HERD PROFILE, MILK PRODUCTION AND FEEDING VARIABLES OF DAIRY CATTLE FARMS FROM SELECTED REGIONS IN THE PHILIPPINES

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ABSTRACT

This study examined fifty-four dairy farms in five regions, namely Region II (Cagayan Valley), Region III (Central Luzon), Region IV-A (CALABARZON), Region X (Northern Mindanao), and Region XI (Davao Region) to characterize the herd profile, milk production, and feeding variables. Results showed that dairy farms in CALABARZON had the largest herd size and population of milking cows, the highest milk production, and high efficiency in labor and mechanization. Dairy farms in Cagayan Valley and Davao Region have the lowest herd size, milk yield, and cows per worker. Cagayan Valley dairy farms had the most expensive farm gate price of raw milk while Davao Region had the cheapest. Most farms use a combination of indoor feeding and grazing management system. Farms in Northern Mindanao and Cagayan Valley have the largest grazing area and land for cut and carry system, respectively. 'Pakchong' napier (*Pennisetum purpureum* x *P. glaucum*), kakawate (*Gliricidia sepium*), napier grass (*Pennisetum purpureum*), rice straw, and brewer's spent grains were the predominant feed resources. The herd profile, production, and feeding variables in the surveyed dairy farms of the five regions are influenced by geography, climate, and regional economy, among other factors.

Keywords: agro-industrial by-products, crop residues, dairy cattle, fodder crops, improved grasses, forage legumes

INTRODUCTION

The local dairy industry contributes less than 2% of the total dairy consumption of Filipinos (PSA, 2018). Near-total dependence on the importation of milk and other dairy products implies that interventions need to be done to increase the local milk production. The herd size, feed quality, and feeding practices are contributing factors to the current situation of the local dairy industry. Most dairy farms depend on locally available feed resources, and commercial concentrates and other feed supplements to meet the requirements of the limited number of dairy cows to produce milk. However, the inconsistency in the quality and supply of feed resources often results in fluctuating milk production.

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With the challenges in feed resource supply due to seasonal forage dry matter production variability, formulating a consistent feed ration suitable to a specific production system may lead to increase dairy productivity (Heinrichs and Kmicikewycz, 2016). The adoption of precision feeding whether using total mixed rations and component feeding system would depend on its suitability to the different farming systems that are an integral part of the local dairy sector. Mapping the feed resource base in the different regions of the country, ensuring the availability of enough feed raw materials, and promoting their practical use in the formulation of dairy rations will ensure the sustained adoption of recommended feeding system. Thus, this study was conducted to determine the herd profile, milk production and feeding variables of dairy cattle farms in selected regions in the Philippines.

MATERIALS AND METHODS

The farm survey was conducted from July to December 2019 in Regions II (Cagayan Valley, n=12), III (Central Luzon, n=16), IV-A (CALABARZON, n=8), X (Northern Mindanao, n=10), and XI (Davao Region, n=8). These regions were considered key areas in dairy cattle farming and were represented under the Philippine Dairy Research Consortium (PDRC). Various National Dairy Authority (NDA)-assisted dairy farms were randomly selected from these five regions. A total of fifty-four dairy farms participated in this study. The survey was conducted through physical interviews of the farm owners using pre-tested questionnaires. The data contain variables for the herd profile, milk production, labor, mechanization, land utilization, feed resources, and feeding management system. Milk production data obtained from farm records were the total volume of milk of the previously completed lactation and were not corrected as to breed, age, and parity. The data in herd profile and labor were rounded off to the nearest whole number. Descriptive statistics such as mean, standard deviation and frequency were determined using the PROC MEANS and PROC FREQ model of SAS University Edition (2018).

RESULTS AND DISCUSSION

There were 2,937 heads of dairy cattle in all the farms included in the survey across the five regions; male calves were excluded from the count (Table 1). It is a customary practice in dairy farms to raise male calves for a few months after weaning from milk and sell them ‘on the hoof’ for meat. Dairy farms in CALABARZON had the highest number of animals with an average of 115 heads while Davao Region had the fewest with 17 heads per farm. Similarly, the highest number of milking cows per farm was in CALABARZON with 47 head while the fewest was in Cagayan Valley with only 4 head per farm.

The high population of dairy cattle in the CALABARZON farms could be attributed to factors such as proximity to dense human populations and regulating agencies in the National Capital Region (NCR) and nearby areas. Additionally, farms in CALABARZON may have better access to new dairy technologies, better farming practices, and improved forage cultivars. Van der Lee *et al*. (2020) supported that proximity of a dairy farm to stable markets has a positive effect on the stocking rates, milk yields, and better use of inputs such as feeds and services. Meanwhile, the low dairy cattle population in the Davao region may be explained by the small land area for pasture production. Large rural land areas in this region are utilized for high-value crops such as banana, durian, and mango.

Table 1. Herd profile of participating dairy farms in selected regions in the Philippines.

Variables	Regions[1]				
	II	III	IV-A	X	XI
Number of farms surveyed	12	16	8	10	8
Herd size	23±17	54±3	115±100	76±69	17±16
Milking cows					
Mean ± St. dev.	4±5	17±20	47±38	36± 6	8±14
Percent (%) of the herd	23.98	36.81	42.52	43.90	34.08
Dry cows					
Mean ± St. dev.	6±7	7±15	21±21	14±22	2±3
Percent (%) of the herd	25.30	11.09	15.4	19.61	15.47
Pregnant heifers					
Mean ± St. dev.	3±4	6±5	13±13	3±4	2±2
Percent (%) of the herd	14.62	13.79	10.37	5.79	14.09
Breedable heifers					
Mean ± St. dev.	3±3	6±10	13±14	7±12	1±3
Percent (%) of the herd	9.07	7.61	12.98	9.45	6.53
Yearling heifers					
Mean ± St. dev.	3±5	7±12	9±20	8±12	2±3
Percent (%) of the herd	11.98	10.79	6.23	8.90	17.61
Female calves					
Mean ± St. dev.	2±2	9±13	9±8	7±7	1±1
Percent (%) of the herd	9.28	12.92	9.93	11.50	8.59
Bulls					
Mean ± St. dev.	1±1	2±3	2±2	1±1	0±1
Percent (%) of the herd	5.77	6.98	2.57	0.84	3.63

[1]Regions: II=Cagayan Valley, III=Central Luzon, IV-A=CALABARZON, X=Northern Mindanao, XI=Davao Region

CALABARZON dairy farms had the highest daily milk yield per cow and total milk production per lactation with 11.13 kg and 3,262.50 kg, respectively. The large herd size of dairy farms in CALABARZON plays a major contribution to their increased productivity. An increase in herd size had a positive correlation with higher milk yields and efficiency (Krpalkova *et al*., 2016). Meanwhile, dairy cows in Cagayan Valley had the lowest milk yield per cow (5.96 kg) total milk yield per lactation (1000.50 kg), and the shortest lactation period (5.75 months). The low productivity of dairy cows in the Cagayan Valley could also be explained in part by the generally warm weather in the region. The high air temperature in this region was the result of bordering mountain ranges blocking cold and lighter air and trapping the warm air in the plains and valleys. The harsh climate discourages farms from keeping a high number of animals. Temperature above the thermoneutral zone may lead to reduced dry matter intake and increased respiration and body temperature which adversely

affect milk production (Johnson, 1980).

For having the lowest productivity, dairy farms in Cagayan Valley had the most expensive farmgate price of raw milk at Php 52.78. The raw milk in these dairy farms was typically sold to shops that sell specialty dairy products. Meanwhile, raw milk was the cheapest in Davao Region at Php 28.43. The low milk volume and small herd size may play a crucial role in the cheap prices of raw milk in Davao Region. Consumers rely on imported milk to supply their requirements for dairy products, thus forcing the farmers to compete by selling their raw milk at a cheaper price.

Dairy farms in CALABARZON employ the highest number of farmworkers and cows per worker (CPW). Furthermore, dairy farms in this region also had the highest utilization of machinery and equipment (Table 2). Due to the large herd size of dairy farms in CALABARZON, farm owners tend to increase the workforce or purchase machinery and equipment such as tractors, forage harvesters, feed mixers, forage choppers and milking machines to support the farm operations. Gargiulo *et al*. (2018) mentioned that there was a positive relationship between herd sizes with labor and animal management pressures on Australian dairy farms. Davao Region dairy farms were among the lowest CPW, milk yield, and the least mechanized. Cagayan Valley dairy farms had the lowest milk yield and CPW despite being highly mechanized among the regions surveyed. Thus, there were low production efficiencies of dairy farms in these two regions.

In terms of land utilization, dairy farms in Northern Mindanao have an average of 25.68 ha of land. About 23.30 ha are devoted to grazing and growing forages for cut and carry feeding system. On the other hand, farms in Davao Region had the smallest land area devoted to dairy operation with an average of 3.13 ha as most of the land is used for growing of high-value crops like banana, pomelo, durian, cacao, and coffee. Farms in Davao Region also had the smallest land area for grazing and cut and carry with an average of 1.19 ha and 1.44 ha respectively due to the above reason.

Most farms in the five regions use the combination of indoor feeding and grazing system in the feeding management of their dairy herd. This practice maximizes the utilization of available feed resources in their locality. Only a few of the surveyed dairy farms practice solely indoor feeding. Indoor feeding involves the gathering of outsourced feed materials for their animals. The limited area of owned pastureland prevents farmers from practicing the grazing system of management.

The three most common improved grass species utilized by dairy farmers were: (1) Mulato II (*Brachiaria ruziziensis*, *B. decumbens x B. brizantha*), (2) 'Pakchong' napier (*Pennisetum purpureum x P. glaucum*), and (3) Mombasa (*Panicum maximum* cv. 'Mombasa') which were utilized by 35.2% of the surveyed farms across the five regions (Table 3). Meanwhile, the three most common forage legumes used were kakawate (*Gliricidia sepium*), centrosema (*Centrosema molle*) and ipil-ipil (*Leucaena leucocephala*) at 27.8%, 20.4% and 18.5% of the surveyed farms, respectively. Meanwhile, for native vegetation, the three most common types of grass were napier (*Pennisetum purpureu*m), carabao grass (*Paspalum conjugatum*) and common setaria (*Setaria sphacelata*) used by 14.8%, 11.1%, and 7.4% of the surveyed farms, respectively.

For the most utilized improved types of grass per region, 'Pakchong' napier was widely utilized as dairy cattle feed in Cagayan Valley and Davao Region. 'Pakchong' is a hybrid Napier developed in Thailand. It is known for being drought tolerant and has higher dry matter yield and crude protein than the Napier grass (Sarian, 2013). The even

Table 2. Production profile of participating dairy farms in selected regions in the Philippines.

Variables	Regions[1]				
	II	III	IV-A	X	XI
Number of farms surveyed	12	16	8	10	8
Milk production variables, mean±standard deviation					
Daily milk/ yield cow, kg	5.96±1.62	10.41±2.63	11.13±1.89	9.18±3.59	6.81±2.45
Lactation period, months	5.75±2.53	8.06±2.02	9.38±1.25	10.00±1.85	8.35±3.42
Milk production/ lactation, MT	1.00±0.55	2.58±1.13	3.26±0.72	2.64±0.95	1.71±1.17
Farm gate price of raw milk, Php	52.78±20.48	32.65±8.81	33.00±1.15	32.25±7.27	28.43±5.77
Labor, mean±standard deviation					
Number of farm workers	4.00±6.00	5.00±4.00	12.00±13.00	3.00±2.00	3.00±4.00
Cows per worker	1.00±6.00	3.00±2.00	5.00±4.00	5.00±3.00	2.00±2.00
Machineries and equipment, percent (%) of farms					
Tractor	58.33	37.50	62.50	20.00	0
Forage harvester	8.33	6.25	37.50	20.00	0
Feed mixer	16.67	6.24	50.00	10.00	0
Forage chopper	33.33	50.00	62.50	50.00	25.00
Milking machine	100.00	100.00	100.00	100.00	100.00
Baler	0	18.75	0	0	0
Forage mower	0	0	0	20.00	0

Table 2. Continuation....

Variables	Regions[1]				
	II	III	IV-A	X	XI
Number of farms surveyed	12	16	8	10	8
Land utilization, mean±standard deviation					
Total land area, ha	11.83±15.98	10.30±15.82	7.84±9.87	25.68±31.9	3.13±3.51
For grazing, ha.	5.04±5.90	7.02±15.12	5.44±9.72	23.30±31.93	1.18±2.27
For cut and carry, ha	5.21±8.81	3.22±5.35	2.41±4.39	2.38±3.30	1.44±2.16
For other purposes, ha	1.58±2.94	0.06±0.25	0±0	0±0	0.5±1.41
Feeding management system, percent (%) of farms					
Intensive	16.67	43.75	12.50	10.00	37.50
Extensive	8.33	0	0	10.00	0
Combination	75.00	56.25	87.50	80.00	62.50

[1]Regions: II=Cagayan Valley, III=Central Luzon, IV-A=CALABARZON, X=Northern Mindanao, XI=Davao Region

Table 3. Percentage (%) of participating dairy farms utilizing forages in selected regions in the Philippines.

Forages	Scientific name	Regions[1]					Total
		II	III	IV-A	X	XI	
Number of farms surveyed		12	16	8	10	8	54
Improved grasses							
Pakchong napier	*Pennisetum purpureum x P. glaucum*	58.30	18.80	25.00	10.00	75.00	35.20
Florida napier	*Pennisetum purpureum x P. glaucum*	0	6.30	0	10.00	0	3.70
Napier grass	*Pennisetum purpureum*	16.70	43.80	25.00	10.00	12.50	24.10
Mulato II	*Brachiaria hybrid*	25.00	12.50	62.50	50.00	50.00	35.20
Mombasa	*Panicum maximum* cv. 'Mombasa'	25.00	18.80	62.50	60.00	25.00	35.20
Guinea grass	*Panicum maximum*	25.00	0	12.50	10.00	12.50	11.10
Signal grass	*Brachiaria decumbens*	0	6.30	25.00	60.00	0	16.70
Stargrass	*Cynodon nlemfuensis*	8.30	12.50	50.00	50.00	12.50	22.20
Paragrass	*Brachiaria mutica*	8.30	50.00	12.50	20.00	0	21.80
Forage legumes and fodder							
Calopo	*Calopogonium mucunoides*	16.70	6.25	12.50	0	0	7.40
Perennial stylo	*Stylosanthes guianensis*	16.70	6.25	12.50	10.00	0	9.30
Centrosema	*Centrosema molle*	16.70	25.00	12.50	40.00	0	20.40
Arachis	*Arachis pintoi*	0	12.50	12.50	40.00	0	13.00
Kakawate	*Gliricidia sepium*	25.00	18.80	12.50	20.00	75.00	27.80
Trichanthera	*Trichanthera gigantea*	8.33	0	0	0	12.50	3.70
Ipil-ipil	*Leucaena leucocephala*	16.70	18.80	25.00	0	37.50	18.50

Table 3. Continuation...

Forages	Scientific name	Regions[1]					Total
		II	III	IV-A	X	XI	
Number of farms surveyed		12	16	8	10	8	54
Forage legumes and fodder							
Indigofera	*Indigofera zollingeriana*	0	12.50	0	0	25.00	7.40
Rensonii	*Desmodium cinereum*	0	12.50	12.50	0	25.00	9.30
Calliandra	*Calliandra calothyrsus*	0	0	0	0	12.50	1.90
Flemingia	*Flemingia macrophylla*	0	6.25	0	0	0	1.90
Moringa	*Moringa oleifera*	8.30	0	12.50	0	0	3.70
Mulberry	*Morus alba*	0	0	0	0	12.50	1.90
Native vegetation							
Humidicola grass	*Brachiaria humidicola*	8.30	0	0	0	0	1.90
Common Setaria	*Setaria sphacelata*	0	0	12.50	20.00	12.50	7.40
Napier grass[2]	*Pennisetum purpureum*	8.30	18.80	0	30.00	12.50	14.80
Carabao grass	*Paspalum conjugatum*	8.30	12.50	0	20.00	12.50	11.10
Amorseco	*Chrysopogon aciculatus*	8.30	0	0	0	0	1.90
Cogon grass	*Imperata cylindrica*	0	0	0	10.00	0	1.90
Red oat grass	*Themeda triandra*	0	0	0	10.00	0	1.90
As-is	*Ficus ulmifolia*	0	6.30	0	0	0	1.90
Itchgrass	*Rottboellia cochinchinensis*	0	0	12.50	0	0	1.90
Goosegrass	*Eleusine indica*	0	0	12.50	0	0	1.90

[1]Regions: II=Cagayan Valley, III=Central Luzon, IV-A=CALABARZON, X=Northern Mindanao, XI=Davao Region.
[2]Napier grass was established for a long time and had become a major component of the native vegetation.

distribution of rainfall in Cagayan Valley and Davao Region is conducive for the growth of 'Pakchong' resulting in high forage yield. In the flat and low-lying areas of Central Luzon, para grass (*Brachiaria mutica*), a waterlogged-tolerant and creeping grass was the most adaptable grass species and commonly utilized for the feeding of dairy cattle. Mulato II and Mombasa, on the other hand, were the common vegetation in the surveyed pasture in CALABARZON and Northern Mindanao. Mulato II and Mombasa were introduced forage species in the Philippines through the Philippines-New Zealand Dairy Program in 2013. These grasses have high dry matter yield, are drought-resistant, and have excellent nutritive value (Tropical Seeds, 2013). Signal grass (*Brachiaria decumbens*) was also a widespread improved grass in Northern Mindanao, occupying large areas formerly used in beef cattle ranch-type of operations. Signal grass is a high-yielding and low-lying grass that could withstand infertile soils. It is also highly palatable and could resist heavy grazing (Cook *et al*., 2005).

Among the legume fodder crops, kakawate was the most common in dairy farms in Cagayan Valley and Northern Mindanao. Kakawate could yield up to 16 t/ha in fodder plots and could resist pests and thrive in poor conditions (Wiersum and Nitis, 1992). Additionally, kakawate trees are widespread in the tropical conditions of the country which makes it a readily available feed source for dairy cattle. Ipil-ipil and calopo (*Calopogonium mucunoides*) were widely fed to dairy animals in CALABARZON. Feeding ipil-ipil leaves to cattle is a common practice in the province of Batangas where it is known to improve weight gain. This was attributed to the tannin content of ipil-ipil. Tannin could form complexes and precipitate protein so that it can be directly digested and absorbed in the small intestines escaping rumen actions (Hagerman, 2012). Centrosema and pinto peanut (*Arachis pintoi*) were the two most common forage legumes in Northern Mindanao during the survey. Centrosema is well well-suited for grazing animals and can also be mixed with other pasture crops. Pinto peanut is also an excellent forage for grazing animals and can thrive in a wide range of conditions (Cook *et al*., 2005).

For the native vegetation, napier grass was among the most utilized in surveyed farms in Central Luzon and Northern Mindanao. Napier had become a common component of native vegetation due to its ability to produce viable propagules which can invade arable land. This high-yielding grass is well accepted by the farmers in the country as it is very adaptable to tropical conditions and can regrow quickly after cutting. Humidicola (*Brachiaria humidicola*), napier and amorseco (*Chrysopogon aciculatus*) were the most dominant components of native vegetations in Cagayan Valley while common setaria and itchgrass (*Rottboellia cochinchinensis)* were the most prevalent species in CALABARZON.

Rice straw and corn stover were the most utilized crop residues for feeding across the five regions (Table 4). Brewer's spent grains, soya pulp, and rice bran were the common agro-industrial by-products. Ensiling was practiced in 37.0% of the surveyed dairy farms. Vitamins, minerals, and salt were used as feed supplements in 22.2%, 25.9%, and 25.9% of the surveyed dairy farms in five regions. Molasses as feed supplement was a customary practice in 35.2% of the surveyed farms.

In Cagayan Valley, rice straw and corn stover were the widely used crop residues for dairy cattle. Additionally, agro-industrial by-products such as rice bran and coconut pulp were common in this region. Many farmers practice ensiling to conserve feeds. Moreover, most farms (58.3%) give mineral supplements while only a few (8.3%) give vitamin supplements to their dairy animals. Since more than half of the dairy farms in this region feed

Table 4. Percentage (%) of participating dairy farms utilizing other feed resources in selected regions in the Philippines.

Variable	Region[1]					Total
	II	III	IV-A	X	XI	
Number of farms surveyed	12	16	8	10	8	54
Crop residues						
Banana by-products	0	0	12.50	10.00	37.50	9.26
Cassava by-products	0	12.50	12.50	10.00	0	7.40
Corn cobs	0	0	0	10.00	0	1.85
Corn stover	58.30	12.50	0	40.00	12.50	25.90
Mango rejects	0	0	12.50	10.00	0	3.70
Rice straw	66.70	25.00	25.00	20.00	25.00	33.30
Agro-industrial by-products						
Brewer's spent grains	0	6.30	50.00	50.00	50.00	25.93
Cacao pods	0	0	12.50	0	0	1.85
Coconut pulp	16.70	0	0	0	0	5.50
Copra meal	0	0	37.50	20.00	0	9.10
Corn bran	0	0	0	30.00	0	5.56
Fishmeal	0	6.25	0	0	0	1.80
Pineapple pulp	0	0	0	30.00	0	5.50
Rice bran	33.30	12.50	0	0	25.00	14.80
Soya pulp	0	75.00	37.50	10.00	0	29.63
Sugarcane tops	8.30	0	0	0	0	1.85
Conserved feed						
Silage	58.30	31.25	37.50	20.00	37.50	37.04
Feed Supplements						
Minerals	58.30	6.25	50.00	20.00	0	25.93
Vitamins	8.30	43.75	12.50	30.00	0	22.20
Salt	33.30	12.50	37.50	30.00	25.00	25.93
Molasses	75.00	12.50	50.00	30.00	12.50	35.19

[1]Regions: II=Cagayan Valley, III=Central Luzon, IV-A=CALABARZON, X=Northern Mindanao, XI=Davao Region.

silage, it is expected that these farmers use molasses. Moreover, Cagayan Valley is the second and third top producing region of rice and corn in the Philippines, (PSA, 2018). Hence, rice and corn by-products were widely utilized as an additional source of feed for dairy cattle and these by-products were typically conserved as silage.

In Central Luzon, cassava by-products and corn stover were the most common crop residues for feeds. While this region was among the lowest producing region for cassava (PSA, 2020) and corn (PSA, 2019) in the country, dairy farmers have been importing these

crop residues from different cassava and corn farms in Cagayan Valley. In Bulacan, soya pulp, the by-product from the soy factories in the province is commonly used as feed supplement in dairy cattle. Few dairy farms practice feed conservation through making silage. Vitamins were the most common feed supplement used by dairy farmers in this region.

Rice straw was the most utilized crop residue in CALABARZON dairy farms. Due to the dwindling pastureland in the region and the shortage of fresh green grass during the dry season, dairy farmers use rice straw because it is readily available and cheap alternative source for feeding ruminants. Molasses and urea were commonly added to the rice straw to improve its palatability and nutrient content. Brewer's spent grains were the most utilized agro-industrial by-product. Brewer's spent grain is a by-product of brewing and accounts for 85% of the total by-products from breweries (Reinold, 1997). Brewer's spent grains come from the breweries located in the provinces of Bulacan and Laguna. Meanwhile, copra meal and cacao (*Theobroma cacao*) pods were also fed to dairy cattle. About 50% of the surveyed farms use mineral supplements and molasses.

Since Northern Mindanao is the top corn-producing region in the country (PSA, 2018), feeding corn stover is a typical practice for dairy animals. Farms in this region also utilize brewer's spent grain since two big beer companies are in the area. Del Monte with its 25,000 hectares of pineapple plantations in Bukidnon provides an ample supply of pineapple pulp for dairy cattle farms in the region. However, most farms do not practice feed conservation such as ensiling. Only 20-30% of the farms, give feed supplements. The even distribution of rainfall throughout the year in this region minimizes the shortage of fresh forages during the dry months.

Feeding of rice straw and banana rejects to dairy cattle was customary on most dairy farms in the Davao Region. The biggest banana plantations for export were in Davao Region (PSA, 2020). Bananas rejected for export are being sold locally as feed for dairy animals ("Rejected bananas", 2006). The presence of large breweries in Davao City motivates dairy farms to include brewer's spent grains in the daily ration of their animals. Only a few farms give feed supplements to their animals.

Dairy farms from each region had diverse and distinct farm profiles, feed resources and feeding management systems. The differences in the geography, climate, access to technologies, and regional economy of the five regions were among the major factors that affect the diverse feed resources and feeding systems of the dairy farms included in the present study. The utilization of improved grasses, tapping of native vegetation and supplemental feeding of crop residues and agro-industrial by-products to meet the dry matter requirement and subsequent nutrient needs of the dairy animals are contributing factors that increase milk production. Conducting an in-depth study on the varied factors affecting production in dairy farms and their effects on the selection of feed resources and management systems could provide a thorough understanding of the feed profile of dairy farms in the Philippines.

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