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An Investigation into the Role of Livestock Extension Services in Influencing Dairy Farming in District Mardan, Khyber Pakhtunkhwa

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Abstract

Pakistan is an agricultural country and about three quarters of its total population is engaged in this sector, due to inappropriate extension services and poor management practices by farmers little has been achieved so far. This study was carried out in District Mardan of Khyber Pakhtunkhwa in 2025, with the objectives to examine the socio-economic characteristics of dairy farmers, to identify the main problems faced by them. The research was carried out by selecting 5 villages purposively from district Mardan namely Shergarh, Toru, Baghdada, Katlang, and Rustam using multi stage cluster sampling technique. The total number of sampling respondents were 105. Result showed that majority of the respondents (72%) were middle age and (88.6%) were literate, (63.8%) work for full time in their farms, majority of farmers have cows and buffaloes as dairy animals, while some have sheeps and goats. Majority of milk production of dairy animals range between 11 to 50L and they sale their product in wholesale. About 90% farmers were aware of extension services but half of them did not interact with them and those who interact with farmers are only when they need some help. The farmers were not satisfied from the livestock extension services. They used social media for getting information about dairy farming because there is no other source or training program which give any information about the dairy farming. The dairy farmers faced many challenges in dairy farming and accessing the livestock extension officers. The visits by livestock extension officers were not regular. The study recommends that livestock extension agents may increase visits, restore farmers' confidence and start some programs on media. Besides this the concerned department should provide interest free loans, skills and information regarding credits and vaccinations and medication.

Introduction

As the largest sector of the national economy accounting for 24% of the GDP, agriculture contributes to a significant part in Pakistan's economy. Nearly 75% of Pakistan's population depends, directly or indirectly, on this sector for their livelihood. Agriculture also employs 37% of the country's workforce and provides essential inputs for exports and agro-industries (GoP, 2023). The agricultural sector is thus a cornerstone for national development. The average yield per hectare remains much lower than in other countries, despite government effort to boost agricultural productivity. This is primarily attributed to poor farm management and a lack of knowledge among farmers about modern agricultural technologies. Addressing these issues through non-formal education and extension services is crucial (Rehman *et al.*, 2022). Mardan District, located in Khyber Pakhtunkhwa, has vast potential for dairy farming and livestock rearing due to its favourable geography and agrarian economy. However, the productivity of dairy animals in Mardan remains far below global standards. Poor farm management, lack of quality fodder, and inadequate access to veterinary and extension services are key limiting factors. Addressing these issues through enhanced livestock extension services can significantly improve productivity and income (Ahmad *et al.*, 2023). The milk production in Mardan increased by 3.2% and meat

production by 4.5% during the 2019-2020 period compared to the previous year (GoP, 2023). Despite these gains, Mardan continues to lag in realizing its full agricultural potential. Pakistan, ranked second globally in buffalo milk and meat production, and among the top producers of wheat, sugarcane, and rice, struggles with a significant proportion of its population being undernourished (Bashir *et al.*, 2020). Livestock in Mardan contributes not only to food production but also generates substantial foreign exchange earnings between PKR 580 Million to PKR 1.74 Billion annually. Additionally, it supplies valuable secondary products such as wool, hides, bones, and manure. This sector also supports rural transportation and farm labour. Livestock micro-enterprises are a sustainable source of income for underprivileged communities, especially landless farmers who view livestock as a profitable investment. For instance, a single buffalo can provide a family with milk and additional calves, yielding positive economic returns over its lactating life of approximately nine years (Waheed, 2023). Despite significant research on Pakistan's crop sector, there is a surprising lack of specific economic analysis of the dairy economy. This gap in research limits the understanding of the dairy sector's potential impact on rural economies. Improved practices in livestock farming, such as better breed management and access to quality fodder, remain underutilized, hindering productivity growth (Burki *et al.*, 2024). One program, recently developed in Pakistan, is the Whole Family Extension Approach (WFEA), which is a farmer-engagement program providing training to the men, women and children of the farming household about the whole dairy-farming system. Providing information to all family members stimulates informal discussion among family members over meals and during non-working hours. Research has shown that success can be achieved when implementing the WFEA, including on-farm practice change, leading to overall productivity increases of up to 25-30% on smallholder dairy farms (Warriach *et al*., 2024). Cattle farming extension could accelerate innovative use of technology to increase the income of farmers and standard of living. The increase in several competent personnel will affect the efficient use of natural and farmers' human resources (Khan *et al.*, 2018).

Objectives of the study are

- To assess the role of livestock extension services in improving the production of farmers in the area of study.
- To examine the socioeconomic characteristics of dairy farmers in the area of study.
- To identify the constraints faced by farmers in dairy farming in the study area.
- To formulate the recommendations for future policy implications.

Materials and Methods

The study was conducted in District Mardan, Khyber Pakhtunkhwa focusing on how livestock extension services influence dairy farming. The target population included dairy farmers in Mardan. Five Union Councils—Baghdada, Katlang, Toru, Rustam, and Shergarh were randomly chosen. One village was randomly chosen from each Union Council, resulting in five villages: Baghdada, Katlang, Toru, Rustam, and Shergarh. A list of registered dairy farmers was obtained from the Livestock and Dairy Development Department and 40% of registered dairy farmers were randomly selected from each village. Both primary and secondary data were used in this study. Due to financial and time limitations, a census was not feasible, so a representative sample was selected. Primary data were gathered through an interview schedule tailored to the research objectives and pre-tested on 10 respondents (2 from each village) to ensure reliability and to improve interview schedule. Multi-stage sampling was applied, and only male farmers were interviewed, following the region's cultural norms. Interviews were conducted at the respondents' farms, and Secondary data were collected from published and unpublished materials. After collecting data, the data were tabulated and analyzed in the Statistical Package for Social Sciences (SPSS) software.

Results and Discussions

Demographic characteristics of respondents are presented in Table 1. Young people may more quickly absorb innovations, which are more relevant to any activity, especially in understanding

and communication (Khan *et al.*, 2022). Age was classified into four categories. These include i) younger than 30 years ii) 31 to 40 and iii) 41 to 50 as they count as middle age and iv) above 51. Table 1 indicates that majority i.e. 73% respondents belonged to 31 to 50 age group which is middle age group. Same result was identified by Akram and Khan (2012), 60% of the responders were between the ages of 26 and 45.

Table 1: Demographic characteristics of sample respondents

Age (in years)	Frequency	Percentage
Up to 30	21	20
31 to 40	49	47
41 to 50	27	26
51 and above	8	8
Education		
Illiterate	13	12
Primary	2	1.9
Middle	12	11.4
Matric	37	35.2
Intermediate	25	23.8
Graduate	16	15.2
Farming involvement of farmers		
Part time	38	36.2
Full time	67	63.8
Farm size		
Up to 10 Marla	12	11.4
10.1- 20 Marla	32	30.5
20.1-60 Marla	27	25.7
60.1 and above	34	32.4
Number of cows		
No cows	15	14.3
1 to 10	74	70.5
11 to 20	9	8.6
21 to 50	6	5.7
51 and above	1	1
Number of buffalos		
No buffalo	39	37.1
1 to 10	41	39
11 to 20	20	19
21 to 50	4	3.8
51 and above	1	1
Farming experience		
1 to 5 years	11	10
6 to 10 years	20	19
More than 10 years	74	71
Awareness about livestock extension services		
Yes	95	90.5
No	10	9.5

Source: Field survey, 2025

Literate peoples are typically seen to be more suited to any challenge. Adoption of agricultural technologies is associated with education (Darko, 2014). Majority of respondents 98% were literate while 12% were illiterate. This study differs from the study of Ishaq *et al.*, 2016. In which majority of farmers were illiterate. Peoples who do not have any other source of income they get their income only through dairy farming. They are divided in two parts full time and part time respondents work in the dairy farm. Farm size refers to the amount of land used for farming

activities (Sanaullah *et al.,* 2020). 63.8% farmers involve for full time in dairy farming. Majority i.e. 36.2% farmers have dairy farm with land of 60.1 Marla and above It was also found that majority of animal's owners lack own dairy farming area. They have set up farms on other people's property and bought a lot of animals. Through data collection from dairy farmers during the research majority of respondents have cows and buffalos for dairy farming. Table 1 also indicates that majority of sample respondents in district Mardan were keeping cows and buffaloes as dairy animals. Our study differs from the study of Khan *et al*., 2018, they reported that dairy farmers were rearing the buffalo and various cattle breeds and population of animals ranged from 35 to 600 in every dairy farm. Farming experience is positively correlated with problem identification and farm management (Idrees *et al.,* 2024). Data regarding farming experience is also given in Table1, show that 71% farmers were having farming experience of more than 10 years. There is no doubt about the importance of agriculture extension services to the development of the global agriculture industry. Without efficient extension services, no nation can make any real strides in the agricultural sector (Mapiye *et al.,* 2021). Table 1 also shows the data regarding farmers' awareness about livestock extension services. The findings indicated that the majority of respondents i.e. 90.5% were aware about livestock extension services, while only 9.5% respondents did not know about livestock extension services of their area.

Milk Production of Dairy Farmers

The farmers who do not have any other source of income they only depend on the dairy product which they market and get income from it. Dairy is a prominent subsector of agriculture in Pakistan (Khan et al., 2022). The market price of the milk is from 180 to 200 RS while in their area or neighbourhood they sold the milk on 150 to 180 RS.

Table 2. Milk production and price

Average daily milk production (litre)	**Frequency**	**Percentage**
Less than 10 L	4	4
11 L to 50 L	56	53
50 L to 100 L	27	26
101 L and above	18	18
Milk price per litre		
150 to 180Rs	45	43
181 to 200Rs	60	57

Source: Field survey, 2025

Table 2 shows Milk production of dairy animals and price of its marketing. Majority i.e. 53% dairy farmers has milk production of 11 to 50 litre. 43% respondents sold their milk on the price of 150 to 180 RS while 57% of respondent's report that they sold their product from 181 to 200 RS.

Livestock extension visits to the farmers

Livestock extension visits help farmers to improve livestock productivity and health by sharing knowledge with the dairy farmers about dairy farming. Samiullah *et al*., (2021) stated that extension visits to nearby farmers are essential for enhancing their technical proficiency as they exchange experiences. Table 3 shows data regarding livestock extension staff visits to dairy farmers that only 36.2% of the respondents reported visits of livestock extension staff to their farms. Majority i.e. 63.8% respondents were deprived of the visits. It is clear from data given in table 1 that 90.5% of respondents were aware of livestock extension services but only 36.2% of them were benefited/ visited by livestock extension staff showing poor performance by livestock extension department.

Table 3: Distribution of sample respondents on the basis of livestock extension visits to farmers

Villages	Do extension staff visit your farm			If no why		
	Yes	No	Total	Lack of ext. staff	Visit big landlords	Lack of knowledge
Baghdada	5 (27.8%)	13 (72.2%)	18	9	13	11
Katlang	10 (47.6%)	11 (52.4%)	21	8	11	10
Rustam	8 (30.8%)	18 (69.2%)	26	6	16	16
Shergarh	9 (42.8%)	12 (57.2%)	21	7	10	10
Toru	6 (31.6%)	13 (68.4%)	19	2	12	13
Total	38 (36.2%)	67 (63.8%)	105	32	62	60

Source: Field survey, 2025

Table 4: Distribution of sample respondents on the basis of how is frequency of interaction with livestock extension officers

Village	Frequency of interaction			Total
	Never	Monthly	Occasionally	
Baghdada	9 (50.0%)	1 (5.5%)	8 (44.4%)	18
Katlang	8 (38.1%)	0 (0.0%)	13 (61.9%)	21
Rustam	13 (50.0%)	1 (3.84%)	12 (46.2%)	26
Shergarh	7 (33.3%)	0 (0.0%)	14 (66.7%)	21
Toru	11 (57.9%)	1 (5.26%)	7 (36.8%)	19
Total	48 (45.7%)	3 (2.8%)	54 (51.4%)	105

Source: Field survey, 2025

Frequency of farmers interact with livestock extension officers

The frequency of farmer interaction with livestock extension officer varies. Some farmers interact with the livestock officers monthly and some visits them occasionally. Idrees *et al*., (2024) show that the livestock extension officers visit the farms. The farmers visit extension offices for their problems and took help of the livestock officers. Table 4 shows the data regarding frequency of farmer's interaction with livestock extension officers out of the total 105 respondents 45.7% reported that they never interacted with the livestock extension officers, while 51.4 % reported that they had interaction with the livestock officers but only when there is need so they take help of them occasionally. Only 2.8% of the respondents reported monthly interaction. It is clear from the results that there are no proper monthly or weekly visits in the area.

Breeding practices

Breeding practices are methods used to select and evaluate desirable traits in animals and plants. The goal is to improve the genetic makeup of a population and produce offspring with those desired traits (Kumar *et al*., 2014).

Table 5: Distribution of the respondents on the basis of breeding practices

Villages	Breeding practice				Total
	Artificial insemination		Natural		
	Livestock department	Private	Own	Fellow farmers	
Baghdada	2	16	3	4	25
Katlang	0	19	4	2	25
Rustam	0	26	2	0	28
Shergarh	1	20	2	5	28
Toru	0	18	2	3	23
Total	3	99	13	14	129

Source: Field survey, 2025

Note: The total may not tally due to multiple answers by respondents

Table 5 shows data regarding breeding practices of the respondents, 102 respondents were using artificial insemination for breeding practice, in which 3 respondents consulted livestock department, while 99 respondents consulted private clinic only 27 respondents reported breeding practice naturally in their animals in which 13 respondents used their own animals, while 14 respondents took help from fellow farmers. It differs from study of khan *et al*., (2018) in his study AI technique was adopted by only 24 % respondents as breeding method at dairy farm, remaining 76 % dairy farmers use natural method for buffalos.

Vaccination of dairy animals

Vaccination of dairy animals helps protect them from disease by stimulating their immune system to produce antibodies. This can reduce the likelihood and severity of disease (Hassan *et al*., 2024). Vaccination to animals are necessary once in the year.

Table 6: Distribution of sample respondents on the basis of vaccination of dairy animals

Villages	Vaccination		Total
	Livestock department	Private clinic	
Baghdada	3	17	20
Katlang	3	21	24
Rustam	1	26	27
Shergarh	7	19	26
Toru	0	19	19
Total	14	102	116

Source: Field survey, 2025
Note: The total may not tally due to multiple answers by respondents

Table 6 shows data of respondents about vaccination, it is clear that 14 respondents used vaccine by livestock department, while 102 farmers consulted private clinic for vaccination of animals. The results show that the majority of the sample respondents' preferred private clinic instead of livestock department.

Table 7: Distribution of sample respondents on the basis of improvement due to livestock extension services

Villages	Area in dairy farming show improvement							Total
	No improvement	Milk yield and quality	Animal health and diseases	Feeding and nutrition practices	Breeding and reproduction	Farm profitability	Sustainability and environmental management	
Baghdada	10	1	9	2	1	2	1	26
Katlang	7	1	13	1	2	2	1	27
Rustam	14	0	14	1	1	1	0	28
Shergarh	7	0	15	3	2	2	2	31
Toru	12	1	7	2	1	2	1	26
Total	50	3	58	9	7	9	5	141

Source: Field survey, 2025
Note: The total may not tally due to multiple answers by respondents

Table 7 shows that 50 respondents reported no improvement due to livestock extension services, whereas only 3 respondents reported that the improvement had been shown in the milk yield and quality, 58 respondents responded that improvement had been shown in animal health and diseases, 9 respondents reported about feeding and nutrition practices, 7 reported about breeding and reproduction. Improvement regarding farm profitability was reported by 9 respondents, 5 respondents reported that sustainability and environmental management was improved due to livestock extension services.

Table 8: Distribution of sample respondents on the basis of getting information regarding dairy products

Village	Get information about dairy farming					Total
	Livestock and dairy development	Social media	TV	Land lords	Fellow farmers	
Baghdada	3	11	0	2	11	27
Katlang	10	12	0	4	16	42
Rustam	10	21	0	4	17	52
Shergarh	5	20	1	1	6	33
Toru	4	9	0	3	9	25
Total	32	73	1	14	59	179

Source: Field survey, 2025
Note: The total may not tally due to multiple answers by respondents

Table 8 shows the data collected from farmers about sources of getting information from dairy farmers, 32 Respondents stated that the department of livestock and dairy development provided them with the information, 73 respondent get information through social media, 1 respondent got through TV, 14 respondents reported that they got information from landlords, while 59 farmers got information about dairy farming from fellow farmers or their friends. It is concluded from the results that majority of the respondents got information from other sources only 30.5% respondents got information from livestock and dairy department, showing poor role of livestock department in the study area.

Challenges faced in accessing extension workers

Table 9 show challenges faced by dairy farmers in accessing the livestock extension department, 26 respondents reported that the lack of extension agents in the area as a problem, 63 respondents reported about high cost of services, 11 responded about poor communication skills, 42 farmers responded about limited resources and training materials, 69 respondents reported inadequate follow up and support, 8 respondents mentioned language and cultural barriers, while 9 respondents reported about geographical barriers as a challenge.

Table 9: Distribution of sample respondents on the basis of challenges faced in accessing extension services

Villages	Challenges faced in accessing extension services							Total
	Lack of extension officers	High cost of services	Poor communication	Limited resources or materials	Inadequate follow up and support	Language or cultural barriers	Geographical barriers	
Baghdada	4	10	1	5	10	1	1	32
Katlang	6	16	4	7	18	4	4	59
Rustam	10	18	3	12	15	2	2	52
Shergarh	4	7	2	4	15	0	1	33
Toru	2	12	1	14	11	1	1	42
Total	26	63	11	42	69	8	9	228

Source: Field survey, 2025
Note: The total may not tally due to multiple answers by respondents

Table 10: Association between livestock extension visits with milk production

Livestock officers visits	Milk production (L)				Total
	Less than 10	11 to 50	51 to 100	101 and above	
No	1 (33.3%)	44 (77.2)	14(51.9%)	8 (44.4%)	67 (63.8%)
Yes	2 (66.7%)	13(22.8%)	13(48.1%)	10(55.6%)	38(36.2%)
Total	3	57	27	18	105
x^2 =10.223				**P value 0.017***	

Source: Calculated by author *indicates significance level of 10 % probability

Table 10 shows that there was significance association (P<0.01) between milk production with extension visits in study area. The above data delves into how extension visits relates to milk yield. There is significance association between livestock visits and milk yield. It is clear from the result that livestock extension visits affect milk production. Those dairy farmers who were visited by livestock extension staff had high milk production.

Table 11: Association between livestock extension visits with education of respondents

Education of respondents	Livestock officers visit of dairy farmers		Total
	No	Yes	
Illiterate	8(11.9%)	5 (13.2%)	13 (12.4%)
Literate	59 (88.1%)	33 (86.8%)	92 (87.6%)
Total	67 (100.0%)	38 (100.0%)	105 (100.0%)
x^2 =1.000			**P value 0.54***

Source: Calculated by author

Table 4.11 shows that there was no significance association (P>0.01) between education and livestock officers visits in the study area. The above data delves into how extension visits relate to education. There is no significance association between livestock officers' visits and education of dairy farmers

Conclusions

It is concluded from the result of the study that majority of dairy farmers were middle aged, literate, and having farming experience for having more than 10 years. Majority of dairy farmers owned /kept cows and buffalos in the study area, the number of goats and sheeps on the farms were negligible. Milk production of majority (60%) of dairy farmers were up to 50 Litres. It is also concluded that majority of the farmers were aware of livestock extension services but deprived of these services. The overall role of livestock extension services is not satisfactory. Majority of dairy farmers in the study area used private artificial insemination for breeding, only three respondents respond artificial insemination done through livestock department. It is also concluded from the result that all the respondent vaccinated their dairy animals but majority preferred private clinic instead of livestock extension department. Majority of the respondents got information from other sources, only 30.5% of the respondents got information from livestock extension department, showing poor role of livestock extension department in the study area. Challenges faced by dairy farmers in the study area were lack of livestock extension staff, high cost of services, poor communication, limited resources, lack of training, inadequate follow up and support from livestock extension department. The respondents also mentioned lack of medication, hospital, vaccination and credit facilities in the study area.

Recommendations

Based on the findings of the study, it is recommended that

- Livestock Dairy Development (LDD) may launch vaccination programs in the area and to regular vaccination of the dairy animals from disease.
- Livestock Dairy Development may implement education about dairy animals and dairy products and empowering them to utilize extension services effectively.
- Utilize the strong farmer to farmers' knowledge sharing practices to facilitate the dissemination of best practices in dairy production.
- Livestock Dairy Development may prioritize training on production of dairy products their marketing strategies and advance dairy product techniques to address lower satisfaction level in these areas.
- Livestock Dairy Development should disseminate new technology to the farmers about feeding, health practices and testing of diseases.

- Livestock Dairy Development should solve the challenges i-e lack of livestock extension staff, high cost of services, poor communication, limited resources, lack of training, inadequate follow up and support from livestock extension department and provide medication, hospital, vaccination and credit facilities to dairy farmers.

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