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Assessing the Impact of COVID-19 Lockdown on Dairy Businesses in District Dir Lower, Pakistan

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ABSTRACT
This study assesses the impact of COVID-19 lockdown on dairy businesses in District Dir Lower, Pakistan. Convenience sampling technique was used to select District Dir Lower, followed by the selection of two tehsils —Balambat and Timergara— due to ease of accessibility. Using purposive sampling, a total of 30 milk collectors were identified across the chosen tehsils. Primary data were gathered through a semi-structured questionnaire from literate respondents, while personal interviews were conducted for data collection from illiterate respondents. Descriptive statistics tools, frequencies and percentages were used to summarize the data. For data analysis, binary logistic regression was used to assess the impact of COVID-19 on dairy businesses. The results indicate that COVID-19 lockdown had a significantly significant impact on dairy businesses in District Dir. The study recommends that the government and local authorities should develop improved cold-chain infrastructure to stabilize milk supply and minimize losses faced by dairy farmers. Additionally, the

Volume 5 Issue No 1 (2026)
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concerned authorities should provide financial assistance to the most vulnerable families during crises like COVID-19.

Keywords: COVID-19, Lockdown Impact, Dairy Businesses, Binary Logistic Regression, Dir Lower

INTRODUCTION

The novel coronavirus disease, also known as severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) and coronavirus disease 2019 (COVID-19), is a developing worldwide health issue. COVID-19 was first diagnosed in December 2019 in the city of Wuhan, China, and quickly spread to other countries around the world (Ahmad & Jan, 2023). Due to its rapid spread and extensive influence on almost every aspect of life, the World Health Organization (WHO) declared the disease as a pandemic on March 11, 2020 (Alam et al., 2022). Pakistan confirmed its first COVID-19 case on February 26, 2020, in Karachi, Sindh province, followed by another case reported the same day in Islamabad, the federal capital (Waris et al., 2020). By April, 23, 2020, the number of COVID-19 confirmed case rose to 10,000. As of May 31, 2020, the COVID-19 confirmed cases reached to 64,496 in the country (Jawad et al., 2020). As of June 17, 2020, every district in the country recorded at least one confirmed COVID-19 case. By June 22, 2022, the country had reported a total of 1.532 million cases, including 30,385 fatalities, 1.495 million recoveries, and 7,133 active cases (Ahmad & Ahmad, 2025). To stop the transmission of viruses, measures such as lockdowns, movement restrictions, and maintaining social distancing were imposed by governments worldwide. These measures interrupted the economies of almost all countries globally, resulting in uncertainty in almost all sectors, including the livestock sector in Pakistan (Ahmad et al., 2025). The livestock sector is an important sub-sector of Pakistan's agriculture, accounting for approximately 64% of the value added in agriculture. It contributes about 15% to the country's Gross Domestic Product (GDP) and 2.9% to exports (Ali, 2025). Livestock plays a crucial role for the rural population in Pakistan, with about 30-35 million people engaged in the livestock sector for their survival, deriving around 30-35% of their income from livestock productivity, including dairy products (Ahmad et al., 2025). Pakistan is the 4th largest milk-producing country in the world. About 80% of the milk is produced on a small scale in rural regions, 15% in peri-urban areas, and the remaining 5% in urban regions of the country. The major sources of milk production are buffaloes, cows, goats, and sheep. In 2018-19, buffaloes contributed 60%, cows 36%, and almost 4% by goats and sheep, with camels also contributing to the total milk production (Sattar, 2020). However, the growth of dairy industry has been hit hard by COVID-19 all over the globe, including Pakistan.

In the study by Hussain et al. (2020) the impact of COVID-19 was examined on dairy farming. It was found that both animal health and animal products, which are the backbone of the dairy sector, were greatly affected by the COVID-19 due to feed shortages and drug unavailability. Similarly, Popat et al (2020) reported continuous decrease in the daily demand of milk in the market. Due to unprecedented lockdowns,

Volume 5 Issue No 1 (2026)
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Print ISSN: 3006-2039

the selling decreased and the farmers faced significant losses. Furthermore, Acosta et al. (2021) indicated that COVID-19 adversely impacted the global dairy sector and its production. Additionally, in the research of Rahman and Das (2021) they showed that COVID-19 affected thousands of farms in the different parts of Bangladesh. The marketing of dairy and dairy products collapsed and farmers experienced unprecedented losses. The findings by Das et al. (2021) noticed that dairy farmers experienced decreased milk productivity due to unprecedented lockdown restrictions. Vall et al (2021) found that measures to control the spread of virus adversely affected dairy farmers. Traffic restrictions affected small and informal milk collectors. Similarly, the findings by Alam et al. (2022) also presented that milk productivity decreased on the selected farms due to COVID-19 in the research area. Furthermore, Geol et al. (2023) reported that lockdowns during COVID-19 severely affected dairy farmers. Additionally, Das et al. (2025) highlighted that COVID-19 created unprecedented challenges for the dairy sector. It faced challenges due to the perishable nature of dairy products and disruptions in the supply chain caused by unprecedented lockdowns, resulting in reduced net returns from the dairy sector.

In District Dir Lower, the majority of the population lives in rural areas and depends on agriculture, including the livestock sector. Apart from other agricultural activities, people depend on livestock and the dairy sector. They rare animals including cattle, buffaloes, goats, and sheep and obtain products, including dairy products, for both self-consumption and commercial needs (Ahmad et al., 2025). The dairy sector is considered an important source of revenue generation in the district; however, this sector has been hit hard by COVID-19. To the best of our knowledge, there is no empirical study regarding the effects of COVID-19 on the dairy business in research area. The current study aims quantitatively covers the research gap and examine the effects of COVID-19 on the dairy businesses in the District Dir Lower.

MATERIALS AND METHODS

The current study was conducted in District Dir Lower, Pakistan. Convenience sampling was used to select District Dir Lower, followed by two tehsils - Balambat and Timergara due to easy accessibility. Purposive sampling was also used in the study to identify 30 milk collectors (middlemen) across different bazaars in the two tehsils Balambat and Timergara. Through these milk collectors, a total of 260 dairy farmers (households engaged in selling milk) were identified to represent the sample size, as shown in Table 1. A semi-structured questionnaire was used to collect data from literate household heads (respondents), while personal interviews were conducted for illiterate household heads. Data were collected from June 2021 to June 22 regarding relevant information about the dairy business and the effects of COVID-19 on the dairy business. Descriptive statistics was used, with frequencies and percentages calculated. Inferential statistics, such as binary logistic regression was used for empirical analysis as shown below.

$$\text{logit}\left(P(Y=1)\right) = \ln\left(\frac{P(Y=1)}{1-P(Y=1}\right) = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 D_1 + \beta_5 D_2$$

Volume 5 Issue No 1 (2026)
Online ISSN: 3006-2047
Print ISSN: 3006-2039

Where:
P(Y = 1) = Probability of dairy businesses affected by COVID-19
$\ln\left(\frac{P(Y=1)}{1-P(Y=1}\right)$ = log odds of dairy businesses affected by COVID-19
X_1= Farm size (Kanal)
X_2= Livestock holdings (No. of animals)
X_3= Dairy farming experience (Years)
D_1= Household mildly affected lockdown (0 = No, 1 = Yes)
D_2= Household highly affected lockdown (0 = No, 1 = Yes)
β_0 = Intercept of the model
β_1, β_2, β_3, β_4, β_5 = coefficients of independent variables

Table 1: Tehsil-Wise Distribution of Sample Size

Tehsil	Milk Collectors	Dairy Farmers
Balambat	15	125
Timergara	15	135
Total	30	260

Note. Source: Field Survey, 2022

RESULTS AND DISCUSSION

This section presents the socioeconomic characteristics of the sampled respondents and investigates the effects of COVID-19 lockdown on their dairy business. The details of the socioeconomic characteristics are discussed in Table 2.

Table 2: Distribution of Socioeconomic Characteristics of Respondents in the Study Area

Variables	Frequency	Percentage
Farm size		
Up to 5	120	46
6-10	94	36
Above 10	46	18
Total	260	100
Livestock holdings		
Up to 4	156	60
5-7	80	31
Above 7	24	9
Total	260	100
Dairy farming experience		
Up to 10	55	21
10-15	98	38
16-20	58	22
Above 20	49	19
Total	260	100
Household		

Volume 5 Issue No 1 (2026)
Online ISSN: 3006-2047
Print ISSN: 3006-2039

Not affected by lockdown	-	-
Mildly affected by lockdown	86	33
Highly affected by lockdown	174	67
Total	260	100

Note. Source: Field Survey, 2022

Table 2 indicates farm size, livestock holdings, dairy experience, and households not affected, mildly affected, and highly affected by the lockdown in the research area. According to the results, 120 respondents (46%) had farm sizes of up to 5 kanals, 94 respondents (36%) had land sizes from 6-10 kanals, and 46 respondents (18%) had farm sizes above 10 kanals. The results in the table show that 156 respondents (60%) had livestock holdings up to 4 animals, 80 respondents (31%) had livestock holdings from 5-7 animals, and 24 respondents (9%) had livestock holdings above 7 animals. Regarding dairy experience, 98 respondents (38%) had experience from 10-15 years, followed by 58 respondents (22%) with experience from 16-20 years, 55 respondents (21%) with up to 10 years of experience, and 49 respondents (19%) with over 20 years of experience. The most important variable is household affected by COVID-19. To control the spread of the virus, a lockdown was imposed which affected household in the research area. They were asked about the effects of the lockdown, and Table 2 summarizes their perceptions. The results present that 174 respondents (67%) reported being highly affected, while 86 respondents (33%) stated that they were mildly affected by COVID-19.

Effects of Lockdown on Dairy Businesses

During the COVID-19 pandemic, the lockdown disrupted income-generating activities across different sectors. The dairy business, like other enterprises, was substantially affected. In the research area, a vast majority of households rely on dairy businesses for their livelihoods. The sampled respondents were asked about the effects of COVID-19 on their dairy businesses. Table 3 highlights the details of their responses.

Table 3: Distribution of Respondents' Opinions about the Effects of Lockdown on Dairy Businesses

Dairy Businesses	Frequency	Percentage
Not affected by lockdown	12	5
Affected by lockdown	248	95
Total	360	100

Note. Source: Field Survey, 2022

Table 3 presents 248 respondents (95%) reported being affected, while 12 respondents (5%) responded that they were no affected by lockdown in the research area. A small portion of respondents were not affected because they sell their milk and related products directly to local milk collectors in the rural areas. Some of these milk

Volume 5 Issue No 1 (2026)
Online ISSN: 3006-2047
Print ISSN: 3006-2039

collectors purchase from households and sell it from their homes, allowing the farmers to continue their business despite the lockdown.

Impact of COVID-19 Lockdown on Dairy Businesses

The impact of the COVID-19 lockdown on the dairy businesses was examined using a binary logistic regression model. The dependent variable was the dairy business affected by the lockdown (0 = not affected, 1 = affected by lockdown). The independent variables included farm size, livestock holdings, dairy farming experience, and two separate dummy variables showing the household effects, one for household mildly affected by lockdown (0 = No, 1= Yes) and another for household highly affected by the lockdown (0 = No, 1= Yes). Table 4 highlights the estimated results of the model below.

Table 4: Estimated Results of Assessing the Impact of Lockdown on Dairy Businesses

Variables	Beta	Std. Error	Wald	p-value	Odds ratio
Farm size	-.291	.038	58.86	.000	0.75
Livestock holdings	-.253	.081	9.78	.002	0.78
Dairy farming experience	-.141	.038	14.08	.000	0.87
Household highly affected by lockdown (0= No, 1= Yes)	.494	.131	14.19	.000	1.64
Household mildly affected by lockdown (0= No, 1= Yes)	.290	.093	9.77	.002	1.34
Constant	2.482	.635	15.29	.000	11.96

Nagelkerke R^2 = 0.731
Chi-square = 263.90
p-value = 0.000

In logistic regression, a positive beta indicates a positive relationship, while a negative beta shows a negative relationship between the independent variable and the dependent variable. This can also be determined from the odds ratio, where an odds ratio greater than 1 indicates that an increase in the independent variable increases the odds of the outcome occurring, and an odds ratio less than 1 indicates that a decrease in the independent variable decreases the odds of the outcome occurring.

Table 4 shows that farm size had a negative coefficient and an odds ratio of 0.75 (OR<1), with a p-value of 0.000, indicating a negative and statistically significant relationship at a 5% significance level. This means that a 1-kanal increase in farm size decreases the odds of dairy businesses being affected by lockdown by 0.75 times or 25%. The major challenge was the limited availability of feeding items for dairy farms due to the shutdown of feed mills during the lockdown (Hussain et al., 2020).

Volume 5 Issue No 1 (2026)
Online ISSN: 3006-2047
Print ISSN: 3006-2039

Larger farm size increases the availability of feeding items for livestock, resulting in higher livestock productivity, which in turn expands dairy businesses.

Livestock holdings had a negative coefficient and an odds ratio of 0.78 (OR<1), with a p- value of 0.002. This implies a negative and statistically significant relationship at a 5% significance level. This suggests that a 1 animal increase in livestock holdings decreases the odds of dairy businesses being affected by lockdown by 0.785 times or 22%. Although the restrictions disrupt the supply of milk, selling continues at local markets. More livestock contributes to increased output, helping to minimize the negative impact of the lockdown. The result is similar to the findings of Ahmad and Ahmad (2024) who estimated that an increase in the number of livestock results in an increase in the income of farmers in the livestock sector. More animals contribute to higher milk productivity and reduce the adverse impact of crises like COVID-19 and related measures to control it.

Dairy farming experience had a negative coefficient and an odds ratio of 0.87 (OR < 1), with a p-value of 0.000. The relationship is negative and statistically significant at a 5% significance level. This indicates that an additional year in dairy experience reduces the odds of dairy businesses being affected by lockdown by 0.87 times or 13%. Ahmad and Ahmad (2024) highlighted that farming experience had a positive and significant relationship with farmers' income in the livestock sector. This means that an increase in experience increases milk productivity, leading to higher income and reducing challenges faced by farmers during the COVID-19 pandemic.

Household highly affected by lockdown had a positive coefficient and an odds ratio of 1.64 (OR>1), with a p-value of 0.000, showing a positive and statistically significant relationship at a 5% significance level. This suggests that compare to household not affected, the odds of household being affected by lockdown increases by 1.64 times or 64%. Household mildly affected by lockdown had a positive coefficient and an odds ratio of 1.34 (OR>1), with a p-value of 0.000, showing a positive and statistically significant relationship at a 5% significance level. This suggests that compare to household not affected, the odds of household being affected by lockdown increases by 1.34 times or 34%. These results are similar to the findings by Singla (2021) that milk sales declined and the cost of dairy production increased during COVID-19. Additionally, there was an increase in health challenges and veterinary services, and a lack of dairy inputs resulted in decreased milk output.

Nagelkerke R^2 was 0.731 means that about 73% of the variation in the dependent variable is explained by independent variables included in the model. The Chi-Squre test had a value of 263.90 with a p-value of 0.000, showing that the overall model is statistically significant at 5% significance level.

CONCLUSIONS AND POLICY IMPLICATIONS

COVID-19 is a worldwide health issue affecting human beings. Apart from humans, it has influenced almost all sectors, including the livestock and dairy sector around the globe. Pakistan is no exception, as it has impacted livestock and dairy productivity in the country. Evidence of these effects has also been reported in District Dir Lower, where dairy businesses have been disrupted as a result of COVID-19. The current

Volume 5 Issue No 1 (2026)
Online ISSN: 3006-2047
Print ISSN: 3006-2039

study assesses the impact of COVID-19 lockdown on dairy businesses in District Dir Lower. The results show that lockdown led to a positive and significant impact on dairy businesses in the research area.

From findings, it is suggested that the government and local authorities should support dairy sector by supply of feed, veterinary services and medicines during crises. Investment in cold-chain infrastructure is necessary to stabilize milk supply and mitigate losses. Additionally, the most vulnerable families and dairy farmers should be provided financial assistance to minimize losses and sustain livelihoods.

REFERENCES

Acosta, A., McCorriston, S., Nicolli, F., Venturelli, E., Wickramasinghe, U., ArceDiaz, E., ... & Steinfeld, H. (2021). Immediate effects of COVID-19 on the global dairy sector. *Agricultural Systems*, 192, 103177. https://doi.org/10.1016/j.agsy.2021.103177

Ahmad & Ahmad (2024). Impact of Credit Advanced by Zarai Taraqiati Bank Limited on the Income of Farmers in the Livestock Sector in District Dir Lower, Khyber Pakhtunkhwa. *Journal of Development and Social Sciences. 5*(2). https://doi.org/10.47205/jdss.2024 (5-II-S)31

Ahmad, I., & Jan, I. (2023). Effect of Covid-19 on Income of The People in District Dir Lower, Khyber-Pakhtunkhwa. *INTERNATIONAL JOURNAL OF HUMAN AND SOCIETY*, *3*(4), 435446.

Ahmad & Ahmad (2025). Impact of COVID-19 on Livelihood Activities of the People in District Dir Lower, Khyber Pakhtunkhwa. *Dialogue Social Science Review (DSSR). 3*(8). https://doi.org/10.5281/zenodo.16794568

Ahmad, I., Irshad, A., & ur Rahman, S. (2025). Impact of institutional credit granted by Zarai Taraqiati Bank Limited on farmers' livestock outcomes in District Dir Upper, Khyber Pakhtunkhwa. *ACADEMIA International Journal for Social Sciences*, *4*(4), 4305. https://doi.org/10.63056/ACAD.004.04.1269

Ahmad, I., Irshad, A., Khan, Z., & ur Rahman, S. (2025). Assessing the impact of Zarai Taraqiati Bank Limited on farm productivity and farm income in District Dir Lower, Pakistan. *ACADEMIA International Journal for Social Sciences*, *4*(4), 4691. https://doi.org/10.63056/ACAD.004.04.1302

Ahmad, I., Tabish, M., Majeed, K., & Naqvi, S. H. A. (2025). Effects of COVID-19 on Agricultural Productivity of Farmers in District Dir Lower, Khyber Pakhtunkhwa. *THE ASIAN BULLETIN OF GREEN MANAGEMENT AND CIRCULAR ECONOMY, 5*(1), 127-139. http://abgmce.com/10.62019/abgmce.v5i1.134

Alam, M. S., Schlecht, E., & Reichenbach, M. (2022). Impacts of COVID-19 on small-scale dairy enterprises in an Indian megacity—insights from greater Bengaluru. *Sustainability, 14(*4), 2057. https://doi.org/10.3390/su14042057

Ali, K. (2025, June 10). Economic survey 2024–2025: Livestock contributes 23.5% to GDP employing over 37% of labor force. *DAWN*. https://www.dawn.com/news/1916126

Volume 5 Issue No 1 (2026)
Online ISSN: 3006-2047
Print ISSN: 3006-2039

Das, A., Shivaswamy, G. P., Bhandari, G., Subash, S., Devi, M. C. A., Dixit, A. K., & Sivaram, M. (2025). Economic effect of COVID-19 pandemic on member and non-member farmers of dairy cooperative societies in West Bengal State, India. *Asian Journal of Dairy and Food Research, 44*(1), 36–44. https://doi.org/10.18805/ajdfr.DR-2146

Goel, S., Singh, M., Phaugat, A., Grewal, S., Goel, M., Mishra, A.K. (2023). Impact of COVID-19 lockdown on Indian agriculture: A review. *Agricultural Reviews. 44*(2): 215- 222. http://doi.org/10.18805/ag.R-2188.

Hussain, S., Hussain, A., Ho, J., Sparagano, O. A., & Zia, U. U. R. (2020). Economic and social impacts of COVID-19 on animal welfare and dairy husbandry in Central Punjab, *Pakistan. Frontiers in Veterinary Science*, *7*, 589971. https://doi.org/10.3389/fvets.2020.589971

Jawed, F., Manazir, S., Zehra, A., & Riaz, R. (2020). The novel Coronavirus disease (COVID-19) pandemic: knowledge, attitude, practice, and perceived stress among health care workers in Karachi, Pakistan. *Medical journal of the Islamic Republic of Iran*, 34, 132. https://doi.org/10.34171/mjiri.34.132.

Popat, S.J., Ashish, R., Kadam, S. and Mane, S.P., 2020. Effects of COVID-19 on dairy farming. *Juni Khyat*, *10*(6), pp.16-30.

Rahman, M.S. and Das, G.C., 2021. Effect of COVID-19 on the livestock sector in Bangladesh and recommendations. *Journal of Agriculture and Food Research*, *4*, p.100128.

Sattar, A., (2020, March 1). Milk Production in Pakistan. https://pide.org.pk/blog/milk-production-in-pakistan/

Singla, N. (2021). Impact of COVID-19 pandemic on dairy industry in Punjab: Major concerns and policy options. In S. Verma & A. Kumar (Eds.), *COVID-19 pandemic and economic development: Emerging public policy lessons for Indian Punjab* (pp. 83–90). Springer. https://doi.org/10.1007/978-981-16-4442-9_7

Vall, E., Mburu, J., Ndambi, A., Sall, C., Camara, A. D., Sow, A., Ba, K., Corniaux, C., Diaw, A., Seck, D., Vigne, M., Audouin, S., Rakotomalala, L. J. E., Rakotonoely, L. N., Dias Ferreira, F., Véromalalanirina, E., Rajaonera, M., Ouédraogo, S., Sodré, E., Tall, I., Ilboudo, M. D., & Duteurtre, G. (2021). Early effects of the COVID-19 outbreak on the African dairy industry: Cases of Burkina Faso, Kenya, Madagascar, and Senegal. *Cahiers Agricultures, 30*, Article 14. https://doi.org/10.1051/cagri/2020047

Waris, A., Atta, U. K., Ali, M., Asmat, A., & Baset, A. J. N. M. (2020). Covid-19 outbreak: current scenario of Pakistan. *New microbes and new infections, 35*, 100681. https://doi.org/10.1016/j.nmni.2020.100681