

# Assessment of Husbandry Practices Affecting Milk Production in Dairy Cattle in Claveria Misamis Oriental

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**Abstract**—The increase in importation of dairy products in the country has put heightened pressure on the dairy industry. Dairy production is gaining popularity due to its demand, and links between production and sustainability need to be better understood and more widely documented. This study aimed to document the current strategies and operation practices adapted in farms within Claveria to assess dairy productivity. These consist of the management of farms, reproductive efficiency, and feed self-sufficiency of lactating dairy cows located in Claveria, Misamis Oriental. Farmers' high confidence in their income for diversification and growth creates a robust framework for dairy farms. Basic procedures were followed by grazing and feed management, making animal health a top priority for staff, according to training attended by owners and keepers. Most cows in Claveria, Misamis Oriental, will still be in production for the next 5-8 years, with some cows capable of calving 6-8 times. The records also show long calving intervals related to milk production time, and the results show that some cows were fed less than their MJME needed, and some cows were fed more than needed showed that there was. The various milk production systems investigated in this study differ in the size of inputs and outputs. Based on these results, one option might be that policymakers and development planners need to take the initiative to strengthen milk production systems for sustainable milk development.

**Keywords**—Dry cow, gestation, heifer, herd, open-days.

## I. INTRODUCTION

The Philippine government has prioritized the development of the dairy industry, which presents a significant opportunity for the industry's growth. Our country produces less than 1% of total annual milk production and imports the rest (P. A. Ang, 2017; Sevilla, 2021). This will help improve the Philippines' dairy industry to contribute to household livelihoods, food security, and nutrition. Milk offers comparatively fast returns for small-scale producers and serves as a vital source of cash revenue.

In various developing nations, limited genetic potential due to inadequate feed resources, disease, limited access to markets and services, and restricted milk output in dairy cows are prevalent issues. Dairy productivity in the Philippines was recorded to be 14,865 tons, the least milk-producing country among the top ten dairy producers in the world, which was considered the second largest country in terms of its population (Department of Agriculture, 2022). The herd of cows increased slightly due to the import of new cows and the increase in the number of births. The average Philippine milk

production per animal (8 liters/day) needs to be higher, mainly due to poor feeding and management practices, high production costs, and poor milk infrastructure, with a particular emphasis on improving the local supply of fresh milk. Dairy is the third largest agricultural importer after wheat and soybean meal (P. Ang, 2020). The Philippines, which will grow to approximately 109 million in the following year, is a large market for milk and dairy products. Filipino families are now spending Php—4000 per annum for dairy. Half of smallholder milk production goes to schools and community milk supply programs; the rest goes to local businesses or home consumption. However, dairy imports are expected to grow moderately over the next few years as economic activity begins to recover as the outbreak is contained. Historical evidence and data gathered over the years have highlighted the need to recognize the specific characteristics of dairy farms' various responses to their milk production trends. This is to ensure sustainable growth of the dairy industry by supporting farmers to meet milk quality and milking standards, with particular attention to factors that may affect fertility.

Moreover, further understanding and examination of these complexities are needed to support the success of these initiatives. A comprehensive survey on dairy production will be developed and will be carried out to assess husbandry practices and elements that may influence animal welfare and productivity. As such, this study can provide a helpful reference on current practices in various aspects of dairy farms, including genetics, nutrition, and management practices in dairy farms.

## II. MATERIALS AND METHODS

### A. Setting

The study was implemented for two (2) months in the identified Commercial Dairy Farms in the Municipality of Claveria, Misamis Oriental, based on the Farm Classification stipulated by the Philippine Statistic Authority (PSA). The dairy cattle farm must tend at least 21 heads of adults and zero heads of young, tending at least 41 heads of young adults or at least 10 heads of adults and 22 heads of young. A survey was developed and implemented to assess dairy production practices and factors that included questions regarding six aspects of each dairy operation: farm profile, farm

management, herd size, reproductive management, farm reproductive performance, and feeding management.

#### *B. Sampling method*

The identification of the survey respondents was predetermined according to the list of dairy farms in Claveria, Misamis Oriental, by the National Dairy Authority (NDA) Region X. Slovin's formula was used to determine the sample size (Adam, 2020). Respondents interviewed were the farm managers or owners, whosoever of the two was available during the interview. Identified respondents were considered the most knowledgeable in the farm regarding management practices, milk production, reproductive traits, and performances, as well as the feeding management practices. This survey was delivered to each dairy farm within Claveria, Misamis Oriental. Data was collected through face-to-face interviews with farmers, followed by an inspection of the production environment, dairy cows on dairy farms, and a review of the farm records.

#### *C. Research instrument*

A semi-structured pen-and-paper questionnaire was used in the study. The survey questionnaire was translated to Bisaya for a proper understanding of the survey instrument when explained to the respondents. The questionnaires comprised three (3) sections: The preliminary page will comprise a consent form and the socio-demographic profiles, followed by the farm management practices, reproductive performance of dairy cattle, and feeding and nutrition.

#### *D. Data gathering procedure*

The interview took place for two (2) months, starting from the distribution of letters asking for permission to conduct a survey in their respective dairy farms. This was followed by farm visitations to facilitate the credibility of the survey questionnaire, especially in the feed requirement of the dairy farms in Claveria, Misamis Oriental. The research team measured the cow's body weight, liters of milk produced, and the cow's activity. Regarding the feed provided to the lactating cows, the amount of each type of feed given and the nutrient composition of each type of feed were identified. For the pasture evaluation, average pasture cover (APC) was determined using the dry matter yield of the farm pasture area. A document review was done to verify the data for the reproductive traits and performance.

#### *E. Data collection quality control*

Prior to the interview proper, the survey instrument was subjected to pre-testing with five (5) dairy farms in Northern Mindanao to validate the ease of comprehension understanding and determine the time allotment needed per respondent during the survey proper. Further instrument refinement was done after the pre-testing prior to final reproduction. During the conduct of the survey, the procedure was implemented by the enumerators as training was done. Clearing and de-briefing sessions were conducted as often to clarify pending questions, and such that the interview team gathered all the required information. The researchers did observation on the first interview with the enumerators.

The survey instrument was administered by the enumerators linguistically capable of speaking in the translated language. The team leaders conducted 100% supervision and independent on-the-spot checking during the interview schedules to ensure the quality of data gathering. The enumerator double-checked accomplished questionnaires before leaving the site to evaluate the consistency and proper filling-up of the questionnaires, ensuring the data quality.

#### *F. Data processing and analysis*

The survey result was processed, consolidated, tabulated, and analyzed using exploratory data analysis (EDA). The statistical test also included the means, frequency counts, ranking, and percentage data.

### **III. RESULTS AND DISCUSSION**

#### *3.1 Farm profile*

Table 1 shows the average total dairy farm area (ha) in Claveria Misamis Oriental. Currently, the municipality has seven (7) dairy farms, mostly (28.6%) owning 0-1 and 6-7 hectares of total land area with an estimated average of 30 to 50 heads (Table 6) of total inventory present in the farm. However, 14.3% declared ownership of 2-3 and 4-5 hectares of total dairy farm area with an average of 5 to 10 heads (table 6) of dairy cattle. This suggests that small-scale dairy farms prevailed in the municipality of Claveria, Misamis Oriental.

Regarding the number of employees engaged in the dairy farm, 42.9% of dairy farm owners interviewed stated that 2-5 persons were employed and working on the daily operation of the dairy farms. Moreover, 14.3% declared 6-7 employees currently working on the success of dairy farm operations composed of dairy farm assistants, staff, and trainees.

TABLE 1. Total dairy farm area and number of employees of dairy farms in Claveria, Misamis Oriental

Category	Total Dairy Farm Area (% n=7)	
	Farm Size (ha)	No. of Employees
0-1	28.6	-
2-3	14.3	42.9
4-5	14.3	42.9
6-7	28.6	14.3
8 and above	14.3	-
Mean	20	33.3

As presented in Table 2, the total dairy farm owners interviewed knew about dairy farming (100%) before engaging in the booming milk industry in the Philippines. They affirmed the preceding information on the operations and system of dairy farming. Most dairy farms interviewed had attended training on dairy farm operations, milking procedures, breeding techniques, postharvest and marketing of milk produced, and other topics related to dairy farming. Regarding permits, licensing, and certifications for the legitimacy of dairy farms, 71.4% of dairy farms complied with a business permit. This essential document entitles and enables a dairy farm to operate legally. However, 28.6% still needed to be entitled to legalities in dairy farm operations, for they do not have business permits. Thus, 85.7% of dairy farms interviewed have licenses, and only 14.3% still need the certification to operate thoroughly.

Most dairy farms in Claveria Misamis Oriental do not have a certification in the Animal Welfare Act (57.1%). Accordingly, 42.9% of dairy farm owners interviewed owned and certified with Republic Act No. 8485, The Animal Welfare Act of 1988 (Kayaban, 2013). Regarding the principle and minimum requirements for dairy farming, 57.1% acknowledged the code of Good Animal Husbandry minimum requirements, and 42.9% did not comply with GAH code in the operation of dairy farms in the Municipality of Claveria Misamis Oriental. The Environmental Compliance Certificate (ECC) related to dairy farming is being provided by the Department of Environmental and Natural Resources (DENR). It is being granted to dairy farms in compliance with environmental management. Thus, in Claveria Misamis Oriental, 42.9% of dairy farms have complied and been granted this certification, and 57.1% were not yet granted however they already processed and some were waiting for the result of inspections in granting such certification.

TABLE 2. Prior knowledge, Business Permit, License to Operate, Animal Welfare Act, Good Animal Husbandry and Environmental Compliance Certificate Dairy Farms

Category	Prior Knowledge and Licenses of Dairy Farms (% n=7)					
	PKDF	BP	LO	AWA	GAH	ECC
Yes	100	71.4	85.7	42.9	57.1	42.9
No	-	28.6	14.3	57.1	42.9	57.1

PKDF=Prior Knowledge in dairy farming; BP=Business Permit; LO=License to operate; AWA=Animal Welfare Act; GAH=Good Animal Husbandry; ECC=Environmental Compliance Certificate

### 3.2 Farm management

Table 3. survey identified the main influences on why farmers in Claveria, Misamis Oriental engage in dairy farming. Farmers' high confidence in their income for diversification (28.6%) and growth (28.6%) creating a solid framework for dairy farms. Although respondents said they were less dependent on dairy farms as a source of food (14.3%), their passions (14.3%), and trust (14.3%), their commitment still represented opportunities that could be optimized for farmers.

TABLE 3. Reasons for Engaging in Dairy Farms in Claveria, Misamis Oriental

Category	Reasons For Engaging in Dairy Farm (% n=7)
Increase Income	28.5%
Food security	14.3%
Diversify income source	28.6%
Passion for animals' husbandry	14.3%
Believer of the dairy industry	14.3%

TABLE 4. Benefits offered by dairy farms in Claveria, Misamis Oriental

Category	Benefits Offered (% n=7)
Paid vacation	18.2%
Employee-owned cows	9.1%
Accommodation	36.4%
Profit-sharing	18.2%
Health insurance	18.2%
Share of calves	18.2%
Salary	18.2%

Table 4. highlights the main benefits offered to dairy farm employees strongly influenced by non-wage benefits. Accommodation (36.4%) was the most popular offer, followed by paid holidays, profit sharing, health insurance, calves split, and salary (18.2%).

Personnel training is indispensable to reduce managerial drift (Mills et al., 2021). Table 5 showed the training attended by the owner/manager, caretaker/milker, and staff in dairy farms. A list of five major dairy components were determined. The results revealed that even in the most popular training areas, there needed to be more. Basic procedures came first, followed by grazing and feed management, with animal health being the top priority for staff, according to the results of a training course attended by owners and keepers. Therefore, advisory bodies and training should pay special attention to health care and feeding, especially owners and managers. This is because it can become more valuable and essential for every dairy farm to improve.

TABLE 5. Training Attended by Owner, Caretaker, and Staff in Dairy Farms in Claveria, Misamis Oriental

Category	Trainings Attended by Owner/Manager (% n=7)		
	Owner	Caretaker	Staff
Basic Procedure	36.4%	40.0%	20.0%
Pasture and Forage	36.4%	30.0%	10.0%
Feeding	18.2%	20.0%	30.0%
Animal Health	9.1%	10.0%	40.0%

### 3.2 Farm herd size

Table 6 shows that 42.9% of the farms raised only 1-3 heads of newborn calves, while 28.6% raised 8-9 heads of young calves. Most farms raised 8-9 heads of replacement heifer (28.6%), and 71.4% of the dairy farms in Claveria, Misamis Oriental have no breeder bull raised. This indicates that the farm relies on the Artificial Insemination breeding program services by the National Dairy Authority (NDA). When looking at the spatial distribution of cattle in the farm, 14.3% of the farm-raised 28-29 heads of milking cows and 28.6% of 8-9% of dry cows. Knowing the herd size prevents the possible problems regarding feed shortage, overcrowding, and appropriate workforce ratio to animals (Dallago et al., 2022).

TABLE 6. Herd size newborn calf, young calf, replacement heifer, milking cows, dry cows, and breeder bull of dairy farms in Claveria, Misamis Oriental

Number Heads	Herd Size of Dairy Farms (% n=7)					
	NBC	YC	RH	MC	DC	BB
0	28.6	-	-	-	14.3	71.4
1 - 3	42.9	28.6	-	-	28.6	28.6
4 - 5	14.3	-	28.6	-	28.6	-
6 - 7	-	14.3	-	14.3	-	-
8 - 9	-	14.3	28.6	28.6	28.6	-
10 - 11	14.3	28.6	14.3	-	-	-
14 - 15	-	-	14.3	14.3	-	-
16 - 17	-	-	-	14.3	-	-
18 - 19	-	-	14.3	14.3	-	-
20 - 21	-	14.3	-	-	-	-
28 - 29	-	-	-	14.3	-	-

NBC=New Born Calf; YC=Young Calf; RH=Replacement Heifer; MC=Milker Cows; DC=Dry Cows; BB=Breeder Bull



The Philippines' dairy sector has been recognized and yet sufficiently developed. Mostly, small-scale dairy farms had five to ten cows in the herd. Table 7 shows a five-year goal and prospects of additional herd size of the dairy farms in Claveria Misamis Oriental according to the age classifications of dairy cattle. For newborn calves, 57.1% of dairy farmers intend to have less than five heads, 28.6% for eleven to fifteen heads, which could be a good number of heads for future replacements in herd size, and at least 14.3% stated an additional sixteen to twenty heads. Hence, a calf is anticipated to increase herd size in five years with 42.9% of less than five to fifteen heads, which can be a worthy source of income generating that can be sold as a live weight. The least anticipated of dairy farmers is six to ten heads, with 14.3%. Likewise, a heifer is a suitable replacement for cow milkers. However, 28.6% of dairy farmers interviewed affirmed that they only need less than five to fifteen heads as an additional concurrent to their present number in herd size.

Moreover, 42.9% of dairy farmers assume an additional sixteen to twenty heads of cow milkers, wherein these dairy farms currently own only six to seven heads. Accordingly, commercial dairy farms (28.6%) currently having a good number of heads of cow milkers stated they only need less than five heads of cow milkers as an additional in herd size, and 14.3% of dairy farmers need at least six to ten heads of cow milkers in five years. Lastly, in totality (100%), dairy farmers interviewed only need less than five head/s of bull present in their dairy farm for natural breeding.

TABLE 7. The five-year goal for an additional herd size of the Dairy Farm in Claveria, Misamis Oriental

Classification of Herd	Five-Year Goal – Additional Herd Size (%, n=7)			
	<5	6-10	11-15	16-20
New Born Calf	57.1	-	28.6	14.3
Calf	42.9	14.3	42.9	-
Heifer	28.6	28.6	28.6	14.3
Cow Milklers	28.6	14.3	14.3	42.9
Bull	100	-	-	-

### 3.3 Farm reproductive performance

The recommended age for first heifer breeding is 13-15 months (Heinrichs & Lammers, 1998). Table 8 showed that there were only 1.82% of the present milking cows in Claveria, Misamis Oriental, were able to breed at 13-16 months, and 40% of them were being bred at more than 37 months old. On the other hand, the recommended age at first calving is from 24-26 months old. However, only 9.09% of the present milking cows in Claveria, Misamis Oriental, were able to calve at the age of 25-28 months old. 76.36% of the present milking cows in Claveria, Misamis Oriental, were able to calve at more than 37 months old. The older the heifer is at her initial calving, the fertility may be adversely impacted, and the likelihood of culling tends to be high.

Table 9 showed that 39.39% of cows in Claveria, Misamis Oriental, calved 1-2 times, and 36.36% calved 3-5 times. This implies that most of the cows in Claveria, Misamis Oriental, were still in production for the next 5-8 years. An increase in parity enhances milk production, body condition decline during early lactation, and the possibility of periparturient

disorders and culling due to reproductive failure in dairy herds (Lee and Kim, 2006). The data also showed that 24.24% of cows could calve at 6-8 times. Their calf would be a great candidate for a replacement heifer as their mother shows good reproduction performance in terms of parity.

TABLE 8. Age at first breeding and age at first calving of milking cows in Claveria, Misamis Oriental

Months	First Breeding and Calving Age of Milking Cows (%, n=55)	
	Age at First Breeding	Age at First Calving
<12	-	-
13-16	1.82	-
17-20	10.91	-
21-24	5.45	-
25-28	16.36	9.09
29-32	10.91	9.09
33-36	14.55	5.45
>37	40.00	76.36

An optimum calving interval of 11 to 13 months has been suggested in various studies to maximize the number of peak lactations that a cow achieves during its productive life. Table 9 showed that only 32.65% of the cows in Claveria, Misamis Oriental, could calve at 11-13 month intervals. 2.04% of cows could be calved at 9-10-month intervals. This 2.04% cows could not render its recommended Voluntary Waiting Period (VWP) of 60 days. Data also shows a long calving interval of cows in Claveria, Misamis Oriental. This indicates that achieving the goal of one (1) calf per cow per year takes much work.

TABLE 9. Total calving and calving interval of the cows in Claveria, Misamis Oriental

Category	Total Calving and Calving Interval of Cows (n=66)	
	Total Calving (%)	Calving Interval (%)
1-2	39.39	-
3-5	36.36	-
6-8	24.24	-
9-10	-	2.04
11-13	-	32.65
14-16	-	32.65
17-19	-	16.33
>20	-	16.33

Those cows have an average number of days open from calving to conception. The recommended days open for dairy cattle is only 60 – 90 days (Toledo-Alvarado et al., 2021). However, there were only 12.50% (Table 10) cows in Claveria, Misamis Oriental, with 55-90 days pregnant after calving, and 50% of the cows were still open at more than 161 days, as shown in Table 10. This data supports the long calving interval (Table 9) of cows in Claveria, Misamis Oriental.

TABLE 10. Days open after calving of cows in Claveria, Misamis Oriental

Category	Days Open of Cows (%, n=66)
<54	6.25
55-90	12.50
91-125	25.00
125-160	6.25
>161	50.00

The recommended lactation length for dairy cattle is 270-305 days (Williams et al., 2021). Replacing a shorter lactation with a more prolonged lactation would reduce the total number of parturitions. Table 11 shows that only 17.39% of the cows in Claveria, Misamis Oriental, could render a recommended length of producing milk, and 52.17% of cows extend up to more than 376 days of lactation period. This data was associated with the days open and long calving interval of the cows in Claveria, Misamis Oriental, as there is no need to stop the lactation period of the cows for drying-off. Another area of concern arises from the fact that the capacity of cows to lactate beyond the standard 305-day lactation differs among individual animals. Within the lactation length, only 1.52% (Table 12) of cows in Claveria, Misamis Oriental, produce only 1-3 liters of milk, and 53.03% produce 7-9 liters. With the Philippine daily milk production of 10 liters, 22.73% of cows in Claveria, Misamis Oriental, produce 10-12 liters of milk.

TABLE 11. Lactation length of cows in Claveria, Misamis Oriental

Days	Lactation Length of Cows (% , n=66)
<269	2.17
270-305	17.39
306-340	15.22
341-375	13.04
>376	52.17

TABLE 12. Liters of milk production of cows in Claveria, Misamis Oriental

Volume (L)	Milk Production of Cows (% , n=66)
1-3	1.52
4-6	22.73
7-9	53.03
10-12	22.73

### 3.3 Farm feeding management

Table 13 shows the Mega Joules Metabolizable Energy (MJME) requirement of milking cows in Claveria, Misamis Oriental. 68.89% of the milking cows require 101-150 MJME, while only 6.67% require less than 100 MJME. MJME requirement of the cow is influenced by the weight, BCS, activity, pregnancy, and milk production (Morris & Smeaton, 2017). With the present milking cows in Claveria, Misamis Oriental, 24.44% require MJME of 151-200. However, data shows that 100% of feed offered to the milking cows in Claveria, Misamis Oriental, contains less than 100 MJME only. This led to the result in Table 14, where 93.33% of the milking cows were fed less than the required MJME, and only 6.67% were fed more than required. This result would imply that 53.03% of milking cows produce only 7-9 liters of milk (Table 12) in Claveria, Misamis Oriental could produce more milk if fed with sufficient feed requirement.

TABLE 13. Feed requirement and feed offered of milking cows from the different Dairy Farms in Claveria, Misamis Oriental

Category	Feed Requirement and Feed Offered to Milking Cows (% , n=45)	
	Feed Requirement (MJME)	Feed Offered (MJME)
<100	6.67	100
101-150	68.89	-
151-200	24.44	-

TABLE 14. Feed sufficiency level of milking cows in Claveria, Misamis Oriental

Category	Sufficiency Level of Milking Cows (% , n=45)
Deficient	93.33
Sufficient	0.00
Surplus	6.67

## IV. CONCLUSION

The results showed that each farm in Claveria, Misamis Oriental, had different inputs and outputs. Farmers' high confidence in their income for diversification and growth creates a robust framework for dairy farms. Fringe benefits heavily influenced the most important social benefits for dairy farms. Accommodation was the most popular offer, followed by paid vacation, profit sharing, health insurance, calf tips, and salary—significant influences why farmers in Claveria, Misamis Oriental, engage in dairy farming. Staff training is essential to reduce management drift; even the most popular training areas need improvement. Basic procedures were followed by grazing and feed management, making animal health a top priority for staff, according to training attended by owners and keepers. Most cows in Claveria, Misamis Oriental, will still be in production for the next 5-8 years, with some cows capable of calving 6-8 times. It was also pointed out that there were few cows of recommended breeding age. The records also show long calving intervals related to milk production time, and the results show that some cows were fed less than his MJME needed, and some cows were fed more than needed. Showed that there was. The milk production systems investigated in this study differ in the size of inputs (feed, labor, etc.) and outputs (milk, etc.). The degree of reinforcement and the possibility of providing input and support play a prominent role. Based on these results, one option might be that policymakers and development planners need to take the initiative to strengthen milk production systems for sustainable milk development. However, it should be considered that farmers must apply new cost-saving management strategies. Farm owners and employees should take initiatives to reform training arrangements for health care and feeding, inputs, and facilitating access to yield-enhancing technologies in each production, which will help reduce costs and improve production.

### Declarations

- ✓ *Availability of data and materials.* All data generated or analyzed in this study are included in this article.
- ✓ *Conflict of Interest:* Dairy farms in Claveria did not have concrete farm records.
- ✓ *Funding.* University of Science and Technology of Southern Philippines-Claveria
- ✓ *Authors' contributions.* All authors have contributed to the study from conceptualization, data gathering, analysis, and interpretation. All authors read and approved the final manuscript.

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