate information due to memory lapses considering most of them had only basic education. However, the research recommendations may as well be applicable in other areas having similar ecological and socio-economic characteristics.

Results and Discussion

Household income

Major sources of household income of the respondents include crop sector, livestock, employment, businesses, overseas employment and others (property rents and land rented out) in the study area. The data in Table 2 show that on the average Rs. 30, 2003/- per annum has been received per household from all the major sources of household income. The average annual income per household from the employment sector was found high with Rs. 80,949 and ranked first with 38 percent share to total household income. The employment includes both public and private sector services and daily wages in the locality and other parts of the country. Livestock is regarded second major source to the household income with 19 percent share. From livestock rearing, on the average

a household received Rs. 75,961/- per annum. Overseas employment ranked 3rd with an average of Rs. 56743/- per annum/household. The share of overseas employment to the household income was 18 percent. The crop sector was found 4th major source to household income with 15 percent share and with an average annual amount of Rs. 59,600/- in the study area. Business sector which mostly included small scale businesses and other sources of household income like property rents, land rented out were contributing very less to the household income. The results depict that livestock rearing serves as the second major source of income which is the concern of this study.

Table 3: Major types of livestock in the study area.

Livestock types	Number of Livestock Types	Sheep Equivalent Livestock Types	%ages	Ranking
Cattle*	354	2718	65	1 st
Goats	1245	1245	30	2 nd
Sheep	225	225	5	3 rd
All animals	1824	4188	100	--

*1 Cattle is equivalent to 6 sheep in this study; **Note:** All the percentages are calculated on the basis of sheep equivalent livestock types.

Table 4: Average contribution of livestock (in Rs.) per household/annum in the study area.

Response Categories	Cash Income (in Rs.)	Domestic Value (in Rs.)	Total Value (in Rs.)
A.Milk	23823	68054	91877
B. Milk Products	23683	62910	86593
Yogurt	11698	34622	46320
Butter	2915	17010	19925
Butter oil	9069	11278	20347
C. Other Products	2772	3144	5916
Farm Yard Manure	2270	1994	4264
Dung cakes	502	1150	1652
D. Animal's sale	25683	--	25683
Total (A+B+C+D)	75961	134108	210069

Livestock types

Data regarding major types of livestock in the study area is presented in Table 3. Cattle, goats, and sheep were the major types of livestock in the study area. On the basis of number of animals, a total of 1824 different types of animals were reared in the study area. Of

the total number of livestock, 354 cattle, 1245 goats and 225 sheep were found. In this study 1 cattle is equivalent to 6 sheep. So, on the sheep equivalent basis, a total of 4188 number of animals were kept in the study area as seen in Table 3. Data show that cattle are the major type of livestock (65 percent), followed by goats (30 percent) and sheep (5 percent) in the study area. These results are consistent with the Planning and Development Department of FATA (2014), who reported that cattle, goats and sheep are the major types of livestock in Mohmand Agency.

Contribution of livestock to household

Livestock is attractive to households in rural areas as it provides cash and fulfils some of the domestic requirements of households. Milk, milk products (i.e. yogurt, butter and butter oil etc.) and other products like dung cakes, and farm yard manure, as well as the sale of the animals themselves, are a source of income for rural people and these products are also consumed domestically at household and farm level. Milk and milk products like yogurt, butter and butter oil are a part of the daily diet of the rural communities thus improving their nutritional status and also lowering the household budget. The surplus milk and milk products are sold out to generate cash/income which are further used for livestock development, food expenditures etc. in the households. Similarly, other products like dung cakes are a cheap source of energy for domestic cooking in rural areas and they can also be sold to earn cash by women livestock keepers. Farm yard manure is also used to improve the fertility of farmland and can be sold to earn income. The sale of animals, especially of small ruminants, can provide financial security at household level and mitigate some of their social and economic uncertainties (Biradar et al., 2013). In the present study, the livestock contributions at the household level are assessed by estimating the cash/income generated directly from the sale of different livestock products and animals and by estimating/calculating the value of domestically consumed livestock products. The sources of livestock income are broadly categorised into milk, milk products, other products and animal's sale. Milk products include yogurt, butter, and butter oil, while other products are comprised of farm yard manure, and dung cakes while the sale of the animal also generates income to households. The average and percent annual contribution of livestock to a rural household is presented in Table 4 and Figure 2, respectively. Data in Table 4 show that an average of Rs. 210069/-

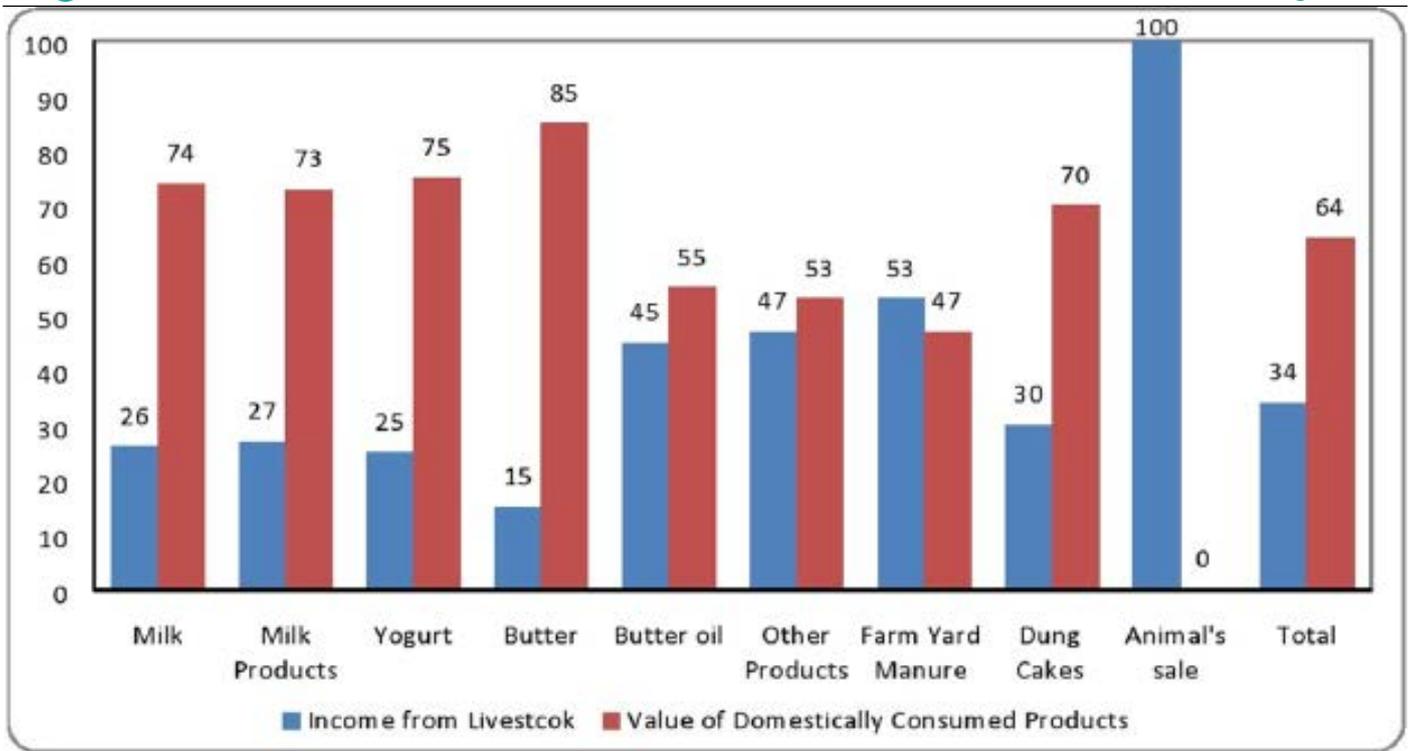


Figure 2: Percent distribution of Livestock's contribution per household/annum in the study area.

per household/annum livestock products had been produced of which Rs. 134108 /- per household/annum products was domestically consumed while, of Rs. 75961 /- per household/annum was sold out to earn cash/income. The results indicate that a major portion of livestock products (64 percent of the total value) were consumed domestically and only 36 percent of the value of products was used to earn cash income in the study area as shown in Figure 1. The findings of Adam et al. (2010), Biradar et al. (2013) and Akter et al. (2007) from Ghana and India support the results reported here that livestock contributes to balancing human diets in a rural area by providing various dairy products as well as contributing to household incomes by earning cash. Milk was the major livestock product sold at household level followed by milk products and animal's sale with an average annual contribution of Rs. 91877/- (74%), Rs. 86593/- (73%), and Rs. 25683/- (100%), respectively. Among the milk products, yogurt was the major one followed by butter oil and butter with average annual contributions of Rs. 46320/-, Rs. 20347/-, and of Rs. 19925/- per household, respectively. The first and second most important category of other products were farm yard manure (Rs. 4264/- per household) and dung cakes (Rs. 1652/- per household), respectively. The results in Table 4 and Figure 2 show that for the first three categories of livestock products (i.e., milk, milk products and other products) the value of

domestically consumed livestock products was high compared to the cash income received from the sale of these products. In the case of milk, 74 percent of the value of milk produced was consumed domestically and 26 percent was sold for cash. The value of domestically consumed milk products includes yogurt, butter and butter oil was higher than that obtained from their sale. Regarding other products of livestock, 47 percent valued products were sold out for cash in the study area. Only in the case of farm yard manure more of its quantity (53 percent) was sold for cash which is due to its fewer requirements at small farms of the respondents. In the case of dung cakes, 70 percent of its value came from domestic use product, while more than half of the value of farm yard manure was derived from its use at farm level. The results are in conformity with Adams and Yankyera (2014) and Ahmad (2014). The fourth category of livestock products includes animals which were mostly calves, goats and sheep were sold to fulfil the cash requirements of households. These findings are consistent with those of Nirmala et al. (2012) and Issac et al. (2012) who also reported that animals were sold to meet the cash requirements of households. No domestic consumption of these animals was reported by the sample households. These results imply that high consumption of livestock products on farms is due to the lack of markets for these products. This is in conformity with the findings of a study conducted by FAO

(2015) where it is reported that ineffective marketing systems prevail in the FATA for dairy products. It is also clear from these results that the consumption of high valued livestock products at household level improves the nutritional status of household members and the consumption of these products lowered the household and farm budget. The results further imply that livestock is important for income generation and fulfilment of domestic needs at household and farm level in the study area. These needs include meeting the cash required to maintain the nutritional and energy requirements of people in the household, as well as the soil fertility requirements of the farm. Cash is used for fulfilling the food, feed and other social requirements at household level while milk and milk products are domestically consumed by the household members thus not only provide food security but also serve as a source of protein-rich food. Dung cakes used as a source of energy within the household and farmyard manure improve the fertility of soil thus increasing agricultural production/yield.

Table 5: Average annual livestock income share (in Rs.) of men and women in the study area.

Response Categories	Women In- come Share (in Rs.)	Male In- come share (in Rs.)	Total Live- stock Income (in Rs.)
Milk	23823	--	23823
B. Milk Products	23683	--	23683
Yogurt	11698	--	11698
Butter	2915	--	2915
Butter oil	9069	--	9069
C. Other Products	502	2270	2772
Farm Yard Manure	--	2270	2270
Dung cakes	502	--	502
D. Animal's sale	7400	18283	25683
Total (A+B+C+D)	55408	20553	75961

Livestock income shares of men and women

Income from livestock at the household level is retained by male and female members of the respective households which are further used for fulfilling various social and economic needs. Data regarding income shares of men and women from livestock can be seen from Figure 3 and Table 5. Women received 73 percent of the total average annual livestock income/household while men received only 27 percent as shown in Figure 3. The reason of highest income shares of women from livestock is that income from the sale of milk and milk products solely goes

to women, while they also share the income of other products with men as well. The results are in line with Rais et al. (2013) who reported that in district Khairpur major share of livestock income (selling milk and milk products) was retained by female and also independently spending. The average annual income share of women from livestock products was of Rs. 55,408/- while men's share was Rs. 20553/- per household in the study area. Income from the sale of milk and milk products were exclusively received by women while in the case of other products and animals' sale men received a higher average annual amount of Rs. 2270/-, and Rs. 18283/- respectively. Results indicate that women received a higher share of livestock income than men in a household in the study area. The results are consistent with the findings of a study conducted by FAO (2015) where it is mentioned that women of FATA have more control over the sale of agricultural produce including livestock products and the income received from the sale is either kept by women or household head which are mostly men. It further implies that due to women's active involvement in livestock management they received a substantial part of livestock income.

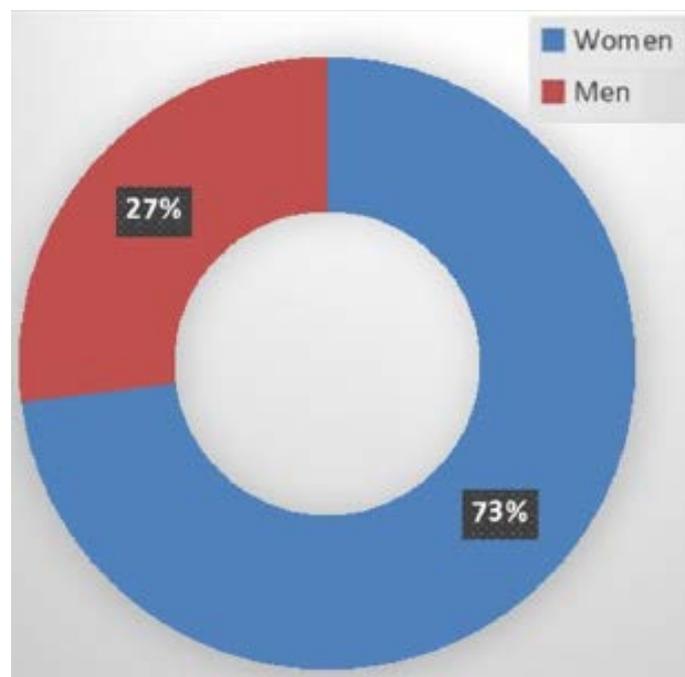


Figure 3: Percent Livestock income shares of men and women in the study area.

Conclusions and Recommendations

The study concludes that livestock was the second major source of household income with 19 percent share highlighting its importance. Among the livestock types, cattle were the major one followed by goats and

sheep. Livestock was found significant at household level in two aspects of income provision and of lowering household and farm budget. Livestock income was derived from the sale of milk, milk products (such as yogurt, butter and butter oil), other products (like farm yard manure and dung cakes) and animals which included calves, goats and sheep mainly. The major share of livestock income was accrued from the animal's sale followed by milk and milk products, respectively. The domestically consumed livestock products comprised of milk, milk products and other products. Milk was the major domestically consumed livestock product followed by milk products. The value of domestically consumed livestock products was high as compared to sold products due to lack of market in the study area. Only, the value of farm yard manure used at farms was low compared to its sold value due to the small farm sizes of the respondents. Income from the sale of milk and milk products were exclusively received by women. Thus, a significant share of livestock income was received by women in a household which ultimately show their contribution to livestock rearing. The study recommends livestock sector development with special focus on market access, expanding livestock assets, and women focused interventions. The increasing returns to livestock can lead to reduced poverty, improved crop production by manure application, and opportunities for small-scale trade in livestock products.

Author's Contributions

This research is a part of PhD study of SN. The idea of this research was generated by SN and refined by NPK. SN collected and analysed the data, and overall managed the study. NPK provided technical input at every step.

References

- Adam, H., P.B. Atengdem, and S. Al-hassan. 2010. Innovations adoption levels of small ruminant farmers in Tolon-Kumbungu district of Ghana. *Ghana J. Dev. Std.* 7(2): 39-66.
- Adams, F. and K.O. Yankyer. 2014. Determinants of factors that influence small ruminant livestock production decisions in northern Ghana: Application of discrete regression model. *J. Biol. Agric. Healthcare.* 4(27)310-321.
- Ahmad, T. 2014. The role of rural women in livestock management: Socioeconomic evidences from diverse geographical location of Punjab (Pakistan). *Geography University Toulouse le Mirail- Toulouse II*, 2013.
- Akter, S., J. Farrington, P. Deshingkar, L. Rao. and A. Freeman. 2007. Species diversification, livestock production and income in the Indian State of Andhra Pradesh. *Lives. Res. Rural Dev.* 19(11): : 65-89.
- Biradar. N., M. Desai, L. Manjunath and M.T. Doddamani. 2013. Assessing contribution of livestock to the livelihood of farmers of Western Maharashtra. *J. Hum. Ecol.* 41(2): 107-112.
- Christiaensen, L., L. Demery and J. Köhl. 2006. The role of agriculture in poverty reduction: An empirical perspective. world bank policy research working paper 4013. World Bank, Washington D.C.
- Cochran, W.G. 1963. *Sampling Techniques*, 2nd Ed., New York: John Wiley and Sons, Inc.
- FAO (Food and Agriculture Organization). 2009. *The state of food and agriculture: Livestock in the balance.* (Rome: FAO).
- FAO (Food and Agriculture Organization). 2015. *Women in agriculture in Pakistan.* Food and Agriculture Organization of the United Nations Islamabad. 2015.
- GoP (Government of Pakistan). 2015-16. *Economic Survey of Pakistan.* Ministry of finance. Islamabad.
- Herrero, M.D., J. Grace., N. Njuki, D. Jhonson, S. Enahoro, S. Silvestri, and M.C. Rufino. 2012. The roles of livestock in developing countries. *Animal*, null. pp. 1-18.
- Isaac B.O. and T.B. Oluwatayo. 2012. Small ruminants as a source of financial security: A case study of women in rural southwest Nigeria. Institute for money, technology and financial inclusion, working paper 2012-1.
- Khan, M., Sajid, M., Hameed, B., Khan and A.U. Jan. 2009. Participation of women in agriculture activities in district Peshawar. *Sarhad J. Agric.* 28(1): 121-127.
- Markey and Daniel S. 2008. *Securing Pakistan's Tribal Belt.* Council on Foreign Relations. pp. 5. ISBN 0-87609-414-0.
- Moll, H.A.J. 2005. Costs and benefits of livestock systems and the role of market and nonmarket relationships. *Agric. Econ.* 32(2): 181-193. <https://doi.org/10.1111/j.0169-5150.2005.00210.x>
- Nirmala, G., D.B.V. Ramana, and B. Venkateswarlu.

2012. Women and scientific livestock management: Improving capabilities through participatory action research in semiarid areas of south India. *APCBEE Procedia*. 4: 152 – 157. <https://doi.org/10.1016/j.apcbee.2012.11.026>
- Planning and development department of FATA. 2014. FATA in figures. Bureau of statistics, FATA cell.
- Rais, M.U.N., A.W. Solangi and H.A. Sahito. 2013. Economic assessment of rural women involved in agriculture and livestock farming activities. *Wudpecker J. Agric. Res.* 2(4): 115 – 121.
- Shah, A.A., J. Ye and M. Abid, M. 2017. Determinants of flood risk mitigation strategies at household level: A case of Khyber Pakhtunkhwa (KP) province, Pakistan. *Nat. Hazards*.
- Smith, J., S. Tarawali, D. Grace and K. Sones. 2013. Feeding the world in 2050: trade-offs, synergies and tough choices for the livestock sector. *Tropical Grasslands – Forages Tropicales*. 1:125-136. [https://doi.org/10.17138/TGFT\(1\)125-136](https://doi.org/10.17138/TGFT(1)125-136)
- Thornton, P.K. 2010. Livestock production: recent trends, future prospects. *Philos. Trans. Biol. Sci.* 365(1554): 2853-2867. <https://doi.org/10.1098/rstb.2010.0134>
- World Bank. 2008. World development report 2008. Agriculture for Development. (Washington D.C., World Bank).