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Research Article

Sustainable livestock farming practices in Punjab, Pakistan: Insights from demographic analysis and disease prevalence

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ABSTRACT

This study investigates the socio-economic landscape and disease prevalence among livestock farmers in Punjab, Pakistan, focusing on Muzaffargarh and Rahim Yar Khan districts. A sample of 400 farmers was randomly selected using a multistage sampling technique. The demographic analysis reveals a predominantly middle-aged and older farming population, with small to medium landholdings. Specifically, 43.3% of farmers were categorized as old (>50 years), while 65.0% were small-scale landholders (less than 12.5 acres). Regarding disease recognition, foot and mouth disease and hemorrhagic septicemia emerged as the most recognized diseases, with mean scores of 3.30 and 3.22 respectively, on a scale of 1 to 5. Additionally, ticks were identified as the primary external parasite affecting livestock, with a mean score of 3.19. These findings highlight the urgent need for targeted interventions to address disease management and improve farming practices in the region. Strengthening veterinary services, promoting disease prevention measures, and enhancing access to quality fodder are crucial steps toward ensuring sustainable livestock farming in Punjab, Pakistan.

Keywords: Livestock farming, Punjab, Pakistan, Disease prevalence, Socio-economic analysis.



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INTRODUCTION

Nowadays more than 35 million people in Pakistan are engaged in the livestock sector either directly or indirectly (Govt. of Pakistan, 2022). Commonly rural families in Punjab engaged in livestock have 2 to 3 buffalo or cow and 5 to 6 goat or sheep. Landless and small farmers are an important contributor in milk and meat production as more than 90% of these small livestock farmers have commonly 2-3 milking animals. The average milk yield in Pakistan is very low due to countless factors, but most common are different types of the fatal disease in cows and buffalos, low quality of fodder traditional farming methods, late maturity of heifer unrecognized and fluctuating market price and poor information source (Ashfaq et al., 2015). Diseases have a bad impact on livestock production e.g. treatment costs, prevention, technical assistance, lowered performance and/or quality of feedstock (Lopes et al., 2015). Due to multiple challenges like the beginning of infectious diseases, the length of animal illness, the expense of feeding, and vaccinations, farmers usually deal with a number of issues that have an impact on their revenue (Benkirane and Alwis, 2002). In Pakistan, five economically endemic diseases i.e. HS, FMD, Rinder Pest, Anthrax, and Black Leg were responsible for 58.7% of cattle mortality in 2012 (Moustafa et al., 2017). Buffalo diseases have grown significantly in economic significance as Pakistan's dairy sector has grown.

In large farms, the most prevalent buffalo breeds are Nili-Ravi and Kundi, but many small farmers raise one or two nursing buffalo for household use. Numerous elements connected to or existing in the environment in which animals live are covered by the field of animal hygiene. By giving them access to water, air, and housing that is properly ventilated and drained, it also maximizes the efficiency of an animal as a good producer. Disease control is crucial to upholding the high standards of animal health, and disease prevention is the first line of defense. It is growing in significance in Pakistan (Ferrari et al., 2014). A prosperous dairy business depends heavily on herd health management, and a variety of elements go into keeping the farm's herd healthy. A successful and financially rewarding dairy farming operation depends on maintaining a healthy and thriving herd. Some of these factors include the type of housing, hygiene standards at the farm, animals, herdsman, and dairy farm equipment; adhering to the strict schedule of prophylactic measures, such as regular and timely year-round vaccination of dairy cows and calves; and providing competent and early veterinary coverage in cases of a disease outbreak (Sibley, 2006). This study looks at how livestock farming is doing in Punjab, Pakistan, especially in Muzaffargarh and Rahim Yar Khan districts. It also checks how common diseases are among the animals raised by farmers there.

MATERIALS AND METHODS

Study Area

Punjab is home to a significant livestock population, with a total of 70.367 million animals, of which 29.07 million (39.4%) are cattle and buffalo. The districts of Muzaffargarh and Bahawalpur boast the highest numbers of cattle, while Okara and Faisalabad lead in buffalo population. However, Rahim Yar Khan and Muzaffargarh stand out with the highest cumulative numbers of buffaloes and cows. Consequently, these two districts were selected as the study area. Muzaffargarh district hosts the highest total number of livestock, with 5,346,080 animals, including 1,272,637 cattle and 665,822 buffalo. Following closely, Rahim Yar Khan district houses 3,776,314 livestock, comprising 760,084 cattle and 691,022 buffalo.

Population

The population under study encompasses all livestock farmers rearing cattle and buffalo in Muzaffargarh and Rahim Yar Khan districts. Cattle and buffalo were chosen due to their prominent role in the livestock sector, and also for feasibility reasons, considering the vastness of other livestock categories.

Sampling Procedure

A multistage sampling technique was employed. Initially, two districts were selected: Muzaffargarh and Rahim Yar Khan, both having four tehsils each. Subsequently, two tehsils were randomly chosen from each district: Liaquatpur and Sadiq Abad from Rahim Yar Khan, and Alipur and Kot Addu from Muzaffargarh. Further, five rural union councils were randomly selected from each tehsil, totaling 20 union councils. Forty villages (two from each union council) were then chosen for sampling, with the assistance of local leaders and progressive farmers, resulting in a list of 3808 livestock farmers. From this list, 400 farmers were randomly selected for the final sample.

Data Collection

Due to resource constraints, data collection was conducted through a team of five Ph.D. students from the Institute of Agricultural Extension, Education and Rural Development, University of Agriculture Faisalabad. The team was trained for three days in research instruments and data collection procedures, ensuring data reliability. Mock interviews were conducted under the supervision of the researcher's supervisory committee to maintain data quality.

Cronbach's Alpha

Cronbach's Alpha, measuring internal consistency, was computed using SPSS, yielding an average value of 0.751.

Data Analysis

Data analysis was performed using the Statistical Package for Social Sciences (SPSS).

RESULTS

Distribution of Livestock Farmers according to their Demographics

The demographic composition of livestock farming communities plays a pivotal role in shaping agricultural practices and resource allocation. In this study, we present a comprehensive analysis of age distribution, family size, and landholding among livestock farmers.

Table 1. Demographic attributes of the respondents.

Demographic	Category	Frequencies (percentages)
Age	Young (<30 years)	68 (17.0%)
	Middle (≥ 30 to ≤ 50 years)	159 (39.8%)
	Old (>50 years)	173 (43.3%)
Family size	<5 members	114 (28.5%)
	5-10 members	215 (53.8%)
	>10 members	71 (17.7%)
Land holding (acres)	Land less farmers	52 (13.0%)
	Small farmers (<12.5 acres)	260 (65.0%)
	Medium farmers (12.5-25 acres)	71 (17.8%)
	Large farmers (>25 acres)	17 (4.3%)
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The data, summarized in Table 1, provides insights into the socio-economic characteristics of farmers engaged in livestock rearing activities. Our findings reveal a diverse age distribution, with a notable prevalence of older individuals, constituting 43.3% of the sample. A significantly dominating category of farmers who are in the middle age group (39.8%) are followed closely by young farmers (below 30 years of age) which constitute 17.0% of the total farmer population. Moreover, we analyze family size patterns and discover that most farmers include 5 to 10 family members (53.8%), second in rank are those whose family is less than 5 members (28.5%), and fewer are found whose family is more than 10 members (17.7%). Families in livestock farming often touch all areas of the enterprise, with everyone sharing duties regarding herd management. In contrast, Ashfaq et al. (2014) reported a similar rate of 9.08 family members per household.

Besides, landholding patterns are examined, while the dominance of small-scale farmers (65.0%) is underlined, followed by medium-sized farmers (17.8%), and a minority number of large-scale farmers (4.3%). This is in line with research by Ashfaq et al. (2014) and Saghir (2015) which has shown the major role that smallholder producers have in the livestock sector.

Livestock Diseases

Farmers often encounter several problems that not only decrease the income of the farmers but also there are certain hindrances such as animal infectious diseases, length of the disease, nutrition and vaccination costs (Benkirane and Alwis, 2002). Farmers were requested to point out the diseases identified among their livestock as well as indicate if these diseases affect their livestock or not. If yes, then they were asked to rate it based (from one to five as one is very low and five is very high) on how much it affects their buffaloes and cows. Data regarding types of diseases for the livestock of the sampled livestock farmers in the study area were gathered and analyzed is given in Table 2.

Information displayed in Table 2 demonstrates that FMD and hemorrhagic septicemia were the most common diseases with mean values of 3.30 and 3.22 respectively. Both these diseases appeared between "Moderate" to "High" on Likert scale. Their means were closer to the "Moderate" column.

Milk fever was ranked 3rd in the list of diseases as recognized by the livestock farmers of the study area with a mean value of 2.56 having a SD of 1.331 and its score of weighted was 379. The low-value of the weighted score indicates there were only a few people who actually know about milk fever disease. Mastitis was ranked 4th, Impaction was ranked 5th and Retained placenta was ranked 6th by the farmers with mean values of 2.50, 2.45 and 2.44 respectively. Milk fever, Mastitis, Impaction and Retained placenta have very balanced mean values between "Lows" to "Moderate". In Pakistan, five economically endemic diseases i.e. HS, FMD, Rinder Pest, Anthrax, and Black Leg were responsible for 58.7% of cattle mortality in 2012 (Moustafa et al., 2017).

Table 2. Distribution of livestock farmers according to the types of diseases for the livestock.

Disease types	Recognize		Central tendency		W.S.	R.O. based on \bar{x}
	<i>f</i>	%	\bar{x}	SD		
Foot and mouth disease (FMD)	359	89.7	3.30	1.482	1183	1
Anthrax	297	74.2	2.09	1.111	622	10
Black quarter	144	36.0	2.20	1.001	317	8
Diarrhea	325	81.2	2.28	1.090	740	7
Hemorrhagic septicemia	375	93.7	3.22	1.125	1206	2
Impaction	355	88.7	2.45	1.262	868	5
Ketosis	271	69.2	2.17	1.191	589	9
Mastitis	345	86.2	2.50	1.341	862	4
Milk fever	148	37.0	2.56	1.331	379	3
Retained placenta	370	92.5	2.44	1.011	904	6
Tuberculosis	84	21.0	1.95	.863	164	11
Tympany	380	95.0	1.93	.939	732	12
Pneumonia	305	76.5	1.92	.946	586	13
Another (specify)	234	58.5	1.82	.953	427	14
Retention of Placenta	278	69.5	1.63	.865	452	15
Metritis	117	29.2	1.60	.696	187	16

Scale 1= Very Low, 2= Low, 3= Moderate 4= High, 5= Very High

Diarrhea, black quarter, Ketosis and Anthrax were ranked 7th 8th, 9th and 10th computing mean values 2.28, 2.20, 2.17 and 2.09 respectively. Diarrhea, black quarter, ketosis and anthrax were also spotted between “Low” to “Moderate” level on the Likert scale, but in reality, their mean values were close to the “Low” column.

Tuberculosis, tympany, pneumonia and some other diseases were ranked 11th, 12th, 13th and 14th with nearly the same mean values. Their means were 1.95, 1.93, 1.92 and 1.83 correspondingly and these were scanned between “Very Low” to “Low” on Likert scale. Retention of Placenta was ranked 15th in the list with the mean value of 1.63 having a SD of 0.865 and its score of weighted was 452. Metritis was ranked 16th in the list of diseases as recognized by the livestock farmers of the study area with a mean value of 1.60 having SD 0.696 and its weighted score was 187. Results were in line with those of Idrees et al. (2007) who concluded that FMD, Hemorrhagic Septicemia, Mastitis and Milk fever as the most recognized disease of the herds in Peshawar districts of NWFP.

Thys et al. (2005) reported that the first restriction on animals was animal health, including drug delivery and treatments. For dairy cattle, Sidibe et al. (2004) reported that mastitis, trypanosomiasis, foot and mouth disease, pasteurellosis and small ruminant pests are the most common diseases in ruminants. Results were in line with the study of Ashfaq et al. (2014); they studied the effect of livestock disease on production in district Faisalabad. They discussed that FMD, and mastitis were the most common disease in cows and buffalo.

Internal and External Parasitic

Financial misfortunes because of worm infestation for example, tapeworms, roundworms, ticks and lice are high in Pakistan, though the actual figure is missing. The effects of ticks and tick-borne diseases on the global livestock industry are of great concern (Piper et al., 2009). Nigerian agricultural owners have suffered a significant loss in income and production due to tick-borne illnesses and pest infestations. Tick bites can result in serious consequences such as anemia, weight loss, decreased milk supply, body condition loss, injury to the udder and teat, and even death (Biegelmeyer et al., 2015). The study classified many forms of external and internal parasites, including warble flies, lice, roundworms, tap worms, mites, lungworms, ticks and liver flukes. Data regarding internal and external parasitic of the sampled livestock the study area were gathered and analyzed) is given in Table 3.

Just like internal diseases, external parasites damage animal husbandry extensively. Data in Table 3 shows that ticks were the main external damaging parasite in livestock with a mean value of 3.19 having SD 1.396 and 1233 weighted score followed by any other (farmers themselves don't know about the name of these parasites) with the mean value of 2.09 having standard deviation 0.83 and weighted score 123. Ticks mean was found between “Moderate” to “High” and any other means was found between “Low” to “High” on the Likert scale.

Table 3. Farmers' livestock distribution based on internal and external parasites.

Internal and external parasites	Recognize		Central tendency		W.S.	R.O. based on \bar{x}
	<i>f</i>	%	\bar{x}	SD		
Ticks	387	96.8	3.19	1.396	1233	1
Unknown	11	97.3	2.09	.831	23	2
Lung worms	222	55.5	1.90	.932	422	3
Tap worms	113	28.2	1.86	.822	210	4
Round worms	200	50.0	1.85	.981	370	5
Lice	163	40.8	1.68	.709	274	6
Mites	286	71.5	1.65	.853	471	7
Liver flukes	284	71.0	1.62	.701	459	8
Warble fly	162	40.5	1.60	.663	260	9

Scale 1= Very Low, 2= Low, 3= Moderate 4= High, 5= Very High

Lungworms, tapeworms and roundworms were ranked 3rd, 4th and 5th with minor differences in means. They have 1.90, 1.86 and 1.85 mean values and 422, 210 and 370 weighted score values respectively. All these were marked between "Very low" to "Low" on Likert scale of the table but in reality, these were approaching to "Low" rank column. Lice worms were ranked 6th in the internal and external parasitic lists with a mean value of 1.68 having standard deviation 0.709 and a weighted score of 274. Mites were ranked 7th, liver flukes were ranked 8th and warble fly were ranked 9th by the farmers with means of 1.65, 1.62 and 1.60 respectively. All these were marked between "Very low" to "Low" on Likert scale of the table.

Results were in line with those of Ghosh et al. (2007), they discussed that in external parasites, ticks were the most commonly known and create a big problem for the herd. Ticks and tick-borne diseases affect 80% of the world's cattle population and are common worldwide, particularly in tropical and subtropical countries such as Pakistan, India and Bangladesh. Shyma et al. (2015) also reported the same trend that more than 80% of the world's cattle population is affected by ticks and tick-borne diseases. Results were also in line with those of Nielsen (2012), they discussed that in internal parasite lungworms were not considered by the organic beef producer.

CONCLUSION

The research is crucial for the understanding of the socioeconomic arena and the health of the livestock farmers in the Punjab province, give the instance of Muzaffargarh and Rahim Yar Khan Districts. Demographic analysis shows that the majority of farmers belong to the middle age and elderly group and have small-to-medium sized properties, thus warranting the need for focus on the issues these groups encounter. Along this line, foot and mouth disease and hemorrhagic septicemia are highlighted as the most recognized diseases by the farmers illustrating the void in terms of disease management and veterinary services in the locality.

RECOMMENDATIONS

Based on the findings of this study, several recommendations are proposed to enhance sustainable livestock farming practices in Punjab, Pakistan:

1. Strengthen veterinary services: The urgency for enhancing veterinary services in the study area, especially in the sectors of disease surveillance, prevention, and treatment, is crucial. It is increasing the accessibility of the qualified veterinarians, diagnostic facilities, and vaccines which ultimately assist to prevent diseases like the foot and mouth disease and the hemorrhagic septicemia.
2. Promote disease prevention measures: Effort should be made to raise the level of public awareness among livestock farmers about the significance of preventive measures of diseases like vaccinations, biosecurity practices and hygiene. Training and extension services should be brought in to educate farmers about the latest technology and how to implement disease prevention and control measures.
3. Enhance access to quality fodder: Feed management, play a vital role in the maintenance of the health and productivity of livestock. Hence, the policy is aimed at enhancing the availability of highly nutritious feeds and supplements for producers in the study region. This could encompass some of these options such as promoting sustainable feed production methods, providing feed input subsidies, and also making access to credit for feed fodder easy.

4. Support small-scale farmers: Considering that independent farmers are dominant in livestock production, special support programs, that take into account their concerns and challenges, should be designed. Such services could include the provision of financial aid, technical training, and access to markets and marketing infrastructure in order to augment the revenue of small-scale livestock industry.

COMPETING OF INTEREST

The authors declare no competing interests.

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