BREEDING AND FEEDING MANAGEMENT PRACTICES OF DAIRY BUFFALO FARMERS DURING THE DIFFERENT PHASES OF THE CORONAVIRUS DISEASE-19 PANDEMIC IN GENERAL TRIAS, CAVITE, PHILIPPINES

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ABSTRACT

Forty-seven dairy buffalo farmers from General Trias, Cavite, Philippines were interviewed using constructed questionnaires to describe their breeding and feeding management practices before and after the ease of the pandemic. The problems encountered and government services that were provided were also included. The stages of the pandemic were divided into three phases namely: pre-pandemic or Phase 1 (before and until 12 March 2020); the peak of the pandemic or Phase 2 (12 March 2020 – 28 February 2022); and Alert Level 1 or Phase 3 (01 March 2022 – 31 December 2022). Results showed a decreased use of AI and bulls in Phase 2 due to lockdowns and travel restrictions that temporarily hindered the breeding services in the locality. However, no changes were observed in the price per service for both breeding systems throughout the three phases. Most respondents (Phases 1; 63.83%, 2; 61.70%, and 3; 65.96%) practiced both pure grazing and cut-and-carry systems to feed their buffaloes. However, 59.58% did not add different types of feeds in Phase 2 because of limited mobility in the area. Moreover, the increasing price of feeds in Phases 1 (Php 21.13), 2 (Php 24.67), and 3 (Php 26.26) was attributed to limited transport. Meanwhile, the difficulty of harvesting grasses and buying feeds were the major challenges in feeding the buffaloes which was evident in Phase 2. In conclusion, the pandemic temporarily hindered the breeding and feeding activities of the respondents in Phase 2 but they slowly recovered when the travel restrictions and strict lockdowns were lifted in Phase 3.

Keywords: breeding system, buffalo, COVID-19, feeding system, lockdowns, restrictions

INTRODUCTION

The coronavirus disease 19 (COVID-19) is highly transmissible and is caused by a SARS-CoV-2 contagion also known as Severe Acute Respiratory Syndrome Coronavirus 2 (Shereen *et al.*, 2020). Its emergence and spread led to a pandemic resulting in a conspicuous worldwide loss of human life and posed an unprecedented threat to the society and economy.

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The continuity of the pandemic situation posed a threat to millions of lives across the globe, including their health, jobs, and incomes (Shereen *et al.*, 2020; Acosta *et al.*, 2021; Elbehri *et al.*, 2022). It all resulted in the pandemic negatively affecting every sector of the economy including livestock and other related animal science industries owing to travel restrictions, health risk perceptions, processing plant closures, and production input shortages (Elbehri *et al.*, 2022).

The several lockdown restrictions caused changes in the dairy industry as shown in the observations from management practices, transportation, and marketing strategies. Due to the pandemic's impacts, 28.00% of farmers had changed their feeding system and management. These farmers applied it through the variation in amounts of their daily offered feed to the animals as well as its components in compensation for the changes brought by the pandemic (Alam *et al.*, 2022). The harvested feed supply was greatly affected: its higher price was due to the increased demand and lack of green fodder. Also, the demand was caused by travel restrictions applied to vehicles moving from one place to another. Furthermore, product demand disruption was considered a major issue in livestock industries and cooperatives and this is followed by problems in transportation, labor issues, increased inventory cost, and declined revenue. On the other hand, during the pandemic, there was a limitation on the availability of dairy inputs. The dairy farmers were also troubled by the overall dairy production scheme such as reduced farm gate prices, increased farm input prices, decreased milk production, unsold milk, decreased demand for milk, and low milk quality (Das *et al.*, 2021).

Several authors from different countries have documented the COVID-19 impacts on dairy sectors, however, studies on the local dairy situation with the impacts of the pandemic are very limited. Therefore, the study aims to gather information and document the effects of COVID-19 on dairy farm operations under the region's different phases of community quarantine. The main objective of this study is to determine the effect of the COVID-19 pandemic on the breeding and feeding management systems of dairy buffalo farmers in General Trias, Cavite, Philippines.

MATERIALS AND METHODS

The study employed a descriptive qualitative approach to determine the effect of COVID-19 specifically on animal breeding and feeding management practices of the dairy buffalo farmers in General Trias Dairy Raisers Multi-Purpose Cooperative (GTDRMPC), General Trias, Cavite, Philippines under the supervision of the Philippine Carabao Center at the University of the Philippines Los Baños (PCC at UPLB) from February 1 – 28, 2023.

Before the conduct of the study, coordination with the PCC personnel was done to easily identify the target respondents and inform them the purpose of the study. Participants were screened based on their engagement in dairy buffalo production before the year 2019, membership to the cooperative, and dairying experience of more than four years. Only those participants who passed all the screening questions were officially selected as the respondents of the study.

Purposive sampling was used to determine the number of respondents while the sample size was computed using Slovin's Formula: $n = N / [1 + (N*e^2)]$ where: n = sample size, N = population, and e = 0.05.

To describe the different conditions of the pandemic, the study utilized three phases

namely: pre-pandemic or Phase 1 (before and until 12 March 2020); peak of the pandemic or Phase 2 (12 March 2020 – 28 February 2022); and Alert Level 1 or Phase 3 (01 March 2022 – 31 December 2022).

A structured survey questionnaire was used in collecting the data from forty-seven (47) respondents. The study utilized both primary and secondary data. All primary data were collected through personal or face-to-face interviews and phone call follow-ups. The secondary data comprised scientific journals, online articles, and published articles relevant to the study.

Data collected were analyzed for descriptive statistics, frequency counts, and percentages using SPSS Statistics software version 20.

RESULTS AND DISCUSSION

Before the pandemic or Phase 1, all respondents (100%) could normally breed their buffaloes due to the accessibility of AI technicians and the availability of bulls in the locality (Table 1). However, it was noted that a few, or 4.24% of them failed to breed their buffaloes in Phase 2 because of the travel restrictions imposed by the government which limited them to avail of AI and bull services in the area. Eventually, all of them (100%) were able to breed their buffaloes in Phase 3 given less restrictive travel policies and movement restrictions. Similarly, Burkart et al. (2020) and FAO (2020a) reported that lockdown measures and movement restrictions affected the mobility of people which made it difficult for many of them to reach their workplaces. Additionally, possible infection of the workforce also led to a shortage of labor while an interruption in breeding programs was also experienced. Moreover, the COVID-19 prevention protocols caused reduced access to inputs and services for animal breeding and production (Obese *et al.*, 2021).

Table 1. Breeding of buffaloes in Phases 1, 2, and 3.

Breeding of animals	Phases of Pandemic					
	Phase 1		Phase 2		Phase 3	
	Frequency	%	Frequency	%	Frequency	%
Yes	47	100	45	95.74	47	100
No	0	0	2	4.25	0	0
Total	47	100	47	100	47	100

The respondents employed three types of breeding systems namely: natural breeding, AI, and a combination of AI and natural breeding (Table 2). The majority of them (53.19%) practiced natural breeding in Phase 1, followed by both breeding services (27.56%), and only 19.14% practiced AI. The high percentage (53.19%) of respondents that relied on natural breeding could be explained by the availability of breeding bulls in the areas. These bulls were loaned out from the Bull Loan Program of the PCC center.

A similar trend was observed in Phase 2 but there was a slight increase of about eight percent (8%) in the number of respondents (57.44%) that utilized natural breeding while a decrease of 38.46% was noted in respondents who used both breeding systems.

The decreased use of AI and breeding bulls (38.46%) was mainly due to temporary travel restrictions which hindered the AI technicians from conducting AI services and other related activities. Likewise, it was also difficult for the bull handlers to travel their bulls to service the in-heat animals in the area. This coincides with the study of Tesfaye *et al.* (2020), the decreased use of AI was attributed to the inability of extension personnel to visit, train and provide AI to farmers. Likewise, FAO (2020b) and Hashem *et al.* (2020), stated that movement restrictions curbed the farmers' access to breeding materials. Frozen semen straws for AI had been largely unavailable including replacement stocks.

Table 2. Breeding systems used by the respondents in Phases 1, 2, and 3.

Breeding Systems	Phases of Pandemic					
	Phase 1		Phase 2		Phase 3	
	Frequency	%	Frequency	%	Frequency	%
Natural Breeding	25	53.19	27	57.44	24	51.06
Artificial Insemination	9	19.14	10	21.27	10	21.27
Both Breeding System	13	27.65	8	17.02	13	27.65
Total	47	100	45	100	47	100

On the other hand, natural breeding was still the predominant (51.06%) breeding system in Phase 3. The number of respondents who availed of AI did not change (21.27%) while a 62.50% increase was observed in both breeding systems. This was possible due to the ease of travel restrictions and lockdowns which allowed the AI technicians to become more reachable.

The price for both AI and bull services ranged from Php 500.00 to Php 1,000.00. The differences in the payment per service depended on the price set by the bull handlers and AI technicians in the locality which was generally based on the proximity of the AI technicians going to the service areas. AI technicians coming from further places asked for higher payments to compensate for the gasoline expenses. Although there were differences in the cost of breeding services, the respondents did not observe any price increase throughout the different phases of the pandemic. In conclusion, the price for both breeding systems was not affected by travel restrictions and lockdowns but their accessibility was temporarily hindered especially in Phase 2.

The problems related to animal breeding were more focused on the limited access to AI services brought about by travel restrictions and lockdowns during the pandemic which were eventually addressed by the issuance of gate passes and identification cards to individuals who are rendering agricultural services and when these protocols were lifted. Meanwhile, most of the support services came from the PCC caravan program where the respondents received technical support such as house visits and general check-ups on their animals. Along with these, the following activities were also done: distribution of AI supplies, and assessment of the animals' reproductive health status which also included pregnancy diagnosis and free AI services. However, the program was halted in Phase 2 and

some of the respondents relied on LGU caravans. Face-to-face seminars were also attended by the respondents in Phase 1 to improve their technical skills, especially on the basics of dairy buffalo production and health management. Similar support services were provided in Phase 2 except for the seminars held online via Zoom application which later on shifted back to a face-to-face set up in Phase 3.

All (100%) respondents employed *ad libitum* feeding throughout the three phases. In terms of feeding systems (Table 3), the majority (63.83%) of them practiced both feeding systems (pure grazing and cut-and-carry system) in Phase 1, followed by pure grazing (29.79%) and cut-and-carry system (6.38%).

Table 3. Feeding systems practiced by the respondents in the locality in Phases 1, 2, and 3.

Feeding Systems	Phases of Pandemic					
	Phase 1		Phase 2		Phase 3	
	Frequency	%	Frequency	%	Frequency	%
Pure Grazing	14	29.79	15	31.91	13	27.66
Cut-and-Carry	3	6.38	3	6.38	3	6.39
Both Feeding Systems	30	63.83	29	61.70	31	65.96
Total	47	100	47	100	47	100

The same trend was noted in Phases 2 and 3. However, there was a slight decrease in the number of respondents (13.33%) that practiced pure grazing in Phase 3 and this was attributed to the limited availability of grasses in the pasture and limited land intended for grazing area but the latter was more related to the urbanization and establishment of infrastructures in the locality. Alam *et al.* (2022) reported that the grazing opportunities of farmers on lakeshores and other public lands were affected by the lockdowns. Only 15% grazed their cattle on lakeshores after the lockdown compared to 28% before the lockdown and the harvest of green fodder on public lands was not possible because they were prohibited from leaving their houses. Meanwhile, physical distancing and requirements for additional personal protective equipment reduced the efficiency of industrial feed enterprises. Furthermore, movement restrictions and illness resulted in labor shortages and also reduced the supply of raw materials and other ingredients. It also disrupted transhumance which crippled the pastoralist ability to feed their animals (FAO, 2020b).

The respondents did not rely on grass alone, they also practiced mixed feeding to meet the required nutrients of the animals. Out of 47 respondents, the majority (82.98%) of them added different types of feeds to the animals' diet in Phase 1 (Table 4).

More than half (59.58%) of them did not incorporate different types of feeds in Phase 2 and this was due to the limited mobility in the area of which they were unable to reach the nearby market to purchase commercial feeds but the number of respondents who did not add any types of feed eventually decrease (17.02%) when the situation became less restrictive and slowly returned to normal which allowed them to freely access the market and other feed resources. The decreased use of some feedstuffs after lockdowns was due to their unavailability caused by lockdown restrictions and higher prices. Moreover, the

COVID-19 pandemic severely affected the regular access of dairy farmers to cattle feed on their public lands. It impacted their feeding strategies and the availability of green forage decreased because they were scared of COVID-19 and they were obliged to abide by the strict movement restrictions imposed across the city, which impeded the collection of fodder from lakes and public spaces (Alam *et al.*, 2022).

Table 4. The number of respondents that incorporated different types of feeds in the animals' diet in Phases 1, 2, and 3.

Did you add other types of feeds to the animals' diet?	Phases of Pandemic					
	Phase 1		Phase 2		Phase 3	
	Frequency	%	Frequency	%	Frequency	%
Yes	39	82.98	19	40.42	39	82.97
No	8	17.02	28	59.58	8	17.02
Total	47	100	47	100	47	100

Table 5. Types of feeds added to the animals' diet in Phases 1, 2, and 3.

Types of Feeds	Phases of Pandemic					
	Phase 1		Phase 2		Phase 3	
	Frequency	%	Frequency	%	Frequency	%
Napier grass only						
Added	35	74.47	19	40.43	34	72.34
Did not add	12	25.13	28	59.57	13	27.66
Total	**47**	**100**	**47**	**100**	**47**	**100**
Concentrate feeds only						
Added	26	55.32	4	8.51	17	36.17
Did not add	21	44.68	43	91.49	30	63.83
Total	**47**	**100**	**47**	**100**	**47**	**100**
Silage						
Added	4	8.51	0	0	4	8.51
Did not add	43	91.49	47	47.00	43	91.49
Total	**47**	**100**	**47**		**47**	**100**

The different types of feeds added to the animals' diet are presented in Table 5. The majority of respondents usually added Napier grass (74.47%), and concentrate feeds (55.5%) except for silage with only a few or 8.51% in Phase 1. There was a remarkable decrease in terms of the number of respondents (Napier grass; 40.43%, concentrate feeds;

8.51%, and silage; 0.00%) that added these feeds in Phase 2. The decrease of about 45.71% in the addition of Napier grass, 84.61% in concentrate feeds, and 100% in silage was due to the limited mobility in the area which restricted them from harvesting Napier grasses in the locality and reaching the nearby market to purchase feeds and silage. This is in agreement with the observations of Alam *et al.* (2022), who mentioned that the lockdown did not affect the supply of fodder on the farmers' land but the supply of harvested feed on public land was affected by strict lockdown regulations.

Table 6. The average price per kilogram of the added feeds in Phases 1, 2, and 3.

Parameter, (Php/kgs)	Phases of Pandemic		
	Phase 1	Phase 2	Phase 3
Napier grass	0.00	0.00	0.00
Concentrate feeds	21.13	24.67	26.26
Silage	7.67	7.67	7.00

Moreover, it also affected the supply of concentrates with a decrease of 7% of farmers that did not feed concentrates after the lockdown compared to 1% that did not feed concentrates before the lockdown. Hussain *et al.* (2020) observed the limitation in feed availability for dairy farms due to the closure of feed mills during the lockdown and the lack of commercial feed availability which resulted in major economic losses. Restrictive measures by various countries to stop the spread of COVID-19 impacted the supply chains of various products and sectors. According to Obese *et al.* (2021), the COVID-19 pandemic has reduced the availability of livestock feed due to movement restrictions and the closure of feed factories.

On the other hand, the sudden price increase in commercial feeds was also noted (Table 6) while the number of respondents who added Napier grass (72.34%), concentrate feeds (36.17%) and silage (8.51%) eventually normalized in Phase 3 due to fewer restrictions and accessibility to the market. This suggests that the sudden price of feeds and the capability of the respondents to purchase feeds in the nearby market was temporarily affected by the pandemic, particularly in Phase 2, the situation became normal as evidenced by the increased number of respondents that added these feeds in Phase 3.

In terms of feed cost (Table 6), the Napier grass was free of charge because these grasses were harvested from the respondents' forage area or any vacant lots in the locality. The increasing price of feeds in Phases 1 (Php 21.13), 2 (Php 24.67), and 3 (Php 26.26) was attributed to the limited transport whereas the price of silage remained in Phases 1 and 2 except for Phase 3. Das *et al.* (2021) mentioned that the prices of dairy inputs such as feed, fodder, and concentrates increased during the pandemic. The prices of cattle feed and dry fodder increased by 20-30% during the lockdown (Bhandari and Lal, 2020; Obese *et al.* 2021) while the drastic decline in livestock was due to the high cost of animal feed (Islam *et al.*, 2022).

The majority of respondents rarely used feed supplements (Table 7). It was found that more than half of them incorporated feed supplements in Phases 1 (59.57%), 2 (56.44%), and 3 (51.06%). The high number of respondents that did not add feed supplements was related to the expensive price of supplements and some of them also relied on pure grazing.

Table 7. The number of respondents that incorporated feed supplements in the animals' diet in Phases 1, 2, and 3.

Did you add feed supplements to the animals' diet?	Phases of Pandemic					
	Phase 1		Phase 2		Phase 3	
	Frequency	%	Frequency	%	Frequency	%
Yes	28	59.57	24	57.44	24	51.06
No	19	40.43	23	42.55	23	48.93
Total	**47**	**100.00**	**47**	**100.00**	**47**	**100.00**

Different feed supplements such as salt, mineral blocks, and molasses were added to increase the palatability of the feeds and enhance the appetite of the animals. However, only 25.53% of them supplemented salt, 4.25% provided mineral blocks while a higher percentage (42.55%) added molasses in Phase 1 (Table 8). There was not much decrease in terms of the number of respondents that added salt and mineral blocks in Phase 2 except for molasses with a 15% decrease while a similar trend was observed in Phase 3. Similar to other types of feeds, the decreasing number of respondents that supplemented salt and molasses in Phase 2 was mainly due to travel restrictions which temporarily hindered them from buying these supplements in the market.

Table 8. Feed supplements provided to the animals in Phases 1, 2, and 3.

Feed supplements	Phases of Pandemic					
	Phase 1		Phase 2		Phase 3	
	Frequency	%	Frequency	%	Frequency	%
Salt only						
Added	12	25.53	10	21.27	10	21.27
Did not add	35	74.47	37	78.72	37	78.72
Total	**47**	**100**	**47**	**100**	**47**	**100**
Mineral blocks only						
Added	2	4.25	2	4.25	2	4.25
Did not add	45	95.74	45	95.74	45	95.74
Total	**47**	**100**	**47**	**100**	**47**	**100**
Molasses only						
Added	20	42.55	17	36.17	15	31.91
Did not add	27	57.45	30	63.83	32	68.08
Total	**47**	**100**	**47**	**100**	**47**	**100**

Additionally, the inflation and increasing price of feed supplements (Table 9) also affected the buying capacity of the respondents. The livestock sector was greatly affected by the restrictions disrupting the activities involving the animal feed supply chain causing

reduced farming services, limited access to markets and consumers, and reduced labor force participation (Rahimi *et al.*, 2020). Likewise, the closure of feed plants resulted in the unavailability of feeds in most places. Also, the dairy farmers in the initial period compromised feeding their cattle and buffaloes with the available dry crop residues and brans. However, the revival of the supply system from feed plants to distributors eventually increased the availability of feed at the local markets and the accessibility of the livestock farmers to feed did not remain a problem in most places in recent times (Biswal *et al.*, 2020).

Table 9. The average price per kilogram of the added feeds in Phases 1, 2, and 3.

Parameter, (Php/kgs)	Phases of Pandemic		
	Phase 1	Phase 2	Phase 3
Salt	16.54	16.82	16.43
Mineral block	70.00	100.00	105.00
Molasses	14.28	15.89	24.00

Few problems were associated with feeding systems and management throughout the three phases. The difficulty of harvesting grasses and buying feeds due to travel restrictions and strict lockdowns were the major problems related to the feeding system which were more experienced in Phase 2. The increasing prices of farm inputs also affected their capability to purchase feeds and feed supplements. Nevertheless, feed concentrates and other support services (AI caravans) were provided by the PCC and LGU to help respondents, particularly with lactating animals.

CONCLUSION

The pandemic temporarily hindered the breeding and feeding activities of the respondents in Phase 2 but they slowly recovered when the travel restrictions and strict lockdowns were lifted in Phase 3. The issuance of travel passes to the AI technicians, agricultural workers, and other government support was very helpful in addressing the problems encountered by the respondents.

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