

Original Research Article

Evaluation of bovine milk production in the commune of Tironiaradougou

ABSTRACT

This study was carried out in the sub-prefecture of Tironiaradougou on 30 cattle farms in order to identify the real conditions of milk production in the area. The lack of reliable data on the sector as well as the lack of control over milk production parameters prompted this study. Over two months, a survey was carried out on these farms followed by the collection and estimation of the different quantities of milk on the said farms. The results showed that 63.33% of breeders are of Burkinabé nationality, 23.33% of Malian nationality and 13.34% of Ivorian nationality. The Fulani were the most numerous (70%), followed by the Malinkés (16.67%) and Senufos (10%). The majority of breeders (86.67%) were illiterate. Almost all breeders used night pens and the herd was made up of Zebus (93.33%) where cows represented 47.33% of the herds. The diet was based entirely on natural pasture, only 20% of breeders distributed food supplements. The herds were watered in the rivers. The total milk production produced on the 30 farms during the month was 9,408 L with a variation of (130 to 615.5 L/Farm). As for the daily milk production in the villages, it varied from 9.33 +/- 0.46 L to 13.27 +/- 2.88 L. This study made it possible to highlight the characteristics of cattle breeding and their low level of production in the sub-prefecture.

Comment [RA1]: please add a data capture method

Keywords: Cattle, production, milk, socio-demographic characteristics, Tironiaradougou

1. INTRODUCTION

Like the entire livestock sub-sector, the Ivory Coast milk sector is characterized by a predominance of imports (Dovonou, 2018). Livestock still remains a secondary economic activity with a contribution of approximately 4.5% to agricultural GDP and 2% to total GDP (Bakayoko, 2016). However, it constitutes an economic activity in the process of development. In terms of livestock over the period from 2016 to 2019, the number of cattle increased from 1,639,287 to 1,722,667 heads, an increase of 4.8%. In 2019, national milk production was estimated at 34,109 Tonnes Milk Equivalent (TEL) and imports at more than 17,000 TEL (MIRAH, 2022). This demonstrates that the milk market, ~~even if not dominant, exists in the country~~ exists in the country, even if not dominant.

Cattle breeding is more than 95% traditional and 85% concentrated in the northern zone of the country. The breeding system is extensive, sedentary or semi-transhumant (MINAGRI, 2017). Milk production is mainly ensured by local cattle kept by pastoralists and agropastoralists. The fact that these cattle are raised in a traditional system, production does not exceed 2 to 3 liters of milk per cow per day. This production is in line with the training levels of the actors. Indeed, according to Soro et al. (2023 and 2024), this sector is essentially full of illiterate actors who benefit from less technical training and supervision. State investments in the livestock sub-sector have been considerably reduced in favor of other national priorities. In addition, with economic growth, the growing middle class is increasingly integrating protein foods including milk into its diet (Dovonou, 2018).

In view of this observation, it is therefore more than necessary to understand the state of current bovine dairy production in the north ~~in order to~~ identify the strengths and constraints of this sector. Better knowledge of this sector would make it possible to guide the production strategies defined by the State with a view to improving local dairy production. It is in this context that the present work is initiated.

2. MATERIAL AND METHODS

2.1. Material

The technical material consisted of survey sheets to collect information relating to the socio-demographic profile of breeders and the characteristics of the farms. It also consisted of empty cans of different capacities (25 liters, 10 liters, 4 liters, 2 liters, 1.5 liters), measuring cups of 50; 250 and 500 ml to measure the quantities of milk but also of personal protective equipment (coat, muffler and pair of boots).

2.2. Methods of investigation

~~In order to~~ facilitate the collection of information from breeders, several interviews were carried out on the one hand with the veterinary agent of the sub-prefecture of Tioroniaradougou who facilitated contact with the breeders. The quota sampling method was used. A pre-survey was carried out from February 13 to March 20, 2024. This made it possible to select 30 farms on which the survey was carried out from April 15 to May 17, 2024 (Table I).

Table I: Farms visited per village

Villages	Number of farms
Navanakaha	08
Togbonga	04

Sologboko	03
Fahala	06
Soloblé	04
Tioniaradougou	05
Total	30

2.3. Method for assessing milk quantity

Milk production was assessed using daily milk collection from the farms throughout the internship period. These quantities collected were measured using containers provided to breeders for this purpose and the quantities were recorded on the planned collection sheets. This work made it possible to record daily quantities of milk on farms. Given the great distances that separated the farms, a program to visit the farms was established. All the farms were subdivided into 3 subgroups to better monitor the milking that takes place each morning and better assess the quantity of milk produced on average per cow and across the entire farm. Thus, the visits were carried out every 2 days given the long distances between the farms.

Comment [RA2]: How often is milking done, once or twice a day?

2.4. Data processing

At the end of the surveys, a manual review of all the questionnaires was carried out. Thus, the data relating to the socio-demographic profiles of breeders, the characteristics of the farms and the milk production of cattle in the area were processed with Microsoft Excel 2016 software which was used to produce the graphs and estimate the different proportions. The different means relating to the quantities of milk were compared at the threshold of 0.05 using the student t test.

3. RESULTS AND DISCUSSION

3.1. Socio-demographic profile of breeders

The results showed that cattle breeding in the sub-prefecture of Tioniaradougou was mainly practiced by foreigners (86.67%) among whom 23.33% were Malians and 63.33% were Burkinabés. Ivorians represented a small proportion (13.34%). The Peulh ethnic group was dominant among the breeders (70%), followed by the Malinkés (16.67%), the Sénoufos (10%) and finally the Baoulés (3.33%). Their main activity was livestock breeding (80%). Some in addition to livestock practiced agriculture (13.33%) and others commerce (6.67%). The level of education of breeders in this locality is relatively low with 86.67% uneducated compared to 13.33% having studied (Table II).

Comment [RA3]: Can you explain the location where the data was taken, geographically? It would be better if you included a map of the Tioniaradougou region

Table II : Sociodemographic characteristics of breeders

Parameters		Pourcentage (%)
Nationality	Ivorian	13.34
	Malian	23.33
	Burkinabe	63.33
Ethnic group	Senoufo	10
	Peuhl	70

	Malinke	16.67
	Baoule	3.33
Instruction	Uneducated	86.87
	Educated	13.33
Professions	Breeders	80
	Farmers	13.33
	Traders	6.67

3.2. Characteristics of the farms

All the breeders interviewed in the region used village parks to house their animals. The vast majority of breeders (63.33%) had farms of two (02) hectares or more while 36.67% had areas of less than (02) hectares. A large majority of breeders (76.66%) did not use breeding equipment. Only 23.33% of breeders used it. Among the latter, 71.43% used only wooden feeders while 28.57% used both wooden feeders as well as cement drinkers. In the 30 farms visited in the sub-prefecture of Tioroniaradougou two (2) types of cattle were identified: zebu and mongrels. The majority were zebu (93.33%) and a minority (6.67%) belonged to other breeds. The number of livestock varied from one farm to another and the average was 34 ± 12.67 heads. A large majority (56.66%) had a population of between 21 and 50 head, followed by a proportion of 30% of breeders who had a population of between 51 and 100 head. Finally came those whose numbers were below 20 (13.34%). The livestock consisted mainly of cows (47.33%); heifers (23.16%); of young calves (17.81%) and bulls (11.70%). All farms (100%) used natural pasture as their staple food all year round. The animals are taken to the pasture every morning at 8 a.m. and do not return until nightfall at 6 p.m. A dietary supplement was provided by a minimum of breeders (20%) only in the form of salt (Na Cl). On the other hand, the majority of breeders (80%) affirmed that they did not provide any dietary supplement. The majority of breeders (83.33%) watered their herds in rivers and 16.67% used drilling to water their herds.

Table III : Characteristics of the farms / Caractéristiques des élevages

Comment [RA4]: In english

Characteristics		Proportion (%)
Nature of facilities	Village park	100
	Modern park	0
Area used	≥ 2 hectares	63.34
	< 2 hectares	36.66
Use of breeding equipment	yes	23.34
	No	76.66
Breeds	Metis	6.67
	Zebus	93.33
Livestock numbers	1 to 20 heads	13.34
	21 to 50 heads	56.66
	51 to 100 heads	30
Livestock composition	Cows	47.33
	Heifers	23.16
	young calves	17.81
	Bulls	11.70

Comment [RA5]: In English?

Staple food	Pâturage naturel/Natural	100
Food supplement	Presence	20
	Absence	80
Water source	Drilling	16.67
	River	83.33

Comment [RA6]: In English!

3.3. Milk production on the surveyed farms

3.3.1. Average daily quantity of milk collected per village

The average daily milk production per village in the Tioroniaradougou Sub-prefecture showed variation from one village to another (Table III). The highest production was observed in the village of Fahala with an average of 13.27 ± 2.88 L and the lowest production was observed in the village of Togbonga (9.33 ± 0.43 L). Apart from the production of the villages of Sologoko (11.69 ± 1.04) and Soloblé (11.29 ± 0.49) which were not significantly different, all the other productions of the villages were significantly different from each other ($p < .01$).

Comment [RA7]: III or IV??

Table IV: Averagedailyquantity per village

Villages	Quantité moyenne journalière de lait produit (L)
Fahala	$13,27 \pm 2,88$
Sologboko	$11,69 \pm 1,04$ a
Soloblé	$11,29 \pm 0,49$ a
Tiorro	$10,99 \pm 0,46$
Togbonga	$9,33 \pm 0,46$
Navanakaha	$10,50 \pm 0,32$

Comment [RA8]: In Englishplease!?

3.3.2. Total quantity of milk produced per farm during the month

The total quantity of milk collected during our month of internship from 30 farms (F) amounted to 9,321.5 L. Milk production varied from one farm to another throughout the collection period, and was between 130 L and 615.5 L with an average of 310.6 ± 114.74 L. Indeed, the greatest production was observed in the Kone farm (615.5 L), followed by the Diallo farm (557 .5 L) then the Doukouré farm (480 L). The smallest production was observed in the ISSIF farm which is 130 L (Figure 1).

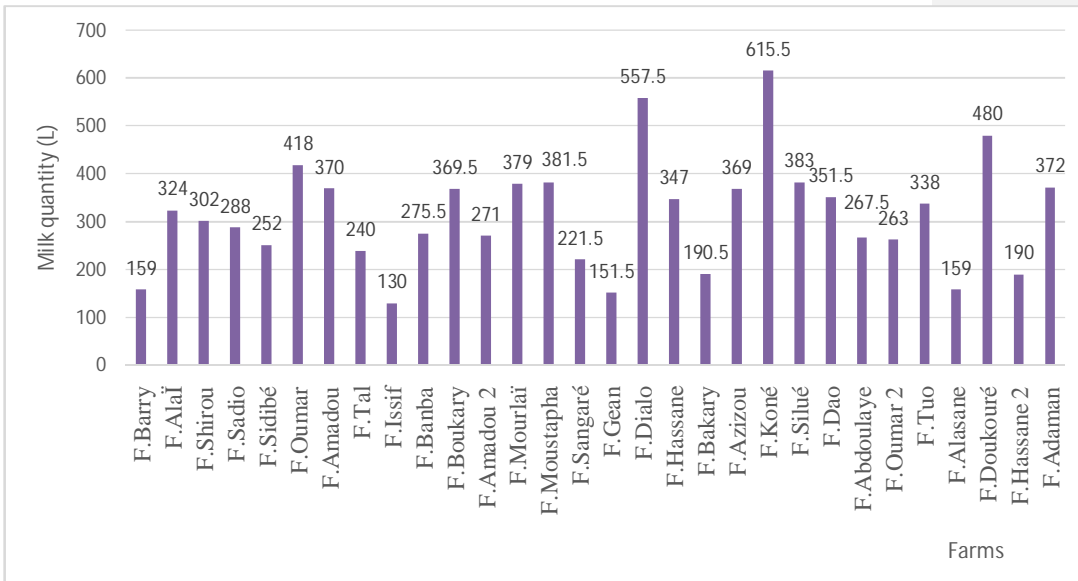


Figure 1 : Total quantity of milk produced per farm during the month

3.3.2. Average weekly farm quantity

From the first week to the last week of collection, a production varying from 331.28 L to 347.86 L/week of milk was collected on all farms. The smallest quantity 331.28 L was collected in the second week while the highest production was obtained in the fourth week (347.86 L) (Figure 2).

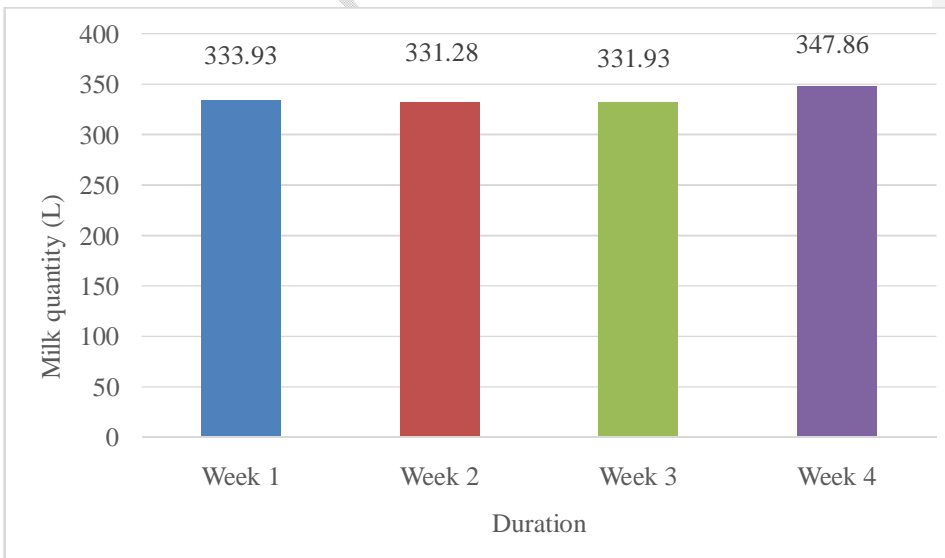


Figure 2: Average weekly farm quantity

4. DISCUSSION

This study carried out in the sub-prefecture of Tioroniaradougou made it possible to identify the cattle production system and to estimate the milk production of the area. The results obtained show that cattle breeding in the commune is mainly practiced by foreigners (63.33% Burkinabés and 23.33% Malians). In addition, these breeders are mostly Fulani. This ethnic distribution is consistent with the historical and sociocultural data of the region, where the Fulani are traditionally recognized for their breeding skills. These observations are similar to those of Soro et al. (2023) which reveal a predominance of foreign breeders in the Sub-prefecture of Dikodougou. Indeed, these authors found that 47.06% of breeders are of Ivorian nationality, 41.18% of Malian nationality and 11.76% of Burkinabé nationality. The strong foreign presence could be attributed to the tradition and expertise of these people in the field of pastoral breeding. However, these observations are contrary to those of Soro et al. (2024) who noted during their study that 61.54% of breeders were of Ivorian nationality and the Peulh ethnic group was in the majority (46.15%) in the Sub-prefecture of Napié. The majority (86.67%) of breeders are illiterate, which limits their ability to adopt modern breeding techniques. Only a minority of them (13.33%) have reached a level of formal education. Our results are similar to those of N'Diaye (2006) who found, in Senegal during his study, that the majority (52%) of breeders were illiterate compared to 48% who had studied. This low level of literacy poses a challenge for training and dissemination of improved practices and technological innovations in the livestock sector.

Comment [RA9]: is it possible to use a newer reference?

The breeding practices identified in this study reveal a predominance of extensive breeding, with low adoption of modern techniques and improved management practices. Almost all breeders use night pens for their animals and lack modern equipment. This is similar to the findings of Soro et al. (2023) who noted a low use of intensive breeding methods in rural areas. The livestock is mainly composed of Zebus (93.33%). This predominance of Zebus and mixed breed cattle could be explained by the dairy potential of these animals and their good beef potential. The high proportion of cows (47.33%) could be explained by the fact that cows play a large role within the herd. Indeed, sedentary breeders introduce Sahelian cattle into their herds in order to obtain crossbreeds with sizes significantly larger than those of bullfighters (Soro et al., 2024). The same observation was made by Sidde et al. (2017) who observed a clear tendency of breeders to want to introduce a Zebu breed sire into herds in order to increase the size and milk potential of their bulls. These results are contrary to those observed by Sokouri et al. (2009) who state that Zebus are the least numerous in the Northern region and represent only 08% of the livestock. The diet is based entirely on natural grazing, and only 20% of breeders add food supplements. Animals are generally watered in rivers, which poses a risk to their health. These results are similar to the system described by Chayer (2021).

Milk production over one month was 9,408 liters, with a variation of (130 to 615.5 L/Fam). This level of production is relatively low. However, our results are similar to those of Soro et al. (2023), this author obtained monthly quantities varying between 187 L and 915.5 L/farm for the same rainy season in the north of Côte d'Ivoire. This low production rate can be attributed to several factors, including the quality of cattle breeds, breeding methods and environmental conditions. According to Soro et al. (2024), the variation in production on farms would be due to the animals and the management of the farm. Indeed, according to these authors, the farms surveyed did not have animals of the same breed and physiological stage, but also the diet varied from one farm to another.

Comment [RA10]: Can you explain the relationship between milk production and regional characteristics in each village

5. CONCLUSION

Our study provided an overview of breeding practices and milk production in the Tioroniaradougou Sub-prefecture. Livestock breeding is dominated by foreign breeders, mainly Burkinabe and Malian, with a strong representation of the Fulani. The literacy level of breeders is low, which constitutes a major obstacle to the adoption of modern practices. Livestock breeding in this region is mainly based on traditional methods with little use of feed supplements and limited infrastructure. Milk production remains very low, mainly due to the quality of cattle breeds and livestock management practices.

This study highlights the challenges and opportunities of the cattle breeding sector in the Sub-prefecture of Tioroniaradougou and offers a solid basis for future interventions aimed at developing this essential sector for the local economy.

REFERENCES

1. ~~4~~–Dovonou EC. State of the dairysectors in the 15 ECOWAS countries, Mauritania and Chad. Annex 4: Côte d'Ivoire Fact Sheet. CIRAD, 2018, 1:26. Available: <https://www.inter-reseaux.org/wp-content/uploads/RapportCoteIvoireOffensiveLait.pdf>
2. ~~2~~–Bakayoko KV. Review of the livestock/meat and milksectors and the policiesthat influence them in Côte d'Ivoire. FAO/ECOWAS, 2016, Available <https://openknowledge.fao.org/server/api/core/bitstreams/f928149c-0b4e-4f8f-b6d3-2a587f6b7526/content>
3. MIRAHA, National Policy for the Development of Livestock, Fisheries and Aquaculture (PONADEPA 2022-2026), 202 2. Available: <https://faolex.fao.org/docs/pdf/ivc209419.pdf>
4. ~~4~~–Soro S, Kouadio KP, Zouh Bi ZF, Brou GKG, Konan KM. Evaluation of cow'smilk production in the beginning of the rainyseason in the peri-urban area of Dikodougou (Côte d'Ivoire). International Journal of MultidisciplinaryResearch and Development, 2023,10 (11): 27-32.
5. Soro S, Aman JB, Aboly BN, Brou GKG, Diomande D. Evaluation of cow'smilk production at the start of the rainyseason: case of the Sub-Prefecture of Napie (Ivory Coast). JCBPS, 2024, 14 (3): 264-272.
6. N'Diaye A. Milk in the income diversification strategy of agropastoralists in the Fatik region. Final dissertation for the Diploma of AgronomicEngineer in Rural Economics. Department of Rural Economics and Sociology (ESR), 2006, 17:25. Available: https://www.bameinfopol.info/IMG/pdf/mmoire4_A._Ndiaye.pdf
7. Sidido S. Socio-economicassessment of the potential for the diffusion of the selectedAzawakzebu in Niger. Liège: University of Liège. Thesis (Doctor of Veterinary Sciences), 2017. Available: <https://duddal.org/files/original/43ffe86dcd224bf269f08e7201075fbd7be9dbf3.pdf>
8. Sokouri DP, Yapi-Gnaoré CV, N'Guetta ASP, Loukou NE, Kouao BJ, Touré G et al. Use and management of local taurine breedsunder the pressure of crossbreedingwithzebu in the Central and Northernregions of Côte d'Ivoire. J. Anim. Plant Sci, 2009, 5: 456–465. English

Comment [RA11]: We did not find anything in your writing about the potential of the region that illustrates the large livestock opportunities in this region.

Comment [RA12]: sort alphabetically

9. Chayer M. Study of the quality of spring and drinking water in cow-calf farms based on physicochemical and bacteriological properties. Master's thesis in animal sciences at LAVAL University, 2021, Available: <https://docplayer.fr/220537085-Etude-de-la-qualite-de-l-eau-de-source-et-d-abreuvement-dans-les-elevages-vache-veau-en-fonction-des-proprietes-physicochimiques-et-bacteriologiques.html>

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