

ORIGINAL ARTICLE

Evaluation of Zootechnical Constraints of Dairy Production in the Western Highlands of Cameroon

Nzakou Blandine Flora Hakoueu^a / Elvis Ndukong Ndzi^{b*} / Nsadzetsen Gilbert Adzemye^a / Mbiba Hassanu Fanadzenyuy^a / Germanus Soh Bah^a / Isabelle Leinyuy Nyuysemo^a / Tanyi Kingsley Manchang^b / Pougueu Henri Dieudonné Bayemi^c /

Authors' Affiliation

^aInstitute of Agricultural Research for Development (IRAD), P.O Box 51, Bambui, Cameroon

^bInstitute of Agricultural Research for Development (IRAD), P.O Box 222, Banganté, Cameroon

^cInstitute of Agricultural Research for Development (IRAD), P.O Box 2123, Yaoundé, Cameroon

Corresponding author

Elvis Ndukong Ndzi, MSc., PhD

^bInstitute of Agricultural Research for Development (IRAD), P.O Box 222, Banganté, Cameroon

Email: elvisndzi@yahoo.com

Tel: +237679449086

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Abstract

Zootechnical practice is an important part of milk production and an essential determinant in improving milk yield. This study is aimed at assessing the zootechnical-constraints faced by dairy cattle breeders in the Western Highlands of Cameroon. Data collected on the zootechnical-practices from 120 farms were analyzed using SPSS statistical package. It was observed that Holstein cows were the predominant (87.5%) dairy breed. The cow-sheds were built with wood while feeders and drinkers were made of concrete blocks. Rearing system was intensive, feed supplemented in 98.3% cases and most farmers (81.7%) gave water ad-libitum to their cows. Reproduction was by natural breeding in most farms and 93.3% cows were assisted during calving by farmer (70%) or a Vet. Milk-production was estimated at 2022 liters/cow/year. The cow-sheds were cleaned once a day with broad-spectrum detergents or water but breeding and dairy production was still influenced by diseases such as mastitis (35.8%), ticks (10%), diarrhea (17.5%) and placental retention (5.8%). The dairy farmers were knowledgeable on dairy cow management but low milk yields could be due to inadequacy in nutrition, livestock management practices, animal healthcare, zootechnical data recording and absence of technical supervision. There is therefore a need for policy implementation by the Government to promote milk production.

Practical application

Milk production in Cameroon is still relatively low. It is the responsibility of the Government to implement a policy to promote milk production in order to accelerate the development of the dairy sector and the processing of milk, which should involve the establishment of small processing units close to production areas and adapted to the production size as well as to the technical capacities of the producers. The knowledge of these aspects would stimulate an increase in milk production in the Western highlands of Cameroon, improve the income of farmers and ensure food security of the population.

Keywords: Animal health, dairy cows, Livestock practices, milk production.

1. Introduction

In most developing countries, 70% of the population live in rural areas. These people are poor, live mostly on subsistence farming, and do not always have enough to eat. Eight hundred and fifty four million people suffer from chronic

malnutrition, two hundred and six million of whom are south of the Sahara (Mazoyer, 2007). In Cameroon, 33% of the population is considered poor and hence do not have the daily financial means and food energy required to

carry out a normal activity (ACDIC, 2006). The consumption of animal proteins like milk is insufficient. Milk production, was estimated at 125,000 tons in Cameroon (MINEPIA, 2015) compared to 780 million tons produced worldwide in 2012 (FAO, 2012). This production is insignificant given the size of the population, which is growing by more than 3% each year.

Milk is one of the livestock products used to meet growing food requirements as a result of population growth (O'connor, 1995). In Cameroon, the latest statistics show that the average consumption of milk is estimated at 15.27 kg /capita /year (FAO, 2014). The deficit of production in relation to consumption is filled by imports of milk and dairy products (Bayemi *et al.*, 2005). This implies significant losses in the national income in importing dairy products from foreign countries. An increase in the country's milk production is needed to reduce these losses.

Dairy production in Cameroon is mainly carried out by traditional livestock farms which hold 80 to 85% of the national cattle herd (ACDIC, 2007). Attempts to improve this production have been made through the introduction of imported higher-yielding dairy breeds, their cross-fertilization with local Zebu (Tambi, 1991) and the creation of private Cooperative Societies for production, management and marketing to accompany breeders. The Western and North West Regions of Cameroon that make up the Western Highlands Agro-ecological zone have benefited from the introduction of exotic dairy cows. However, their level of production is poorly known and they suffer from several constraints. Hence the importance of the present work, which aims at defining the current

situation of dairy cattle farming in the highlands of western Cameroon.

2. Material and Methods

2.1. Description of the study site

Located between latitude 5 ° 20 ' and 7 ° North and between 9 ° 40' and 11 ° 10 ' East longitude above the Equator, the Western Highlands of Cameroon covers the West and North West regions of the country. Located between 300 to 3000 m above sea level, the climate is marked by a dry season from November to mid-March and a rainy season from mid-March to October. The rainfall varies between 1300-3000 mm with an average of 2000 mm per year. Mean annual temperatures range from 15.50 ° C to 24.5 ° C, although temperatures can go above 30 ° C (Bayemi *et al.*, 2005). The average relative humidity is 52% during the dry season and 70% during the rainy season. The soils are of lateritic type with savanna as main vegetation. Pastures consist mainly of *Sporobolus africanus*. However, species such as *Pennisetum clandestinum*, *Pennisetum purpureum*, *Loudetia*, *Hyparrheniarufa*, *Urelytrum fasciculatum*, *Panicum phramitoides*, and *Paspalum arbiculare* are also found in places, with also improved species such as *Brachiaria spp.*, *Trypsacumlaxum spp.* and *Stylosanthes spp.*

2.2. Population and sampling techniques

The study area is divided into two main regions for bovine milk production (West and North-West). The localities where the data were collected were chosen on the basis of the existence of the milk production units. For this, only the divisions of Noun, Bamboutos in the western region and the divisions of Mezam, Momo, Boyo, Bui, Menchum, Donga-Mantum,

and Nkog-ketungja were taken into account in this study. From these divisions, the localities of Bafoussam, Foumban, Foubot, Bangourain, Kouoptamo, koutaba, Babet in the western region and the localities of Santa, Tubah, Bali, Mbengwi, Wum, Jakiri, Vekovi, Nkambe, Ndu, Bamenda, Bali and Kumbo in the Northwest region were selected based on their designation as large milk basins.

2.3. Surveys and interviews with farmers

Farmer interview surveys were conducted during the period from June to December 2019 and covered 120 farms, totaling 285 dairy cows. In order to facilitate the collection of reliable information on farm management and zootechnical performance in the localities concerned, the data were collected through direct observations in the field, surveys and direct interviews with farmers. Data collection included the following aspects:

- Sociocultural characteristics of the breeders
- Housing and equipment
- Food and feeding of cows
- Reproduction and milk production of cows
- Hygiene and health of livestock.

2.4. Statistical analyses

The survey data were introduced in Microsoft Excel 2007. These data were subjected to the descriptive analysis using SPSS software version 21.0. The p-value was considered significant when it was less than or equal to 0.05.

3. Results and Discussion

3.1. Sociocultural characteristics of breeders

Table 1 indicates that, raising dairy cows in the Western Highlands is a male-dominated activity

with 64.2% men and 35.8% women. The spots here are divided between women and men. Women take care of the household and the small livestock, while the men take care of the ruminants (big and small ruminants) because the management of the dairy cows requires not only a lot of physical strength but also a lot of care which would explain the massive number of men compared to women who are mostly involved with milk management. These observations are consistent with results reported by [Mbanya *et al.* \(1995\)](#), [Njoya *et al.* \(1997\)](#), in the Northern Region, and [Takoudjou \(2005\)](#) in North-West Cameroon, who reported women's involvement in activities such as milk processing and the sale of milk and milk products. About 65% of breeders were between 40 and 60 years old, 11.7% between 60 and 80 years old and the rest 23.3% were between 20 and 40 years old. The low proportion of breeders between the ages of 60 and 80 could be justified by the fact that when these breeders reach a certain age, fatigue and diseases push them to hand over the succession of their cows to their children in order to ensure continuity and to keep the different farming techniques. These results are similar to those found by [Takoudjou \(2005\)](#) in Bamenda, who stipulated that 20.8% of the local cattle breeders were over 60 years old. Majority of the breeders in the West Region were Bamouns (47.5%) and the Nso (19.2%), the Tikars (18.3%) and the Fulanis (7.5%) in the Northwest Region. From the two regions, the breeders were mostly Muslims (63.3%) and Christians (36.7%). Cattle breeding generally in Cameroon is practiced by Muslims. The dairy cow has no religious taboo and is highly recommended by the Muslim religion. These results confirm those obtained by [Awa *et al.* \(2004\)](#), who showed that 91.6% of Muslims in the Far North Region of Cameroon were cattle farmers.

Table 1: Distribution of breeders according to their Sociocultural characteristics

| Parameters | | Number of Individuals | Percentage (%) |
|--|------------------|--------------------------|----------------|
| Gender | Male | 77 | 64.2 |
| | Female | 43 | 35.8 |
| | Total | 120 | 100 |
| Age (years) | [20-40[| 28 | 23.30 |
| | [40-60[| 78 | 65.00 |
| | [60-80] | 14 | 11.70 |
| | Total | 120 | 100.00 |
| Religion | Muslim | 76 | 63.30 |
| | Christian | 44 | 36.70 |
| | Total | 120 | 100.00 |
| Ethnic group | Bamileke | 04 | 03.30 |
| | Bamoun | 57 | 47.50 |
| | Fulani | 09 | 07.50 |
| | Nso | 23 | 19.20 |
| | Tikar | 22 | 18.30 |
| | Wimbum | 05 | 04.20 |
| | Total | 120 | 100.00 |
| Marital Status | Married | 110 | 91.70 |
| | Single | 06 | 05.00 |
| | Widow | 03 | 02.50 |
| | Divorced | 01 | 00.80 |
| | Total | 120 | 100.00 |
| Number of dependent members in the family | [1-10[| 89 | 74.20 |
| | [10-20[| 27 | 22.50 |
| | [20-40] | 04 | 03.30 |
| | Total | 120 | 100.00 |
| Educational level | None | 08 | 06.70 |
| | Primary | 82 | 68.30 |
| | Secondary | 24 | 20.00 |
| | Higher education | 6 | 05.00 |
| | Total | 120 | 100.00 |
| Experience in breeding (years) | [1-5[| 23 | 19.16 |
| | [5-10] | 58 | 48.33 |

| | | | |
|---------------------------------------|------------------|------------|---------------|
| | [10-15] | 26 | 21.67 |
| | >15 | 13 | 10.83 |
| | Total | 120 | 100.00 |
| Experience in milk production (years) | [1-5[| 41 | 34.20 |
| | [5-10[| 48 | 40.00 |
| | [10-15] | 25 | 20.80 |
| | >15 | 06 | 05.00 |
| | Total | 120 | 100.00 |
| Principal activity | Breeding | 36 | 30.00 |
| | Agriculture | 72 | 60.00 |
| | Commerce | 04 | 03.30 |
| | Other | 08 | 06.60 |
| | Total | 120 | 100.00 |
| Secondary activity | Breeding | 03 | 02.50 |
| | Agriculture | 72 | 60.00 |
| | Commerce | 35 | 29.20 |
| | Others | 10 | 08.30 |
| | Total | 120 | 100.00 |
| Reason for milk production | Prestige | 01 | 0.80 |
| | Auto-consumption | 33 | 27.50 |
| | Commerce | 86 | 71.70 |
| | Total | 120 | 100.00 |
| Training in milk production | Trained | 110 | 91.70 |
| | Not trained | 10 | 08.30 |
| | Total | 120 | 100.00 |
| Animal Origin | Heritage | 09 | 07.50 |
| | Gift | 102 | 85.00 |
| | Purchased | 09 | 07.50 |
| | Total | 120 | 100.00 |
| Belong to a cooperation | Yes | 115 | 87.50 |
| | No | 15 | 12.50 |
| | Total | 120 | 100.00 |

The breeders surveyed were mostly married (91.7%). The number of children and dependents ranged from 1 to 10 which was evaluated at 74.2%. Polygamy is still important in families many heads of households want a lot of children because they are a family workforce for raising dairy cows and other family activities.

The majority (68.3%) of these breeders received a primary education, while a minority (6.7%) of the breeders interviewed received no education. A total of 91.7% of breeders benefited from training in breeding techniques for dairy cows while 87.5% were organized into cooperatives. The ability to read and write allows farmers to exploit not only breeding guides but also to attend various training seminars in dairy farming. These results, however, are contrary to observations made by [Mbanya *et al.* \(1995\)](#) who reported that 79.3% of northern cattle farmers received no education. This result suggests that in the present days, many more breeders may have learnt the importance of education in dairy farming and Younger and educated breeders are taking over from their parents of education which could help them know how to read and write.

From the total number of breeders, 48.33% had a long experience in breeding estimated on average at 17 years while 40% of them had an experience of about 10 years in dairy production. For 71.7% of breeders in the western highlands use dairy farming for economic purposes because milk and products derived from milk processing are resold and provide a source of financial income, while 27.5% farm for self-consumption and 0.8% do it for prestige.

Sixty percent of the breeders surveyed had agriculture as their main activity while breeding especially that of the dairy cows appeared to be

the main activity for 30% of the breeders. Traders represented 3.3% while traditional healers, masons, carpenters, electricians, religious, civil servants and others accounted for 6.6% of all farmers. In order to valorize the residues of the fields, 60% of farmers indulge in secondary pastoral activities.

From Table 1, it appears that farmers are increasingly integrating livestock into their activities. This allows them to valorize the residues of different crops that are used in this case for feeding cows. These results corroborate with those obtained by [Njoya *et al.* \(1999\)](#) in the Far North who showed that the agriculture-livestock association functions as a graining process.

3.2. Distribution of breeders according to herds

87.5% of the livestock were Holstein breeds, 7.5% were Gudali and 4.2% were crossbreeds from exotic and local breeds, while 0.8% were Jersey. Of these cows, 90.8% were exploited for milk while 9.2% were exploited for meat production. Of the herders, 7.5% inherited these cows, 7.5% bought them while 85.5% of the herders received the cows as a donation. Intensive rearing is practiced in 96.7% of farms while 3.3% are transhumance similar to reports by [Bayemi *et al.* \(2005\)](#) and [Takoudjou \(2005\)](#) in the North West, who reported lower proportions of livestock local cows in intensive breeding. These authors stipulate that exotic breeds need special care and would not resist transhumance.

In general, the age of cows ranged from 2 (5.8%) to 17 years (0.8%) with a majority of animals (50%) having between 5 to 10 years and an average age of 6 years.

The number of cows per farm varied from one (40.8%) cow to 14 cows (0.8%). Of all the

farmers, 64.2% had between one and two cows as shown in Figure 1. Thirty-five percent of them concomitantly with cows, kept (51.26%) poultry, (13.44%) goats, (18.49%) sheep and 16.81% other animals such as pigs and grass cutters.

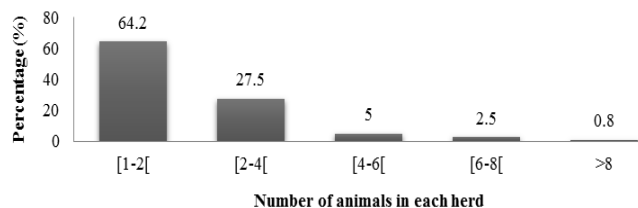


Figure 1: Distribution of animals in the different herds

3.3. Housing and equipment

Table 2 indicates that, the majority (95%) of dwellings consisted of hangars made of planks (86.7%) with concrete tanks (94.2%) mainly used as feeders. In some dwellings 4.2% of half-drums were used as feeders while 43.3% were used as drinking troughs. However, the majority of dwellings had water troughs made of concrete block (56.7%).

Farms were mainly based in peri-urban areas. Only 8% of the stables were secured with fences made of planks. A fraction of 31.7% of the stables were locked with padlocks. Some farms (20.8%) used night watchmen for the safety of their barns, while 15.8% used both night watchmen and security dogs.

3.3. Forage and cow feeding

Analysis of the data shows that 94.96% of the breeders practiced intensive breeding with animals in tie-stalled housing while 5.04% breeders practiced semi-intensive breeding with animals in loose housing. Pastures were 11.7% improved, 8.3% natural and 80% improved and

natural. About 94.2% of breeders practice forage cultivation of species such as *Bracharia* (13.3%), *Stylosanthes* (1.7%), *Guatemala* (5.8%), as well as *Bracharia* and *Stylosanthes* (13.3%), *Bracharia* and *Guatemala* (30%), *Bracharia*, *Stylosanthes* and *Guatemala* (35%) and a small proportion (0.8%) practiced cultivation of *Guatemala* and *Stylosanthes*. Other breeders (5.8%) did not practice any forage crop. The basic ration of livestock comes mainly from the exploitation of natural and improved pastures. The productivity of natural pastures varied with the seasons. Fodder is abundant in the rainy season and becomes increasingly rare at the beginning of the dry season. These observations confirm those made by [Tendonkeng *et al.* \(2000\)](#) that the basis of animal feeding remains natural pasture. They revealed that animals fed exclusively on pasture generally had a low growth rate and represented only 10% of the genetic potential, hence the need to supplement the diet. The fodder thus cultivated is for 68.3% of farmers harvested throughout the year while 22.5% of breeders harvest in the dry season and 9.2% during the rainy season. Once harvested, these fodder are stored either in the form of hay (22.5%), Silage (1.7%) or heap (75.8%). The fodder crop is grown on areas between 0.5 and 6.5 hectares with 92.5% of herders possessing between 0.5 and 2 hectares of land.

After harvesting in the rainy season, these fodders are directly used by the animals in their boxes because 47.06% of the breeders do not have shelters for conservation, while 52.94% of the breeders have storage sheds which can be provisional (46.7%), semi-temporary (49.2%) or permanent (4.2%). In the dry season, stubble of corn, beans and other agricultural by-products are kept in the barn and fed to animals as food.

Table 2: Distribution of herds according to types of housing and equipments

| Parameters | | Number of farms | Percentage |
|------------|------------------|-----------------|---------------|
| Dwellings | Sticks | 15 | 12.50 |
| | Planks | 104 | 86.70 |
| | Mud blocks | 01 | 0.80 |
| | Concrete | 00 | 0.00 |
| | Total | 120 | 100.00 |
| Feeder | Dishes | 02 | 01.70 |
| | Half drums | 05 | 04.20 |
| | Concrete tanks | 113 | 94.20 |
| | Total | 120 | 100.00 |
| Drinker | Concrete blocks | 52 | 56.70 |
| | Drinking troughs | 68 | 43.30 |
| | Total | 120 | 100.00 |

Table 3: Reproduction parameters

| Parameters | Values |
|--|----------|
| Mean age at first calving (Months) | 27.5 ± 5 |
| Interval between fertilizing insemination (Months) | 6.0 ± 3 |
| Mean Calving Interval (Months) | 12.0±3 |
| Fertility (%) | 76.42 |
| Fertility rate (%) | 75.65 |

Majority (98.3%) of farmers permanently supplement the cows with ingredients prescribed by the Heifer International Project organization. This dietary supplement is composed as follows: corn 32 kg, wheat bran 32 kg, peanut cake 17 kg, palm kernel cake 15%, salt germ 2 kg, cooking salt 1 kg and 1 kg bone powder while 1.7% farmers do not use supplements because of the high cost of ingredients. The dietary supplement is administered either once (5.8%), twice (84.2%) or thrice (10%) daily. When supplements are used, they are administered primarily to pregnant cows or those lactating. In all farms, salt as well as mineral licks are served throughout the year as a mineral supplement. The animals are thus fed in 81.7% of farms individually and collectively in 18.3% of farms.

3.3. Watering

All breeders water the cows in the barn. Water is served to ad-libitum cows in 81.7% farms, in the morning in 11.7% of farms and in the evening in 6.7% of farms. The water thus supplied comes from 83.3% of the tap water, 10% from any watercourse and 6.7% from the water supply. In general, water is abundant in the rainy season, and farmers do not have any difficulty in having water. In the dry season, however, the availability of water becomes problematic. During this season, seasonal watercourses dry up and farmers (77.31%) have to travel long distances in search of water for their cows as only 22.69% have functional water points near their stables.

3.6. Reproduction of cows

In the farms surveyed, the age of breeding ranged from 15 to 24 months and was distributed as follows; 15 months (1.7%), 16 months (1.7%), 17 months (0.8%), 18 months (56.7%), 20

months (22.5%), 24 months (7%) with 19 months as the average age of breeding. It has been noted that no physiological examination is performed before breeding. The choice of breeding for females between 15 and 18 months of age is based solely on the body condition score. These results show that the age of introduction to reproduction is early and below the standard which is between 18 to 24 months in the female. This negatively affects the reproductive and productive career of the female because often her physiological state is inappropriate due to dietary errors (Soltner, 1989).

There are two methods of reproduction used by farmers; artificial insemination (6.7%) and the natural breeding method used by 93.3% of breeders. For a group of breeders gathered in a village or neighborhood, a bull is used for the crossing of 5 cows.

The average age at first calving was 27.5 ± 5 months (Table 3). It varies between 24 and 33 months. A fraction of 34.2% of breeders return their cows for breeding 2 months after calving, 61.7% do so 3 months after calving and 4.2% do so 4 months after calving. The first successful insemination was obtained in 78.99% of the farmers between 2 months and 12 months after the previous calving while 20.17% of the farmers obtained a fertilizing insemination at more than 12 months after calving with an average of 3 months between calving and fertilizing insemination, which complies with the standard as recommended by INRAP in 1988. Of which the interval between calving and fertilizing insemination must be 85 to 90 days, i.e. 3 months.

The mean calving interval (12 ± 3 months) with late weaning of calves was significantly similar to the result (12.2 ± 3 months) in local cows by Njoya *et al.* (1997) in the Far North Region of Cameroon. This result is considered satisfactory if it is compared to the standard which must be between 11 to 13 months as recommended for dairy farms by Boichard *et al.* (2002). The fertility and fertility rates in the farms surveyed were 76.42% and 75.65% respectively, with 1.7% of all abortion cases.

During calving, 93.3% of the breeders provide assistance to cows. Assistance is done either by pulling the calf (70%) or by using the veterinary surgeon (10.8%) or simply by encouraging the cow to grow (19.2%).

3.7. Milk collection

The collection of milk is done manually by 97.5% of the breeders. Milking is done between 5 am to 7 am and is mainly by family members including 27.30% of men, 42.61% of women and 30.09% of children. These results show that milking is an inclusive activity involving all family members with a strong involvement of women. These results confirm the observations made by Ndambi *et al.* (2008) that Fulani herders of local cows in Western Cameroon are the most involved in the milking process. Most breeders (90%) start milking cows 1 to 7 days (after calf sucked colostrum) after farrowing. While the rest (10%) do so after the farrowing period about a month after calving. In 75.8% of the farms surveyed, cows are milked twice a day, morning and evening, while 15% once a day and 3.3% thrice a day. This superior result, contrary to the results obtained by Mbanya *et al.* (1995), according to which the farmers of the local cows of North Cameroon milk their cows once a day,

is due to the fact that 85.7% of the cows in the farms surveyed in the Western Highlands of Cameroon are Holstein breeds, which are much better milk producers compared to other exotic breeds and local breeds (Bayemi *et al.*, 2005). However, 5.8% of farms, even though raising dairy cows, do not collect milk. The milking is thus done whatever the season especially when the food conditions and the milk productivity of the cows are better.

Calving cows and lactating cows receive in 80.8% of cases special care characterized by an increase in the diet (9.2%), the administration of drugs and/or minerals (69.2%) such as calcium, vitamins, iron and antibiotics. About 2.5% of breeders in addition to drugs improve diet. However, 19.2% do not provide additional treatment to lactating cows.

3.8. Production performance of cows

Table 4 shows that, during the last 12 months prior to the survey, 5% of breeders lost animals, of which 94.28% were calves. The mortality rate is close to that reported by Bouba (2006). The high pre-weaning mortality rate can be explained by the susceptibility of calves to parasitic diseases (ticks, intestinal worms), neonatal diarrhea and respiratory diseases. In addition, the fragility of calves with respect to environmental conditions, poor dietary and hygienic practices of calves is not negligible (Kouamo *et al.*, 2014). The breeders (95%) who have not recorded mortality cases are justified by the fact that, apart from respecting vaccination campaigns, they regularly call on veterinarians in case of health problems. The average rate of abortion on farms was estimated at 1.7%.

Table 4: Production performance of dairy cattle

| Parameters | Modalities | Number of herds | Percentage (%) |
|---------------------------------|---------------------|-----------------|----------------|
| Mortality rate | | 06 | 05.00 |
| Abortion rate | | 02 | 01.70 |
| | [3-6] | 13 | 10.83 |
| Milk collection period (months) | [6-9] | 107 | 89.17 |
| | Total | 120 | 100.00 |
| | 6 months | 13 | 10.83 |
| | 10 months | 102 | 85.00 |
| Lactation period | 12 months and above | 05 | 04.17 |
| | Total | 120 | 100.00 |

Tableau 5: Daily milk production according to the lactation stage and the annual production mean per dairy cattle

| Parameters | Mean daily quantity per dairy cattle | Mean total quantity per dairy cattle |
|--------------------|--------------------------------------|--------------------------------------|
| Start of lactation | 15.0 ± 2.0 | 1395 ± 227.2 |
| Mid lactation | 12.0 ± 3.1 | 1680 ± 282.1 |
| End of lactation | 08.0 ± 1.5 | 776 ± 114.1 |
| Annual Mean | 11.5 ± 5.0 | 2022 ± 360.3 |

The withdrawal from milking from the farms surveyed is conditioned by the natural drying up of cows (89.17%) while 10.83% of breeders milk for 3 to 6 months. This is because they consider that letting the calf to suckle for a long time or late weaning of calves would increase milk production.

Some breeders (85%) milk their cows for up to 300 days or 10 months after calving and two months before the next calving, that is seven months of gestation. Other herders (10.83%) milk their cows during the 6 months preceding calving and 4.17% do so until one year or more after calving. This variation is similar to that obtained by [Takoudjou \(2005\)](#) in the extensive breeding of Bamenda. The incidence of disease on cow productivity has been demonstrated by several authors, including [Meyer & Denis \(1999\)](#) who reported that fever and mastitis further depress milk production. Diseases such as mastitis are the cause of short lactations, while late weaning of calves leads to the long lactations recorded in the farms.

The average milk yield of cows as shown in table 5 decreased from one lactation stage to another and this production fluctuated between 3 to 24 liters/day which was lower compared to the potential of the Holstein breed (breed most represented) whose production varies from 25 to 50 liters of milk/day. This could be explained by the fact that these cows face difficult climatic conditions and problems related to food and malnutrition. The average annual quantity of milk produced per cow in the farms surveyed was estimated at 2022 ± 360.3 liters of milk/cow/year, which is 4 times higher than the 483 liters/cow/year reported by [Takoudjou \(2005\)](#) in the extensive breeding of Bamenda. This difference could be justified by the improvement of pastures and the increase in

forage production coupled with the adaptation of crop residues in the diet of dairy cows.

The milk thus collected was either sold in 87.5% or consumed 11.7% in some cases. The average volume of milk consumed was 1.5 liters with 78.2% of farmers consuming between 1 and 2 liters of milk. The quantity of milk sold ranged from 1 to 43 liters of milk with an average of 10 liters per day.

3.9. Health and hygiene of cows

Information on the state of health of cows and the diseases diagnosed in cows are shown in Table 6. It can be seen from this table that mastitis is the main health constraint on farms. They are listed in 35.8% of the farms. Ticks (10%), diarrhea (17.5%), intestinal parasites (9.2%), tuberculosis (2.5%), foot-and-mouth disease (13.3%) also affect cows. These observations are similar to those made by [Bayemi *et al.* \(2005\)](#). Alongside these, 5.8% of breeders have cows that have reproductive-related diseases such as retained placental (5.8%) and deficits in calcium.

Almost a 100% (99.2% to be exact) of breeders respected vaccination campaigns and regularly vaccinated their animals. All the breeders we met used mainly modern veterinary products to cure their cows. Antibiotics, antihelminthics and ascarids were commonly used. However, many breeders (80.83%) still remove ticks by hand or petroleum jelly they used on places affected by the ticks. In addition, 25.2% routinely removed all cows internally and some (3.97%) only treated those with serious parasitic infections.

Table 6: Distribution of the most predominant diseases per farm

| Main diseases | Number of farm | Percentages (%) |
|------------------------|----------------|-----------------|
| Food-and-mouth disease | 6 | 5.00 |
| Dermatosis | 1 | 0.83 |
| Diarrhea | 21 | 17.50 |
| Brucellosis | 1 | 0.83 |
| Mastitis | 43 | 35.83 |
| Meningitis | 1 | 0.83 |
| Retained Placenta | 7 | 5.83 |
| Ticks | 12 | 10.00 |
| Cough | 2 | 1.67 |
| Tuberculosis | 2 | 1.67 |
| Intestinal parasites | 11 | 9.17 |
| No disease | 13 | 10.83 |
| Total | 120 | 100.00 |

The milking is done in the barn in a corridor of contention that stabilizes or immobilizes the cow so that it does not move. All breeders practice hygiene before milking. In 97.4% of the farms observed, milking hygiene is ensured by the cleaning with lukewarm water against 2.6% of breeders who use cold water instead.

The stables of the animals are cleaned once a day, whatever the season, with broad-spectrum detergents or even on all farms. The slopes and gutters are also mentioned for the evacuation of urine and water in order to avoid the litter's severity.

4. Conclusion

This study on the breeding of dairy cows in the Western Highlands of Cameroon, surveys of pastoralists and other actors in the dairy sector revealed that dairy farmers have the will and potentials to keep dairy cattle.

The traditional dairy industry, which is several years old, does not produce enough milk to meet the ever-increasing demand of consumers. Limited milk yields could be related to climatic and nutritional constraints, livestock and animal management practices, herd numbers, animal health, hygiene and prophylaxis. The constraints encountered are multiple and generally dependent on the absence of a development

policy for the dairy sector, the lack of organization of producers in the dairy sector, the cultural habits of producers who are not always compatible with the requirements of entrepreneurship. Another aspect that strongly influences milk production is the lack of recording of data related to the zootechnical performance of livestock and the total absence of technical supervision. It is the responsibility of the Cameroonian State to implement a policy to promote milk production in order to promote the development of the dairy sector and the processing of milk, which should involve the establishment of small processing units close to production areas and adapted to the production size as well as to the technical capacities of the producers.

The knowledge of these aspects would stimulate the increase in milk production in the Western Highlands of Cameroon, improve the income of farmers and ensure food security of the population.

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Conflict of interest

The authors declare that there are no conflicts of interest.

Ethics

This Study does not involve Human or Animal Testing.

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