



Article Socio Economic Impacts of Insufficient Cow Milk Production in Mauritius

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

Aims: Due to the increase in purchasing power, milk and dairy products have increased steadily in recent years. However, milk production remains insufficient to satisfy the high local demand for milk and dairy products in Mauritius. Adding to the problem of the sector's extinction is the lack of information on the socio-economic impact of dairy production. This study aimed to assess the socio-economic impact of milk production on dairy cattle farms in Mauritius.

Methodology: A survey was carried out among 11 respondents in Mauritius, using a validated two-part questionnaire to collect data from dairy farmers and processors.

Results: The survey showed that the majority of dairy farmers were ethnic Hindus with secondary (77.8%) or university (22.2%) education. The breeds of cattle raised are generally Creole (56%) and Friesian (44%) with extensive livestock farming being practised. For the majority (77.8%) of

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respondents, family members are the primary source of labour. The main purpose of raising cattle is to produce milk (55.5%). The price of a litre of milk varies between dairy farmers, ranging from Rs 45 to Rs 70 per litre, with an average of Rs 58 per litre, and the revenue per cow per day averages Rs 1.036. About cheese production, the source of acquisition of cheese production technology is apprenticeship. From an economic point of view, with regard to yield, cost of production and profit margin for cheese production, we were faced with a total refusal of response from the producers. However, the quantity of milk used per day, the quantity of cheese obtained and the unit price per kg of cheese vary from one producer to another.

Conclusion: This study has led to the realization that milk is the source of livelihood for the farmer and his family but also for other consumers. The income from the sale of milk contributes to the purchase of food for the farmer's household and livestock supplements. However, the size of the herd and the low production of milk are an obstacle to the development of this sector.

Keywords: Mauritius; socio-economic impact; dairy Products; dairy Farm; livestock.

1. INTRODUCTION

Milk is an essential food in the human diet, it is a biological fluid collected from mammals, mainly dairy cows. The majority of the 6 billion milk consumers are represented by developing countries [1]. There is a significant rate of growth here and elsewhere, and a production increase of 2% a year would be needed to meet demand [2]. Although overall milk production is increasing over the years, in underdeveloped countries it is mainly due to an increase in the number of dairy cows.

In Mauritius the number of dairy cows has declined alarmingly, from around 40,000 in 1973 to 14,000 in 1995 [3] and from 6,934 in 2006 to 6,041 in 2014 [4]. The main causes of this decline are nutrition and reproductive constraints, and the exodus of labor to the expanding industrial sector. It is also linked to the reduction in space available for livestock due to the continued expansion of built-up areas. Cattle rearing on small village farms in Mauritius is a family affair and generally a part-time activity. Small farms have between 1 and 4 cows per household.

Due to rising purchasing power, demand for beef, milk and dairy products has increased steadily in recent years. However, the self-sufficiency rate for fresh milk and beef is only around 4% respectively. As a result, milk production remains insufficient to satisfy the high local demand for milk and dairy products. Adding to the problem of the sector's extinction is the lack of information on the socio-economic impact of dairy production. With this in mind, and given the multitude of questions that arise, we set out to find out: what is the socio-economic impact of milk production on dairy farms in Mauritius?

2. MATERIALS AND METHODS

2.1 Scope of the Study

The study was carried out in Mauritius, specifically in the nine districts it comprises, namely: Port Louis, Pamplemousse, Moka, Flacq, Rivière du rempart, Black River, Grand Port, Savane and Plaines Wilhems. With a surface area of 1,865 km², Mauritius is an island of the Republic of Mauritius, in the Mascarene archipelago. It is located in the south-western Indian Ocean. Mauritius is 65 km wide and 45 km long (Mauritius Tourism Portal, 2020). There are 5 major towns: Beau Bassin/Rose-Hill, Curepipe, Quatre Bornes, Vacoas/Phoenix, and Port-Louis, the capital in the northwest of the island (Mauritius Tourism Portal, 2020). Fig. 1 shows the geographical location of Mauritius.

2.2 Sampling

A pre-established and validated two-part questionnaire was used to collect data from cow's milk producers and processors. A producer questionnaire (breeders) and a milk processor questionnaire. The producer questionnaire focused on breeders (socio-cultural status), herds (structures) and milk production. The processor questionnaire focused on the origin of processed milk, processing technology and income from milk sales. A total of 11 people were surveyed, i.e. 8 breeders and 3 processors. Fig. 2 shows the proportion of farmers surveyed by district. Processors were surveyed in Nouvelle Decouvert, Belle Riv and Curpipe.

2.3 Methods

Based on field surveys, this study was carried out to understand the socio-economic and

technological characteristics of cow's milk production and processing.

The study, divided into three phases, involved semi-structured interviews based on a questionnaire and the observation of players at work. These phases are the exploratory phase, the data collection phase, and the data analysis and processing phase.

2.3.1 Exploratory phase

This stage identified the various milk production and processing zones in Mauritius. The identification of these different zones will be possible thanks to information gathered from resource persons, but also thanks to documentary research.

2.3.2 Data collection phase

The second phase consisted in sending a questionnaire to various cow's milk producers and processors in the different districts of Mauritius. Respondents were selected on the basis of their willingness to cooperate. The individual survey was carried out using the snowball method developed by Goodman in 1961 [5] and involved a total of 11 respondents, i.e. 8 breeders and 3 processors.

2.3.3 Data analysis and processing

Data collected in the field after analysis, were processed with Excel 2016 spreadsheet to perform descriptive statistics calculations. MiniTab 2018 statistical software was used to analyze the survey data. The significance level used is 5% ($p < 0,05$).



Fig. 1. Geographical location of Mauritius
 (Source: map of the Republic of Mauritius)
 (Géographie de Maurice — Wikipédia (wikipedia.org))

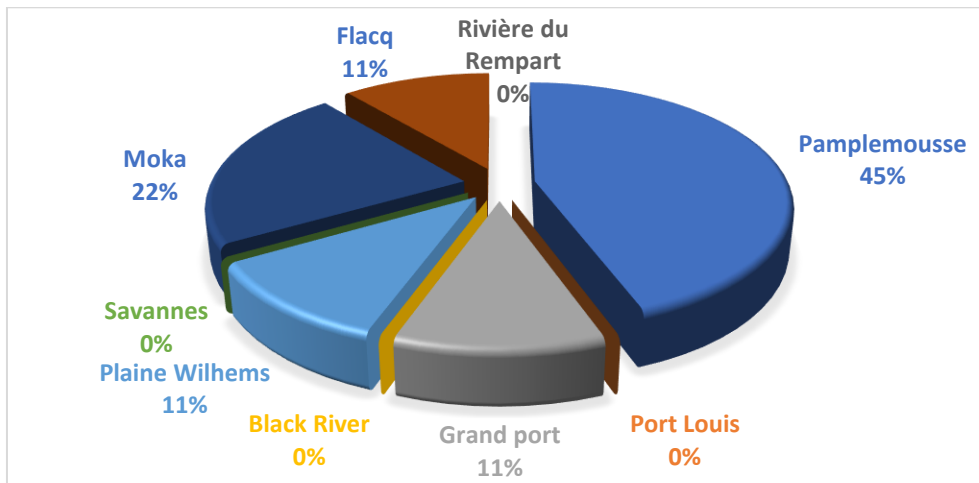


Fig. 2. Proportion of farmers surveyed by district

3. RESULTS

3.1 Characteristics of Dairy Farms in Mauritius

3.1.1 Social status of farmers (surveyed)

The variables considered were gender, ethnicity, level of education, family decision-making level, main activity and membership of a breeder group. Table 1 presents the proportions of the modalities of these different variables.

Table 1 shows that all the breeders surveyed were of Hindu ethnicity (100%) and all male, with secondary (77.8%) or university (22.2%) education. All respondents (100%) were livestock

farmers, and over 55.5% were members of a livestock association. A further 44.4% do not belong to any association.

3.1.2 Cattle breeds

Fig. 3 shows the cattle breeds reared in the districts of Mauritius. The figure shows that the majority of cattle breeds are Creole (56%). However, the remaining 44% are attributed to the Friesian breed.

3.1.3 Animal acquisition

Fig. 4 shows how cattle are acquired. The figure shows that, alone or in combination, inheritance and purchase are the main methods used to acquire livestock.

Table 1. Social status of respondents

Variables	Terms	Size	Percentage
Gender	Male	9	100
	Female	0	0
Ethnicity	Hindou	9	100
	Muslim	0	0
	Creole	0	0
Level of Education	Primary	0	0
	Secondary	7	77,8
	Unversity	2	22,2
	None	0	0
Main activity	Livestock	9	100
	Agriculture	0	0
	Trade	0	0
	Livestock and trade	0	0
	Other :	0	0
Member of Livestock association	Yes	5	55,5
	None	4	44,4

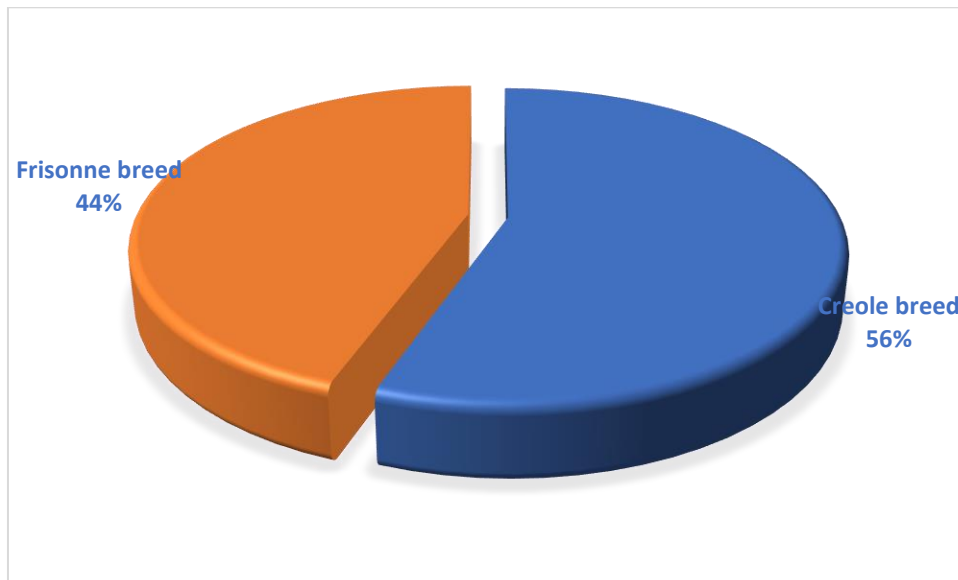


Fig. 3. Cattle breeds

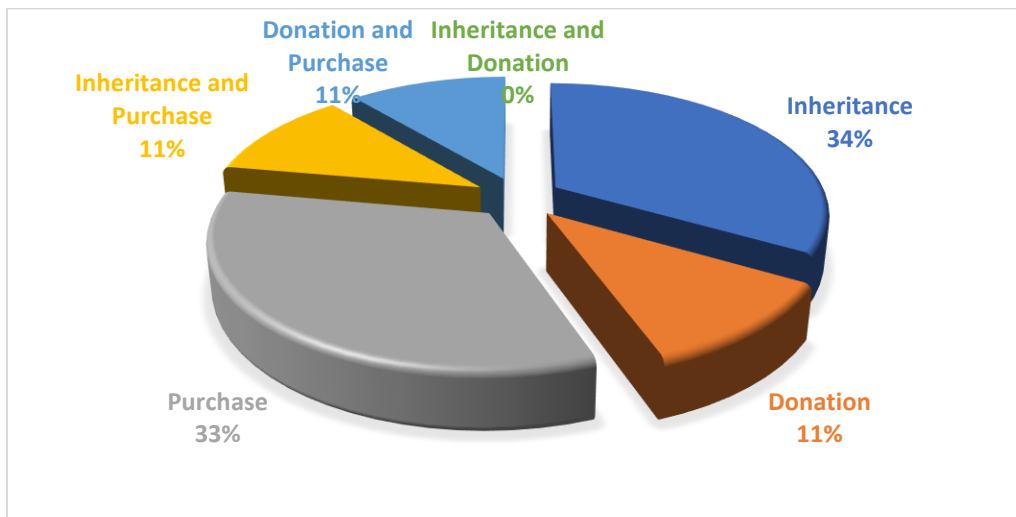


Fig. 4. How animals are acquired

3.1.4 Breeding practices

Table 2 shows the different breeding practices, i.e. the link between the breeder and the herd in the production process.

Table 3 shows that cattle farming is predominantly extensive (66.7% of respondents). In terms of management practices, cattle are mostly managed alone without any other association (55.5%), or in association with sheep (22.2%), goats (11.1%) and others (11.1%). For the most part (77.8% of those surveyed), the source of labor is the family. Cattle are mainly raised for purposes such as milk and meat production, and for other purposes such as

biofertilizer production, in proportions of 55.5%, 22.2% and 22.2% respectively. From this it is clear that the main objective of cattle breeding is milk production (55.5%).

3.2 Milk Production

3.2.1 Milking

Milking is mostly manual, and is carried out by the whole family (86%) for the majority of respondents, and only by men (14%) for a minority, as shown in Fig. 5. Milking is carried out twice a day, in the morning and evening, by all respondents.

Table 2. Breeding practices

Variables	Terms	Size	Percentage
Breeding methods	Extensive	6	66,7
	Intensive	3	33,3
Association conduct	Sheep	2	22,2
	Goats	1	11,1
	Other:	1	11,1
	None	5	55,5
Workforce	Family	7	77,8
	Employee	0	0
	Family and employee	2	22,2
Speculation	Milk	5	55,5
	Meat	0	0
	Mixed	2	22,2
	Other :	2	22,2

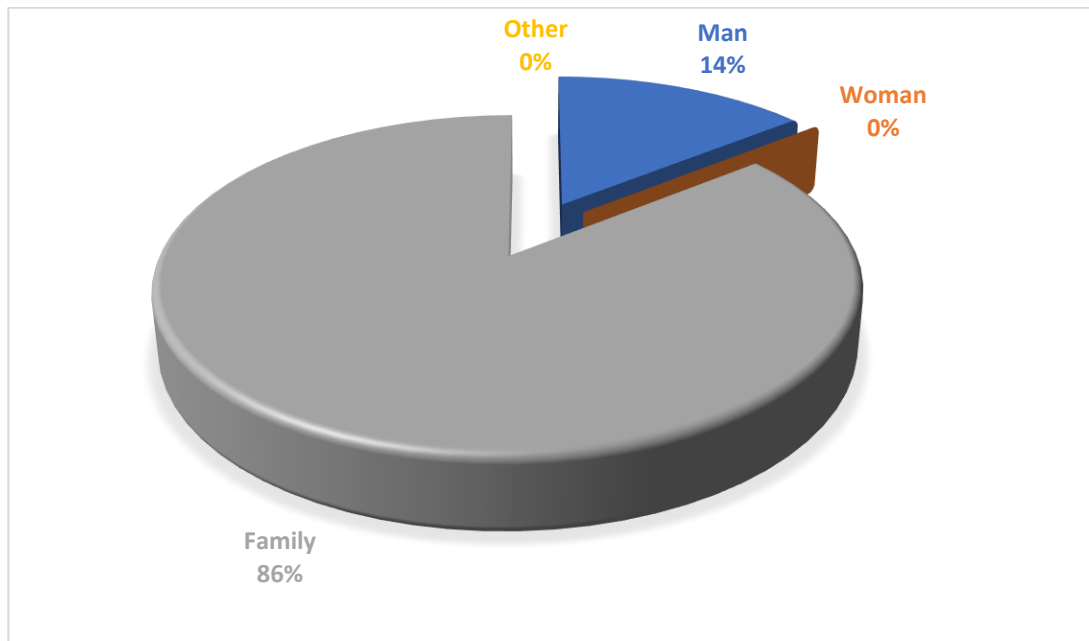


Fig. 5. Milking practice

3.2.2 Quantity of milk produced per day

According to the information gathered, the quantity of milk produced per cow per day varies according to the season and the breed of cattle. Daily milk production per rural community can be estimated by averaging milk production between the two seasons.

3.3 Milk Sales

3.3.1 How and where milk is sold

When it comes to selling milk, all the respondents use the liter as a reference. So they sell milk according to the quantity required by the

buyer. Milk producers sell their herd's milk either directly from the farm to the local village or to hotels.

3.3.2 Form of milk sold

All respondents sell fresh milk (100%).

3.3.3 Economic analysis of milk production: potential income from milk production

This concerns the monetary value of milk production per cow per day. It is estimated by multiplying the average daily milk production per cow (in liters) by the cost per liter for each respondent (Table 3).

Table 3. Potential income per cow per day

District	Quantity of milk produced per cow (L)	Cost per litre of milk (Rs)	Potential income (Rs)
Moka	10	60	600
Flacq 1	10	60	600
Plaine Wilhems	10	70	700
Flacq 2	20	45	900
Pamplemousse 1	10	70	700
Pamplemousse 2	30	45	1350
Grand port	40	60	2400
Avarege	15	58.57142857	1035.714286

This table shows that the average income a dairy farmer can earn from milk production per cow per day is Rs 1036 (ranging from Rs 600 to Rs 2400).

3.4 Characteristics of Milk-to-Cheese Processors in Mauritius

3.4.1 Social status of cheese producers

During our survey we were able to meet only two (02) cow's milk cheese producers. The variables considered were gender, ethnicity, level of education and main activity. Table 4 presents the proportions of the modalities of these different variables. Table 5 shows that all the farmers surveyed were of Hindu ethnicity (100%) and all were female, with secondary (50%) or university (50%) education, aged 30 and 44 respectively.

They collect the milk from their herds and use it to make cheese, which they sell to hotels or home delivery. Their main activity is the production of cow's milk cheese.

3.4.2 Source of cheese production technology acquisition

Analysis shows that 100% of respondents had acquired this technology through apprenticeship. Fig. 6 illustrates the distribution of respondents according to the source of technology acquisition.

3.4.3 Knowledge of cheese-producing regions

The analysis of this figure shows that most of the producers had knowledge of certain areas or met other cheese producers. But we faced a refusal on their part for the indication of these areas.

3.4.4 Cheese production and whey fate

For all those surveyed, cow's milk cheese production was carried out by the farmers themselves, usually in the form of a small family business. The survey revealed that the whey obtained after cheese production was used to feed pets.

3.4.5 Socio-economic organization

- Yield, cost of production and profit margin

With regard to the results of the survey on yield, cost of production and profit margin in cheese production, we were faced with a total refusal to respond from producers in two localities in the Moka district.

- Quantity of milk used, cheese obtained and unit price

Table 5 shows the results obtained in relation to the quantity of milk used per day, the quantity of cheese obtained and the unit price per kg of cheese. Analysis of this table shows that the unit price was higher at Belle rive than at the Nouvelle decouverte at the 5% threshold. On the other hand, there was no significant difference at the 5% threshold between the quantities of milk used and the cheeses obtained during the day in the two zones.

4. DISCUSSION

4.1 Characteristics of Dairy Farms in Mauritius

4.1.1 Breeders' social status

The majority of the breeders surveyed were Hindus (100%), similar to the results obtained by Tou (2006) and Habonimana (2013), who found

that the majority of breeders in Senegal belonged to a single ethnic group (Peulhs). This confirms the fact that the cow is very important in the lives of Hindus. As the cow is considered a divinity by Hindus, cow breeding is seen as a sign of wealth and power.

Most of the breeders surveyed had a secondary education. Less than 23% had a university education. This may be linked to the fact that, for Hindus, dairy farming is a full-time activity, mostly carried out within the family and passed on from an early age.

Table 4. Social status of respondents

Variables	Terms	Size	Percentage
Gender	Male	0	0
	Female	2	100
Ethnicity	Hindou	2	100
	Muslim	0	0
	Creole	0	0
Level of Education	Primary	0	0
	Secondary	1	50
	Unversity	1	50
	None	0	0
Main activity	Cheese producer	2	100
	Agriculture	0	0
	Trade	0	0
	Livestock and trade	0	0
	Other :	0	0

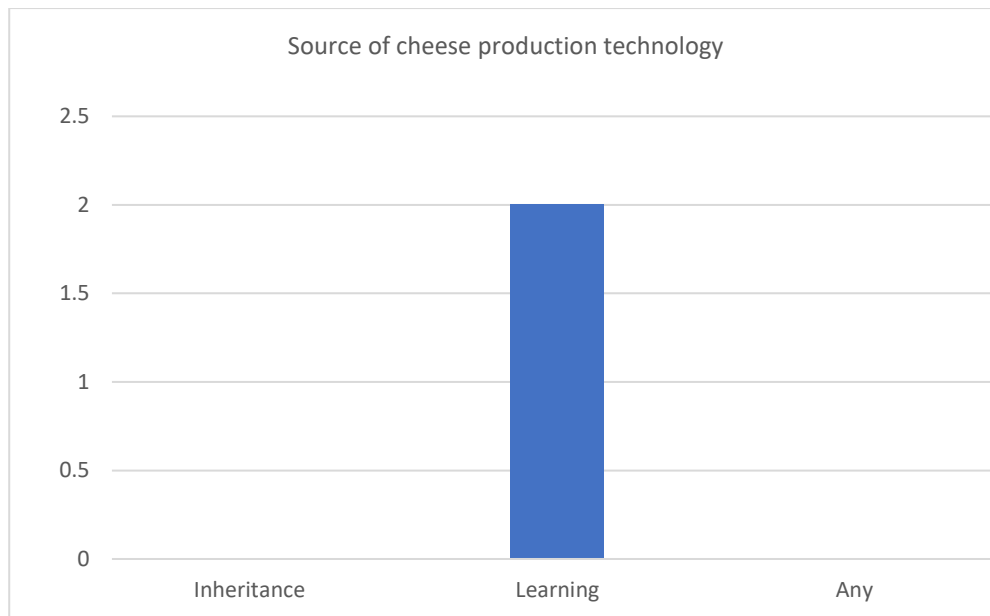


Fig. 6. Source of cheese production technology

Table 5. Quantity of milk used, cheese obtained and unit price per kg of cheese

Parameters	Origin	
	Nouvelle découverte	Belle rive
Quantity of milk required (L)	15-20	20
Cheese obtained (Kg)	2,2	2
Price per unit (Rs)	125-150	350

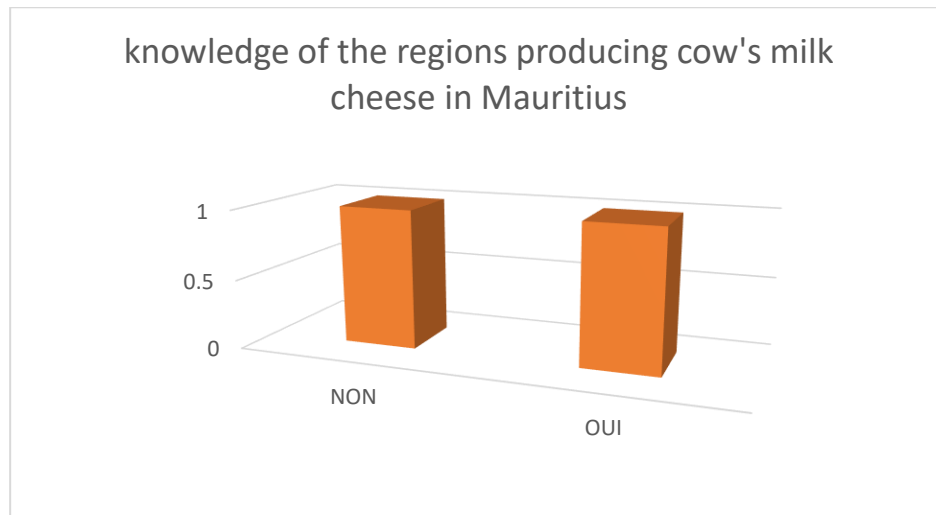


Fig. 7. Knowledge of the cheese-producing regions

The breeds of cattle raised by our respondents were Creole and Friesian. Our results differ from those obtained by Olivier et al. [6], who found three breeds (Creole, Friesian and crossbred). This difference may be linked to the regression of the dairy sector in Mauritius. Our survey showed that the majority of cattle breeds were Creole (56%). This can be explained by the fact that Creole cows have adapted perfectly to the environment and low level of nutrition in Mauritius. They are also known to be hardy and have interesting potential in terms of both production and reproduction.

Most respondents (66.7%) practiced extensive livestock farming. In most sub-Saharan countries, livestock farming is extensive, but during the lean season, those with means supplement grazing. Those with little means are content to supplement their dairy cows in order to maintain milk production, or, due to their impoverished state, some farmers do not supplement during difficult times.

However, it is clear that the main objective of cattle breeding is milk production. This may be due to demand from the population, but also to Hindu culture, which forbids the slaughtering of cows.

Milking is mainly carried out twice a day (morning and evening) and mostly by the whole family (86%). Our results are similar to those obtained by Boodoo et al. [3], according to whom cows are milked by hand twice a day, generally around 05:30 and 18:00. In fact, the number of milkings has an influence on production and dairy cow

health (mastitis) [7]. All cattle are zero grazed and kept indoors [8,9].

The amount of milk produced per cow per day varies according to season and breed. Indeed, milk production is higher in summer than in winter [10]. This may also be linked to the average number of lactating cows per farmer, which differs according to climate.

Most milk is sold fresh (100%). This may be linked to consumer preferences, who prefer fresh milk.

The quantity of milk sold depends on the farmer's needs and lifestyle. For example, farmers who live solely from livestock sell almost all their production in milk, in order to buy their daily meal.

The price per litre of milk varies from Rs 45 to Rs 70, with an average of Rs 59. There is a significant difference between Flacq, Pamplemousse 2 and the remaining farmers in the unit price of a litre of milk. This can be explained by the fact that these two farmers are larger producers (they have more cattle) than the others, and by the fact that they sell their milk wholesale to hotels and restaurants [11,12].

4.1.2 Characteristics of milk-to-cheese processors in Mauritius

The various surveys carried out show that cheese production and marketing were exclusively female activities (Table 5). Cheese is a foodstuff produced exclusively by women from

the Hindu ethnic group in Mauritius, as shown in Table 5. Part of the women producers had a secondary education (50%) and the other part had a university education (50%). The place of dairy cows in the lives of the Hindou, the search for a better method of preserving cow's milk, the profitability of the activity and the provision of financial support without the household are all reasons why women producers and sellers of cheese chose this sector of activity. At both Belle Rive and Nouvelle decouverte, the cheese-making business was run by adult women (aged 30 and 44). This is due to the fact that the adult women had a better command of the technology than the young women. This mastery of cheese production is the result of many years of experience and skill. In some cases, they came to the industry through apprenticeships organized by the government, and in others, during their studies abroad.

As far as cheese production and whey processing are concerned, for all those surveyed, cow's milk cheese production was carried out by themselves, usually in the form of a small family business [13]. This may be linked to the fact that these producers owned dairy farms run by the whole family. So everything from milk production to cheese-making was done in the family.

The survey revealed that the whey obtained from cheese production was used to feed pets. This may be explained by the fact that women producers have no knowledge of the richness of this by-product and other methods for its valorization.

From an economic point of view, with regard to yield, cost of production and profit margin for cheese production, we were faced with a total refusal of response from the producers. This refusal could be explained by a lack of confidence and a certain fear on the part of the producers, which we can't really explain.

However, the quantity of milk used per day, the quantity of cheese obtained and the unit price per kg of cheese vary from one producer to another. The unit price per kg of cheese was higher for the Belle rive producer (Rs 350) than for the Nouvelle Decouverte at the 5% threshold. This difference can be explained by the type of cheese produced and the sales areas. The nouvelle decouverte producer sells her cheeses wholesale to hotels and restaurants. On the other hand, there is no significant difference at the 5% level between the quantities of milk used and the

cheeses obtained during the day in the two zones. The quantity of milk used by each producer was approximately 20L. This quantity was chosen by the producers according to their farm's daily milk production.

5. CONCLUSION

This study has led to the discovery that milk is the feed for the farmer and his family but also for others Consumers. The income from the sale of milk contributes to the purchase of family feed and livestock supplements. Dairy cow rearing and cheese production are of considerable socio-economic and cultural interest. However, the size of the herd and the low production of milk are an obstacle to the development of this sector.

For the continuation of our research work, we plan to:

- Evaluate the physicochemical and microbiological parameters of cow's milk collected from various producers.
- Isolate and characterize lactic bacteria

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. Kapaj A, Deci E. World milk production and socio-economic factors effecting its consumption. In: Dairy in Human Health and Disease Across the Lifespan, Dairy in Human Health and Disease Across the Lifespan. Elsevier. 2017:107–115.
2. FAO. Dairy Market Review: Overview of global dairy market developments in 2020. Rome; 2021.
3. Boodoo AA, Boodhoo K, Toolsee P, Saraye G, Rangasamy M. improving the productivity of dairy cows on smallholder farms in mauritius through studies on nutrition and reproduction; 1999.
4. Ministry of Agro-Industry and Food Security, Strategic Plan (2016 - 2020) for The Food Crop, Livestock and Forestry Sectors; 2016.
5. Wilhelm M. Methods report Snowball sampling, the survey method determined by the respondents; University of Neuchâtel; ed. Federal Statistical Office (FSO); 2014:60.

6. Olivier Pasnin VM. Ranghoo-Sanmukhiya, Molecular studies on the Creole cattle breed in Mauritius. 2 Department of Agriculture and Food Science, Faculty of Agriculture, The University of Mauritius, Réduit, Mauritius *Advances in Bioscience and Biotechnology*. 2013;4:925-929
7. Gagnon L. Two milkings is good but three is better; 2011. Available:http://fr.usenet.nl/?utm_medium=AFSI&utm_campaign=425656&utm_source=AF_TA_93456&utm
8. Darras A, Bosc PM, Mialet-Serra I. Agriculture in Mauritius: Assessment, key figures and challenges; 2021.
9. Livestock Statistics 1966: Livestock statistics for 1950, 1956 and 1964. Department of Agriculture, Mauritius.
10. Pasnin O, Ranghoo-Sanmukhiya VM. *Advances in Bioscience and Biotechnology*. 2013;4:925-929
11. Kumari S, Ekta Singh K, Sangwan V, Choudhary A. Food Purchasing Pattern in Rural Family of Haryana State, India. *Advances in Research*. 2023;24(6):120–125. Available:<https://doi.org/10.9734/air/2023/v24i6992>
12. Ravi Y, Sannapapamma KJ, Muktamath V, Channal G, Desai R, Badami S. Food Consumption, Purchasing and Dietary Pattern of Farm Women in Dharwad District, Karnataka State, India. *European Journal of Nutrition & Food Safety*. 2024; 16(4):41–47. Available:<https://doi.org/10.9734/ejnfs/2024/v16i41406>
13. Kapaj A, Deci E. World milk production and socio-economic factors effecting its consumption. In *Dairy in human health and disease across the lifespan* 2017:107-115.

ANNEXE

SOCIO-ECONOMIC STUDY QUESTIONNAIRE

I. Survey area

1. District
2. City/Village.....

I. Identification of respondents

❖ Category of respondent

1. Producers
2. Resellers
3. Producers and resellers

❖ Identity of the respondent

Name :
First name(s) :

Age of the respondent :

Gender : F M

Social status: Student Student Other (Specify):

Housekeeper Shopkeeper

Ethnicity:

❖ Level of education :

None Primary Secondary University

I. Knowledge of the cheese product and the obtaining of whey

1. What is cow's milk cheese called in Mauritian Creole?

.....

2. Do you have any idea of the regions that produce cow's milk cheese in Mauritius ?

Yes No

3. If yes, which ones ?

.....
.....
.....

4. Is it you who produces cheese from cow's milk?

Yes No

5. If yes, what do you do with the liquid (whey) from the production of cow's milk chees ?

.....
.....

6. Do you have other cow's milk cheese suppliers ?

Yes No

II. Economic organization

1. Does the cow's milk cheese business allow you to support yourself ?

Yes No

2. If yes, how much is your daily income ?

3. If not, what other activity do you associate it with ?

4. What is your production cost and profit margin per Kg ?

5. How much do you sell the bread unit of your cheeses for ?

6. How many liters of milk do you use per day ?

7. For this amount of milk, what kg of cheese do you get ?

8. How much whey do you collect for this daily production ?

9. Do you use imported milk for your production ?

Yes No

10. Why do you need to source elsewhere ?

11. What is the cost of these supplies compared to the local cost ?

III. Cheese production

1. What is your source of acquisition of the technology for the production of cow's milk cheese ?

Legacy Learning

2. If inherited, from whom did you inherit it ?

3. If learning, where did you learn it ?

4. How many years have you been in the business ?

5. What is/are the raw material(s) used ?

.....
.....

6. What are the sources of supply of raw materials ?

Purchase Production

7. Do you have specifications for suppliers ?

Yes No

8. If yes, what are the requirements ?

.....
.....
.....

9. What equipment do you use for the production of cow's milk cheese ?

.....
.....
.....

10. Is the material used for other purposes ?

Yes No

11. If so, which ones ?

.....
.....

12. Where do you make the cheese production ?

.....

14. In what hygienic condition do you do it ?

.....

13. How do you produce the cheese ?

.....
.....
.....

15. What is the duration of the production ?

.....

14. How do you manage the whey obtained at the end of the cheese production ?

.....
.....

17. Do you know of any use or utility of whey ?

Yes No

18. If yes, which one ?

19. How do you maintain your production equipment ?

.....
.....

15. How often do you maintain your production equipment ?

.....
16. Do you encounter any difficulties in the production of cheese from a technological point of view ?

Yes No

22. If yes, which ones ?

.....
.....
.....

23. Are you experiencing difficulties with the whey management system ?

Yes No

17. If yes, which ones ?

.....
.....
.....

25. Do you dump the whey directly into nature ?

Yes No

26. If not, what do you do ?

.....
.....
.....

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