Evaluation of Bovine Milk Production in the Commune of Tioroniaradougou

Soro Soronikpoho [a*], Kouadio Kouakou Parfait [a] and Aboly Bosson Nicolas [a]

[a] *Department of Animal Science, Laboratory of Biology and Animal Health, Agropastoral Management Institute, Peleforo Gon Coulibaly University, Korhogo, Bp 1328 Korhogo, Côte d'Ivoire.*

Authors' contributions

This work was carried out in collaboration among all authors. Author SS designed the study, wrote the protocol, and wrote the first draft of the manuscript. Author KKP participated in the collection of data in the field, the entry and statistical analysis of the data. Author ABN participated in writing the manuscript. All authors read and approved the final manuscript.

Original Research Article

ABSTRACT

This study was carried out in the sub-prefecture of Tioroniaradougou on 30 cattle farms to identify the real conditions of milk production in the area. The lack of reliable data in 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 amounts 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%). Most of breeders (86.67%) were illiterate. Almost all breeders used night park, 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. Total milk production

_____

*Corresponding author: E-mail: soronikpohosoro@gmail.com;

produced in the 30 farms during the month was 9,408 L with a variation of (130 to 615.5 L/Farm). Regarding 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-prefect.

1. INTRODUCTION

Like the entire livestock subsector, the Ivory Coast milk sector is characterised by a predominance of imports [1]. Livestock still remains a secondary economic activity with a contribution of approximately 4.5% to agricultural GDP and 2% to total GDP [2]. However, it constitutes an economic activity in the development process. In terms of livestock during 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 [3]. According to Chatellier [4] and Corniaux et al. [5], Africa West covers barely half of its internal milk needs. This demonstrates that the milk market 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. [6,7], this sector is essentially full of illiterate actors who benefit from less technical training and supervision. State investments in the livestock subsector have been considerably reduced in favour of other national priorities. In addition, with economic growth, the growing middle class is increasingly integrating protein foods including milk into its diet [1].

In view of this observation, it is therefore more than necessary to understand the state of current bovine dairy production in the north 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. MATERIALS AND METHODS

2.1 Study Framework

The sub-prefecture of Tioroniaradougou covers a total area of 191 hectares. It is 14 kilometers away from that of Korhogo. It is a locality in the north of Côte d'Ivoire belonging to the department of Korhogo, savannah region (Fig. 1). It is one of the areas which supplies the town of Korhogo with cow's milk.

2.2 Materials

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).

Table 1. Farms visited per village

Villages	Number of farms
Navanakaha	08
Togbonga	04
Sologboko	03
Fahala	06
Soloblé	04
Tioroniaradougou	05
Total	30

2.3 Methods of Investigation

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 1).

2.4 Method for Assessing Milk Quantity

Milk production was assessed using daily milk collection from farms throughout the internship period. Only one milking was done every morning. Thus, just after milking, the quantities obtained were measured using containers made available to breeders for this purpose and the quantities were recorded on the collection sheets provided. This work made it possible to identify the daily amounts of milk on farms. Given the great distances between the farms, a farm visit program was put in place. All farms have been subdivided into 3 subgroups to better monitor the milking that takes place each morning and better

evaluate the quantity of milk produced on average per cow and on the entire farm. Therefore, the visits were made every 2 days given the large distances between the farms.

2.5 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 related to the quantities of milk were compared at the 0.05 threshold using the student t test.
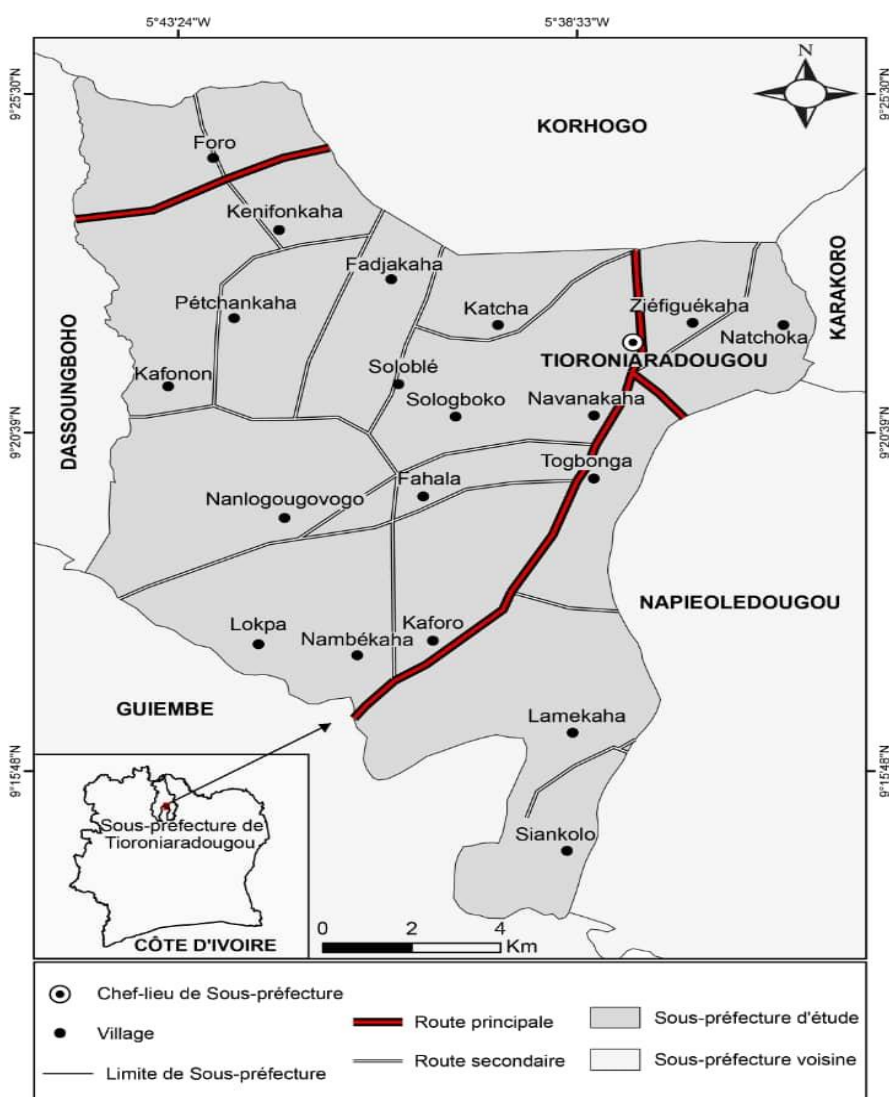

Fig. 1. Map of the Tioroniaradougou Sub-Prefecture

3. RESULTS AND DISCUSSION

3.1 Sociodemographic Profile of Breeders

The results showed that cattle breeding in the subprefecture of Tioroniaradougou was mainly practiced by foreigners (86.67%) among whom 23.33% were Malians and 63.33% 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 2).

Table 2. Sociodemographic characteristics of breeders

Parameters		Percentage (%)
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 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. The vast majority of breeders (76.66%) did not use breeding equipment. Only 23.33% of the 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: zebus and mongrels. The majority

were zebu (93.33%), and a minority (6.67%) belonged to other breeds. The number of cattle varied from one farm to another and the average was 34±12.67 heads. A large majority (56.66%) had a population between 21 and 50 heads, followed by a proportion of 30% of breeders who had a population of between 51 and 100 heads. 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 main 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 minimum of breeders (20%) provided a dietary supplement in the form of salt (Na Cl). In the other hand, most of breeders (80%) affirmed that they did not provide any dietary supplement. Most of breeders (83.33%) watered their herds in rivers and 16.67% used drilling to water their herds.

Table 3. Characteristics of the farms

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
Staple food	Natural grazing	100
Food Supplement	Presence	20
	Absence	80
Water source	Drilling	16.67
	River	83.33

Table 4. Average daily quantity per village

Villages	Average daily quantity of milk produced (L)
Fahala	13,27 ±2,88
Sologboko	11,69 ±1,04 **a**
Soloble	11,29 ±0,49 **a**
Tiorro	10,99 ±0,46
Togbonga	9,33 ±0,46
Navanakaha	10,50 ±0,32

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 4). 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 other productions of the villages were significantly different from each other ($p < .01$).

3.3.2 Total quantity of milk produced per farm during the month

The total amount of milk collected during our internship 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 between 130 L and 615.5 L with an average of 310.6 ±114.74 L. Indeed, the highest production was observed in the Kone farm (615.5 L), followed by the Diallo farm (557.5 L), and then the Doukouré farm (480 L). The smallest production was observed in the ISSIF farm which is 130 L (Fig. 2).

3.3.3 Average weekly farm quantity

From the first week to the last week of collection, a production ranging 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) (Fig. 3).
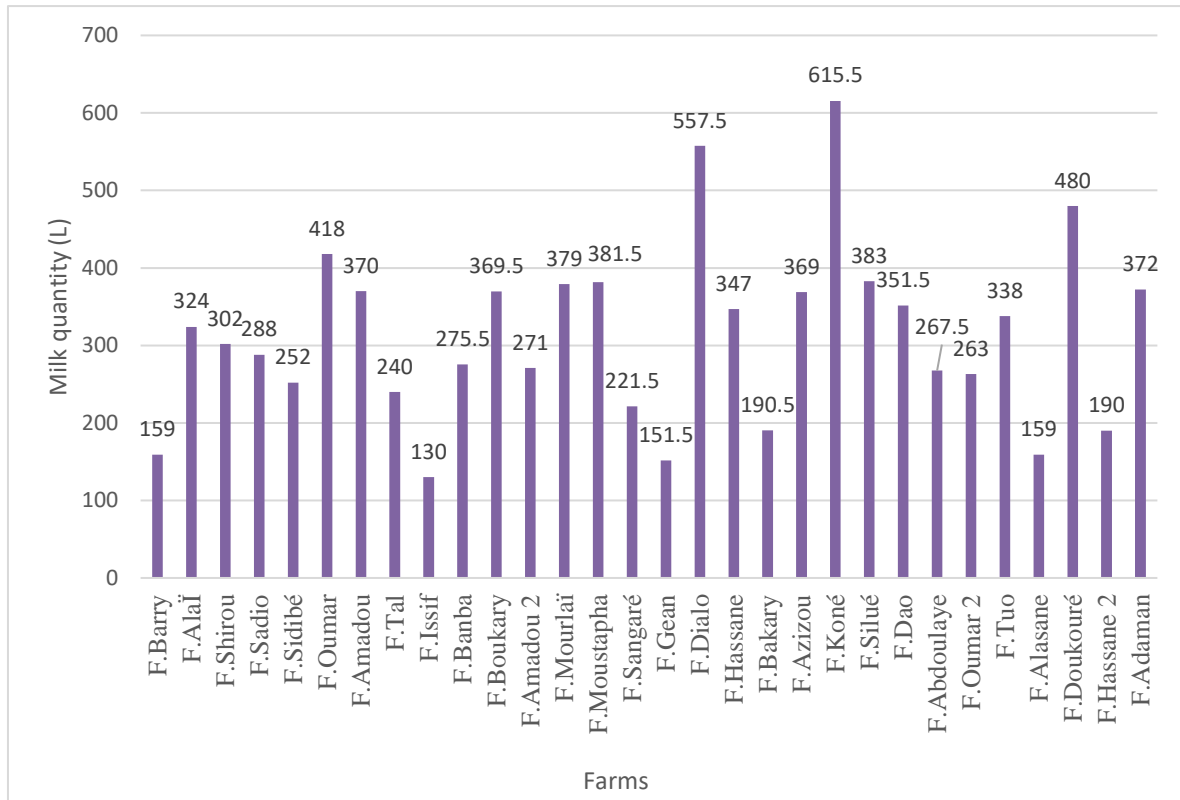

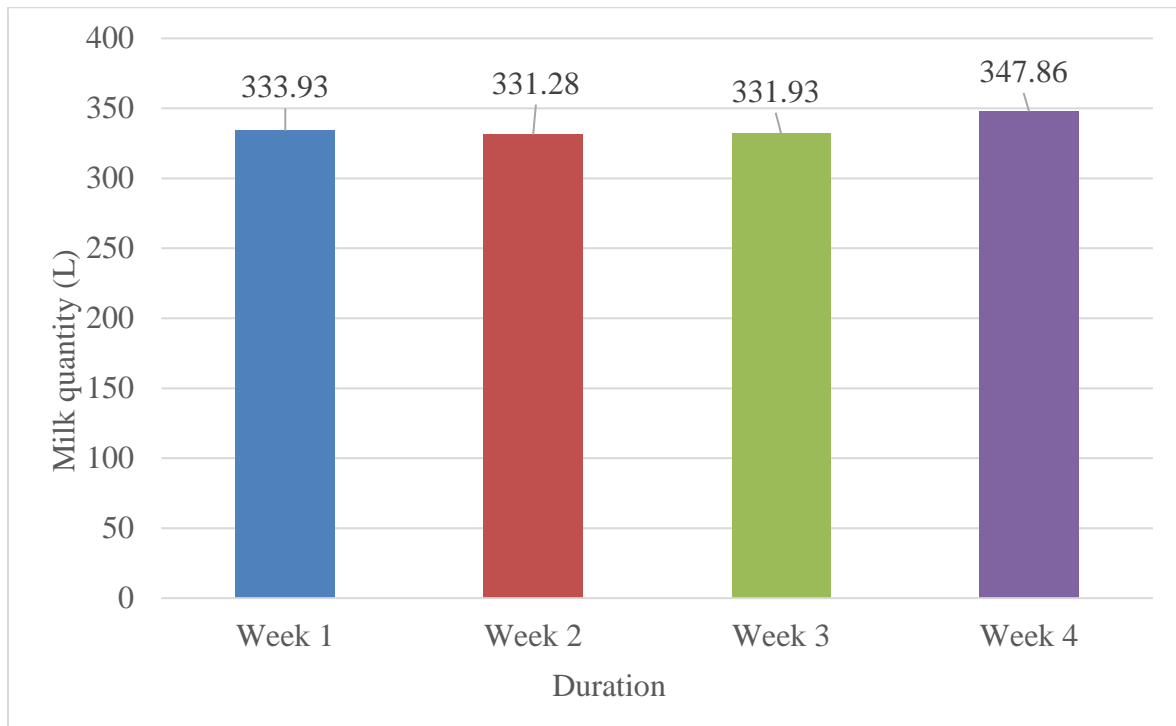**Fig. 2. Total quantity of milk produced per farm during the month**

Fig. 3. Average weekly farm quantity

4. DISCUSSION

This study carried out in the Tioroniaradougou subprefecture 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 Fulani are traditionally recognised for their breeding skills. These observations are similar to those of Soro et al. [6] which reveal a predominance of foreign breeders in the Subprefecture 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. [7] 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 Subprefecture of Napié. The majority (86.67%) of breeders are illiterate, which limits their ability to adopt modern breeding techniques. Only a minority (13.33%) have

reached a level of formal education. Our results are similar to those of Soro et al. [8] who found, during they study, that the majority (50%) of breeders were illiterate 14.2% had a primary level and 28.57% a secondary level of education. This low level of literacy poses a challenge to training and dissemination of improved practices and technological innovations in the livestock sector.

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. [6] 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 to obtain crossbreeds with sizes significantly larger than those of bullfighters [7]. The same observation was made by Siddo et al. [9], 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. [10] 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 [11]. Also, during their work, Ibrahim et al. [12] noted that grazing was the feeding method used by all breeders. Only 19% of breeders supplemented the entire herd without distinction.

Milk production in one month was 9,408 liters, with a variation of (130 to 615.5 L/Farm) described by Chayer [11]. This variation in milk production at the village level could be explained by the number of suckler cows, the anarchic crossings which take place within the herds and the level of technicality of herd management. Our results are like those of Soro et al. [6], 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. [7], the variation in production on farms would be due to animals and farm management. 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. According to Kassa et al. [13] the low level of milk production of livestock and the lack of control of the factors which generally act on this production. According to these authors, the factors are genetic and non-genetic and deserve to be elucidated if we want to improve cow's milk production.

5. CONCLUSION

Our study provided an overview of breeding practices and milk production in the Tioroniaradougou Subprefecture. 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 the breeds of cattle and livestock management practices.

DISCLAIMER (ARTIFICIAL INTELLIGENCE)

Author(s) hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc) and text-to-image generators have been used during writing or editing of manuscripts.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. Dovonou CE. State of the dairy sectors 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-ontent/uploads/RapportCoteIvoireOffensiveLait.pdf

2. Bakayoko KV. Review of the livestock/meat and milk sectors and the policies that 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. MIRAH, National policy for the development of livestock, fisheries and aquaculture (PONADEPA 2022-2026); 2022.
Available:https://faolex.fao.org/docs/pdf/ivc 209419. Pdf

4. Chatellier V. La dépendance de l'Afrique de l'Ouest aux importations de produits laitiers. INRAE Productions animales. 2020 ;33(2):125-140.

5. Corniaux C, Duteurtre G, Dia D, Chatellier V. The rise of fat-filled dairy blends in European dairy exports to West Africa. Économie rurale Agricultures, Alimentations, Territoires. 2023;386:111-124.

6. Soro S, Kouadio KP, Zouh Bi ZF, Brou GKG, Konan KM. Evaluation of cow's milk production in the beginning of the rainy season in the peri-urban area of Dikodougou (Côte d'Ivoire). International Journal of Multidisciplinary Research and Development. 2023;10(11):27-32.

7. Soro S, Aman JB, Aboly BN, Brou GKG, Diomande D. Evaluation of cow's milk production at the start of the rainy season: case of the Sub-Prefecture of Napie (Ivory Coast). JCBPS. 2024a;14(3):264-272.

8. Soro S, Aboly BN, Aman JB, Diomande D. Analysis of production and marketing without packaging of fresh cow's milk in the city of Korhogo. International Journal of Current Research. 2024b;16(06):28643-28647.

9. Siddo S. Socioeconomic assessment of the potential for the diffusion of the selected Azawak zebu in Niger. Liège: University of Liège. Thesis (Doctor of Veterinary Sciences); 2017.
Available:https://duddal.org/files/original/43ffe86dcd224bf269f08e7201075fbd7be9dbf3.pdf

10. Sokouri DP, Yapi-Gnaoré CV, N'Guetta ASP, Loukou NE, Kouao BJ, Touré G et al. Use and management of local taurine breeds under the pressure of crossbreeding with zebu in the Central and Northern regions of Côte d'Ivoire. J. Anim. Plant Sci. 2009 ;5:456–465.

11. 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-dela-qualite-de-l-eau-de-source-et-d-abreuvement-dans-les-elevages-vache-veau-en-fonction-des-proprietesphysicochimiques-et-bacteriologiques.html

12. Ibrahim AK, Moumouni I, Harouna A, Souleymane MB, Hamani M. Pratiques d'élevage et indicateurs morphométriques de performance laitière chez les éleveurs de bovins Kouri au Niger. Revue d'élevage et de médecine vétérinaire des pays tropicaux. 2017;70 (2):51-58.

13. Kassa KS, Ahounou S, Dayo GK, Salifou C, Issifou MT, Dotché I et al. Milk production performance of West African cattle breeds. Int. J. Biol. Chem. Sci. 2016;10(5):2316-2330.

Peer-review history:
The peer review history for this paper can be accessed here:
https://www.sdiarticle5.com/review-history/122275