THE MILK VALUE CHAIN AND CHALLENGES IN THE WA MUNICIPALITY OF GHANA

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ABSTRACT
A survey was conducted to evaluate how fresh cow milk is produced and marketed as well as the constraints to dairying in the Wa Municipality of the Upper West Region. Hundred (100) farmers were interviewed through a snowball sampling from twenty-two (22) communities randomly selected from the Municipality. The results revealed that cattle were reared for multiple purposes (64%), savings (26%), income (6%), socio-cultural reasons (2%), meat (1%) and milk (1%). The study also revealed a cattle population of 2,491 with an average herd size of 24.91. Milk yield per annum was estimated to be 32,201.2 litres, with 22,215.6 litres for the rainy season and 9,985.6 litres for the dry season. The wives of Fulani herdsmen and children milked the cattle since they engaged in herding the cattle. Furthermore, 64% of the farmers provided supplements for their animals using groundnut haulms, rice straw, corn stover and corn cobs. The study also showed that the system of management was mainly extensive (65%) with poor housing, feed and water supply in the dry season as well as pests and diseases, posing a threat to increase milk production. Milking was mainly done by hand with no formal training on good quality milk handling. Majority of the milk produced were either sold fresh or processed initially into cheese (wagashi). Majority of the respondents tied the tail and hind legs of the cow before milking. Actual milking was done in the kraal, which was unhygienic. The main source of water for washing milking utensils was borehole water. Fresh milk and other products were marketed in the area through assemblers, processors and retailers who operated mainly within the primary and secondary market centers. Fresh milk production and marketing was done informally using a host of intermediaries. There is the need to improve the value chain of milk production and marketing to meet the increasing need of consumers in the Wa Municipality of Ghana.

Keywords: *Dairy cow, Ghana, Milk value chain, milk yield, Processed milk, Wa Municipality*

INTRODUCTION
According to Sasu (2024), the number of cattle in Ghana reached 2.24 million in 2022 and the free-range system was usually used for cattle production. The West African short horn is the most populous breed, constituting more than 65% of cattle population in Ghana (Gidiglo, 2014). Milk is a nutritious food obtained from the lacteal secretion of mammals such as cows, sheep, goats, buffalos and donkeys (Pereira,

2014). In Ghana, milk for human consumption is mainly produced from cattle, thus milk production in this case refers, to milk from cattle. Mainly herdsmen do milk production, majority of whom are Fulanis. According to Addo *et al.* (2011), cattle herd sizes are generally between 20 and 200 in the southern Savanna zone of Ghana. In many cases, these herds are properties of absentee owners and are cared for by hired Fulani herdsmen. The remuneration of the Fulanis most of the time are their right to milk and a third calve from a cow. This milk is then sold either fresh or processed in the urban and peri-urban areas in the country. The farming families also use some for home consumption as well as to feed calves. The herdsmen's wife may generate some extra income by the production of wagashi, a soft cheese prepared from fresh milk (Food and Agriculture Organisation (FAO), 2004).

Farmers have been encouraged to engage in commercial dairy farming to produce raw milk to satisfy consumer demand, and dairy processors have enabled raw milk to be transformed into a wide variety of products (FAO, 2004). The composition of milk varies according to a range of factors, including species, stage of lactation and diet. Essentially, milk is an emulsion of fats (both saturated and unsaturated), proteins (e.g. casein and whey proteins), lactose, minerals (e.g. calcium, potassium, magnesium and zinc), vitamins (e.g. A, B, D and E) and other solids in water (Rizzoli, 2014). In addition, the total solids content of cow's milk is 13%, with fat representing about 4%, protein about 3.5% and lactose about 5%. Raw milk is highly perishable and as such needs to be quickly transported to consumption centres and for processing into less perishable forms. Moreover, raw milk is typically more than 80% water, resulting in relatively high transportation cost per unit, and limiting the quantities that can be marketed by individuals without vehicular transport (Smallholder Dairy Project, 2004). According to Gidiglo (2014), Ghana consumes less milk than the required minimum of 120 kg per annum. Despite the low consumption of milk, demand for milk and milk products in the country exceed local production leaving a huge deficit that has to be met by imports. In 2010, the total amount of milk imported into Ghana was 28,267.5 metric tonnes (Gidiglo, 2014; National Entrepreneurship and Innovation Plan, 2025).

The dairy industry in Ghana faces challenges including predominant use of local or indigenous low milk yielding cattle, diseases and pests, and poor farm management practices (Gidiglo, 2014). Currently, the dairy sector is expanding rapidly through intensification and expansion of smallholder milk production. To be effective, efforts to improve the productivity of smallholder dairy production needs to be supported and informed by detail understanding of the current and dynamic conditions of production, marketing, processing and consumption of milk and dairy products (Negassa, 2008). Even though very limited research works have been carried out in different areas of the country, in the Wa Municipality there has not been any known research conducted regarding dairy production and marketing systems, thus creating information gap in the Municipality. Therefore, the identification of prevailing problems and understanding of the existing dairy production and marketing systems in the area is of paramount importance for future improvements. This study was therefore conducted to evaluate how milk is produced and marketed in the Wa Municipality, as well as the constraints of dairying in the area.

MATERIALS AND METHODS

Study Area

The study was carried out in twenty-two (22) communities namely: Boli, Sing, Busa, Kperisi, Sagu, Danko, Chansa, Nakore, Logpora, Dapuoha, Kambali, Zingu, Mangu, Kpaguri, Bamahu, Kongpaala, Kunfaabiala No.1, Kunfaabiala No.2, Dokpong, Napogbakolee, Sakpayiri, Kpongu, Jonga and Piisi in the Wa Municipality. The Wa Municipality lies within latitudes 1º40'N to 2º45'N and longitudes 9º32'W to 10º20'W, serves as the regional capital of Upper West Region and has a land area of approximately 579.86 square kilometres (Ghana Statisti-

cal Service, 2012). Wa Municipality has two marked seasons, namely, the wet and dry seasons and the mean annual rainfall varies between 840mm and 1400mm (Ghana Statistical Service, 2012).

Sampling Procedure

Multi-stage sampling tool comprising of simple random, purposive and snowball sampling were used. In the first stage simple random sampling was implemented in the selection of communities from the three zones (Busa, Bamahu and Wa Central) and twelve operational areas within the Wa Municipality designated by Ministry of Food and Agriculture. In the second stage, purposive sampling was implemented to identify communities with cattle from the various zones based on proximity. In the third stage, snowball sampling was implemented to identify individual cattle farmers from each community selected.

Data Collection

The researcher used semi-structured questionnaires, interviews and observations to collect primary data from the targeted cattle farmers. The sample size of 100 was arrived at as a result of snowballing due to the fact that there were no up-to-date data on cattle population from the Municipal Livestock Division. However, secondary data was obtained from the Wa Municipal Livestock Officer of the Ministry of Food and Agriculture with regards to the three zones and twelve operational areas. It covered the areas such as socio-economic characteristics, farm description, management systems, milk production systems, milking handling practices, milk marketing, storage and preservation and constraints to milk production and marketing. The focus was on the herdsmen, their wives and any other hired labour because they are key actors in milk production.

Data Analysis

The data was analysed using IBM Statistical Package for the Social Sciences (SPSS) version 23. Results in frequencies and percentages were presented in Tables and Figures.

RESULTS AND DISCUSSION

Demographic Characteristics of Respondents

The demographic characteristics of the respondents are shown in Table 1. The ages of farmers were between 20 and above 60 years. Majority of these farmers (39%) were between the ages of 41-50. This indicates that, the active labour force was involved in the dairy cattle industry. Males dominated the cattle industry in the study area, similar to a report by Mogre *et al.* (2014). Majority (51%) of the farmers had no formal education. This was followed by 22% of those who had secondary education, 19% basic education and 8% tertiary education. This study showed that, most of the farmers had non-formal education and this could influence the acceptance of new innovations in the study area.

Ownership, Purpose of Rearing and Herd Structure of Cattle in the Area

The ownership structure, herd structure and purpose of rearing cattle are presented in Table 2. Majority (71%) of the farmers kept cattle on individual basis, whilst 28% and 1% represented ownership on behalf of families and other groups of people, respectively. It was also realised that 77% of family children were mostly

Table 1: Demographic Characteristics of Farmers

Age distribution of farmers	**Frequency**	**Percentage (%)**
20-30	12	12.0
31-40	15	15.0
41-50	22	22.0
51-60	39	39.0
Above 60	12	12.0
Educational status of farmers	**Frequency**	**Percentage (%)**
Basic level	19	19.0
Secondary level	22	22.0
Tertiary level	8	8.0
None	51	51.0
Gender of cattle farmers	**Frequency**	**Percentage (%)**
Male	96	96.0
Female	4	4.0

involved in cattle herding, 2% by hired Fulani herdsmen, 20% by cattle owners and 1% were herded by adult herdsmen. These suggest that the ownership and herd structure is more of a traditional, decentralised and community-based, rather than a large-scale industrialised approach.

The study found that cattle were reared for multiple purposes (64%), as a form of savings (26%), as a means of income (6%), for socio-cultural reasons (2%) and for meat and milk purposes (1% each), respectively. This implies that, cattle rearing is not just an economic venture but also for socio-cultural reasons. This therefore highlights the significance of cattle in the livelihoods of farmers beyond just food production.

Table 2: Ownership, Purpose of Rearing and Herd Structure of Cattle

Type of cattle ownership	Number of farmers	Percentage (%)
Personal	71	71.0
Family	28	28.0
Group	1	1.0
Purpose of rearing cattle	**Number of farmers**	**Percentage (%)**
Multiple purpose	64	64.0
Savings	26	26.0
Income	6	6.0
Socio-cultural	2	2.0
Meat	1	1.0
Milk	1	1.0
Herd size of farmers	**Number of farmers**	**Percentage (%)**
Less than 10	24	24.0
10-25	29	29.0
26-40	28	28.0
41-60	15	15.0
Above 60	4	4.0
Herd structure of cattle	**Number of cattle**	**Percentage (%)**
Breeding bulls	376	15.0
Pregnant cows	188	8.0
Nursing cows	421	17.0
Heifers	652	26.0
Young bulls	283	11.0
Dry cows	116	5.0
Calves	455	18.0

The study showed that farmers had varying number of cattle ranging from 10 to over 60. This means, the study area has diverse and fragmented cattle industry with many small-scale farmers who have the potential for scaling up their operations to increase production based on breeding programs and management strategies.

The research revealed an estimated cattle population of 2,491 from the 100 farmers interviewed with an average herd size of 24.91. This implies that, farmers in the study area generally had small herd sizes. This concords with a study by Kara and Galic (2022) who categorised cattle into small (with less than 30 cows), medium (30 to 50 cows) and large (with more than 50 cows) sizes.

The various breeds of cattle reared in the study area is shown in Figure 1. The most dominant breeds identified were the mixed breed (Sange, Zebu and Wash), followed by only Sanga and WASH. The least was WASH. However, Gidiglo (2014) indicated that the WASH was the most popular breed in Ghana.

Management Practices Adapted by Cattle Farmers

The management systems adapted by farmers are presented in Table 3. It was found that majority of the farmers kept their animals under the extensive system (65%), 23% kept theirs under the semi-intensive system and 12% practiced the intensive system. Animals were poorly housed mainly in open kraals where they were left at the mercy of the weather. Similar observations were made by Gidiglo (2014) in the Accra Plains of Ghana.

Stress from exposure to adverse conditions as a result of poor housing can cause reduce growth, milk production and expose cows to diseases. Therefore, both extensive and semi-intensive animal-keeping methods without shelter may not

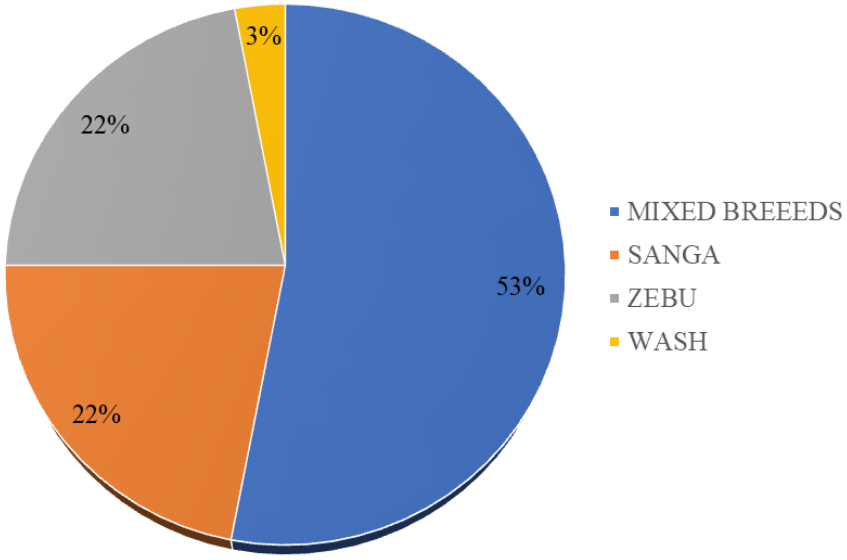

Figure 1: Breeds of Cattle in the study area

Table 3: Management Systems adapted by farmers

Management systems	Frequency	Percentage (%)
Extensive	65	65.0
Semi-intensive	23	23.0
Intensive	12	12.0
Total	**100**	**100.0**

be suitable for increased milk production. Although intensive keeping is recommended for maximum milk yield and collection, it is practically difficult due to lack of mechanisation for large herds in this part of the world.

Feeding

Grazing was communal and to some extent some cattle were tethered, which resulted in overgrasing and some forms of destruction of farmer's properties on the farm. It was realised that 64% of the farmers provided some form of supplementary feed to their animals. According to Timpong-Jones (2016), feeding cattle in the dry season remains a major challenge as available forages are poor in quality and inadequate to meet the nutritional needs of these large ruminants thereby resulting in weight loss, reduction in milk production and in some cases death. Dry season feeding was poor since animals were left to graze on hay of low nutritive value. This could be a possible contributory factor to the loss of body conditions of the animal and the low milk let down in the dry season.

Water Supply

Most of the farmers (85%) did indicate that their main source of water for the animals were dams whilst 8% and 7% indicated rivers and boreholes, respectively. However, animals trekked long distances before getting access to these water sources with the exception of boreholes and this makes them utilise their energy reserves in search of water. Timpong-Jones (2016) stressed that milking cows require more water since milk is made up of 87% water. It was observed during the study that most of these rivers

and streams had dried up leaving these animals with little or no water, which could possibly influence milk let down in the cows.

Milking Process

From Figure 2, majority of the farmers (86%) reported that milking was done once in the morning, 7% of them do not milk their cows, and 7% of respondents milked twice daily (morning and evening) in the wet season all by hand milking.

These findings are similar to a report by Gidiglo (2014) in the Accra Plains where farmers milked once daily in the mornings before grazing. In most cases milking was done by the herdsman (51%), their wives (27%) and children (22%). The age of these children ranges between seven (7) and twelve (12) years respectively. Amanor-Badu (2006) in the Savelugu-Nanton district reported that family children (60%) did most of the milking.

Prior to milking, majority (83%) of the respondents tied the tails and hind legs of their cows to limit movement during milking. This is contrary to what was reported by Gidiglo (2014) in the Accra Plains where 98% of the respondents do not tie the cows' tail during milking. According to Yigrem *et al.* (2008), tying the hind legs as well as the tail of the cow with rope during manual milking is very critical since it will reduce the risk of contamination of the milk especially when it wags it tail. It was observed that milking was mostly (91%) done in unhygienic kraals, whiles just a few (9%) milked outside the kraals. This agrees with a study by Gidiglo (2014) who reported that milking was not done in a specific location and sometimes done in unhygienic kraals.

It was revealed in the survey that, majority (93%) of the herdsmen washed their hands before milking is done with the remaining (7%) not washing their hands. Meanwhile, 84% of the respondents that washed their hands before milking used water from boreholes with the remaining using water from well (6%) and dam (3%). Furthermore, 56% of the respondents washed their hands with only water while 44%

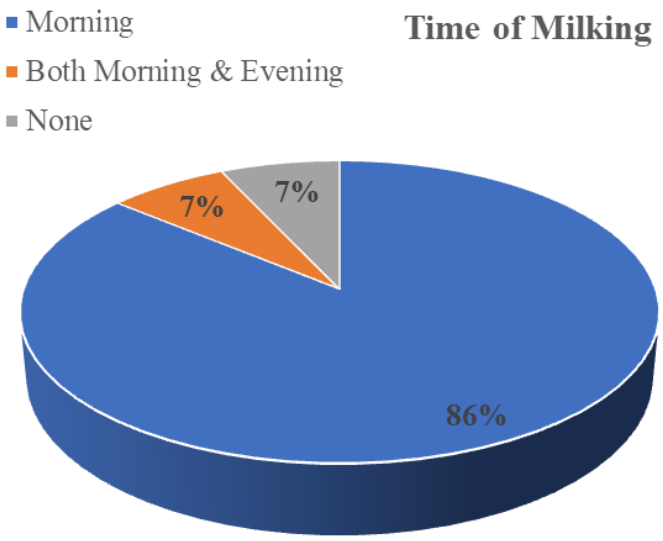

Figure 2: Time of Milking

Table 4: Milking Practices

Tying of tail and hind legs	**Frequency**	**Percentage (%)**
Yes	83	83.0
No	17	17.0
Milking inside kraal	**Frequency**	**Percentage (%)**
Yes	91	91.0
No	9	9.0
Hand washing before milking	**Frequency**	**Percentage (%)**
Yes	93	93.0
No	7	7.0
What is used to wash hands before milking	**Frequency**	**Percentage (%)**
Only water	56	**56.0**
Water and detergent	44	**44.0**
Kind of water used during milking	**Frequency**	**Percentage (%)**
Warm water	53	**53.0**
Water at room temperature (normal water)	47	**47.0**
Covering of collected fresh milk	**Frequency**	**Percentage (%)**
Yes	93	**93.0**
No	**7**	**7.0**
Washing of utensils used for milking	**Frequency**	**Percentage (%)**
Yes	**93**	**93.0**
No	**7**	**7.0**
What is used to wash utensils	**Frequency**	**Percentage (%)**
Detergent and normal water	54	54.0
Detergent and warm water	20	20.0
Only warm water	19	19.0
Drying of utensils after washing	**Frequency**	**Percentage (%)**
Yes	89	89.0
No	11	11.0
Mode of drying washed utensils	**Frequency**	**Percentage (%)**
Sun drying	91	91.0
Air drying	9	9.0
Age at milking	**Frequency**	**Percentage (%)**
3-4 years	57	57.0
5-6 years	26	26.0
7-8 years	17	17.0
Number of times cows have calved	**Frequency**	**Percentage (%)**
Twice	48	48.0
Thrice	28	28.0
Once	24	24.0

washed their hands with detergent and water before milking was done. These findings are contrary to Gidiglo (2014), where 67% of respondents washed their hands before milking with 73% using water from wells and dams, whilst 27% used tap water. Water from wells and dams might not be hygienic enough for washing of hands and teats prior to milking due to reported cases of bacteria in wells and dams (Adzitey *et al*., 2015; Adzitey *et al*., 2016; Issah *et al*., 2019). With regards to the actual milking process, it was found that most (53%) of the respondents used warm water whiles the remaining (47%) used normal water. However, Gidiglo (2014) in the Accra Plains found that most (83%) respondents used hot water in the milking process. Most of the respondents cover their fresh milk after milking. They also wash their utensils with detergent and normal water, and dried them under the sun. The respondents indicated that, most (57%) of the cows milked were between the ages of 3-4 years, and 48% of them have calved twice. Zakaria (2008) reported that for human consumption, milk that is clean and safe is what is desired. Therefore, before milking, the udder must be washed thoroughly with warm water. The milker must also be neatly dressed and should disinfect the hands. Uncleanness before, during and after milking will affect the demand and consumption of fresh milk, since many people are careful of what they consume.

Milk Yield in the Dry and Rainy Seasons

Table 5: Milk Yield in the Dry and Rainy Seasons

Milk yields (per cow per day)	Percentage (%) response by farmers	
	Dry season	Wet season
1/2 beer bottle (300ml)	59	0
1 beer bottle (600ml)	33	10
2 beer bottles (1200ml)	8	38
> 2 beer bottles (>1200ml)	0	52
Total	**100**	**100**

From Table 5, majority of the respondents got 1/2 beer bottle (300ml) of milk in the dry season and > 2 beer bottles (>1200ml) of milk in the wet season. This result confirms that milk production is lower in the dry season than in the rainy season which may be due to breed and inadequate access to drinking water and nutritious feed during the dry season.

From the research, it was estimated that milk yield per annum was 32,201.2 litres with 22,215.6 litres for the rainy season and 9,985.6 litres for the dry season. These figures were contrary to those reported by Gidiglo (2014) in the Accra plains where daily milk production in the study area ranged from one (1) gallon (4.5 litres) to five (5) gallons (22.5litres), with an average daily production of three gallons (13.5 litres). The low milk yield in this study could be due to the absence of improved breeds of dairy cattle in the study area. This may also be because, the available sources of drinking water such as streams, rivers, boreholes dried up during the dry season, compelling animals to trek long distances in search for feed and water using their limited energy reserves to meet their necessary feed and water requirements.

The study also revealed that out of the milk produced, 51% were utilised mostly in a multiple manner, 24% for household consumption and sold as fresh milk, 18% for household consumption and processed milk into other products and sold as fresh milk, 6% sold as fresh milk and processed milk into other products and 3% for household consumption and processing milk into other products. Also, 32% of milk produced were sold as fresh milk only, 9% consumed at household level only and 7% processed milk into other dairy products such as cheese/ wagashi, fermented milk and milk butter.

This was comparable to the study conducted by Gidiglo (2014) in the Accra Plains where it was reported that milk was utilised for household consumption, marketed as fresh milk as well as processed into other dairy products. Twenty-two percent (22%) of respondents sold milk fresh, whilst 78% used part for home consumption,

processed and sold as fresh milk. These farmers throughout the year produced milk seven days in a week; however, the total amount was dependent on the number of lactating cows per farm and the weather. In all 87% of the respondents' milked between 1 to 20 cows on daily basis, whilst the remaining 13% milked more than 20 cows, with the highest number of cows milked being 41.

Marketing of Milk

The dairy market in the study area was characterised by small scale, subsistence and household production with traditional informal market systems where licensing or regulation is absent. Milk was either marketed as fresh milk or processed into other milk products such as wagashi/cheese, sour milk and butter at farm-gate level. Fresh milk were sold at farm gates which largely served as primary collection centres. Some of these collection centres were located in Boli, Busa, Kparisaga, Nakore, Kperisi, Zingu, Sagu, Kpongu and Chansa. The main market outlets were the Wa central market, Fadama livestock market and Wa Zongo dairy market in the urban centre of Wa.

Table 6: Marketing of Milk

Sale of milk	Frequency	Percentage (%)
Yes	86	86.0
No	14	14.0
Milk clients	**Frequency**	**Percentage (%)**
Public in the market	70	70.0
Households	15	15.0
Processing plants	1	1.0
Quantity of milk sold	**Frequency**	**Percentage (%)**
Above 2 beer bottles	46	46.0
All	26	26.0
1 beer bottle	8	8.0
2 beer bottles	6	6.0
Processed milk products	**Frequency**	**Percentages (%)**
Cheese/wagashi	59	59.0
Fermented milk	18	18.0
Fura drink	16	16.0
Burkina drink	7	7.0

The results of the marketing of milk is shown in Table 6. Majority (86%) of the milk produced were sold to consumers while the remaining were consumed at the household level. For the milk that were sold, 70% were sold to the public at the market, 15% to households and 1% to processing plants. Also, for the respondents who sold fresh milk, majority (46%) sold above 2 beer bottles of milk, 26% sold all their milk produced in a day, 8% sold 1 beer bottle of milk and 6% sold 2 beer bottles of milk. It was observed that, most (59.0%) of the respondents processed milk into wagashi/cheese, 18.0% fermented the milk, 16.0% processed milk into fura drink and 7.0% processed milk into Burkina drink. According to Gidiglo (2014), more than 80% of farmers collect milk for financial purposes, thus its marketing was important to them. This study is similar to that of Gidiglo (2014) who reported that milk was either marketed fresh or processed into wagashi at the farm level, and at the primary collection centres milk was sold fresh because that is the form consumer's demand. In Ethiopia, 83% of the total milk and 97% of the cow milk comes from indigenous breeds and most consumers prefer unprocessed fresh milk due to its natural flavour and availability, taste and low price (Netherland Development Organisation, 2008).

Milk Value Chain in Wa Municipality

The milk value chain is made up of various individuals who handle fresh milk as it moves through the marketing process. The channels are the routes through which fresh milk flow from the producer to the ultimate consumer. Fresh milk marketing in the Wa Municipality generally goes through three key actors along the chain of distribution before reaching the final consumer. These are assemblers, processors, and retailers as indicated in Figure 3.

The figure shows that, the milk value chain involves intermediaries who add some transforma-

tional efforts to the milk. Fresh milk from the farm is either sold to itinerant collectors (assemblers) or household consumers at the farm gate by the herdsman`s wife or it is delivered to other processors as well as retailers at either the primary collection centre or at the secondary market centre.

Generally, milk is transported in plastic containers by the producers themselves or by milk collectors (informal traders and intermediaries). Milk collectors usually collect milk from several producers and transport them by vehicle or foot to local/urban markets, family shops, stands, or small-scale processing sites.

Assemblers

The assemblers (itinerant collectors) collect raw milk at the farm gate and wagashie (soft cheese) from processors and deliver to wholesalers/ retailers in the markets. Milk assemblers were mainly women who moved from farm to farm collecting raw fresh milk and wagashi. The results of this study also showed that, herdsmen's wife mostly served as assemblers where they supplied directly to retailers at the secondary markets. The retailers were either mobile or sedentary traders. They mainly sold wagashi in small quantities. Some of the wives of herdsmen doubled up in both roles as producers and retailers of milk and were generally the wagashi processors, this was especially so for those farms located far from market centres.

Small Scale Processors

These dairy processors were mainly involved in

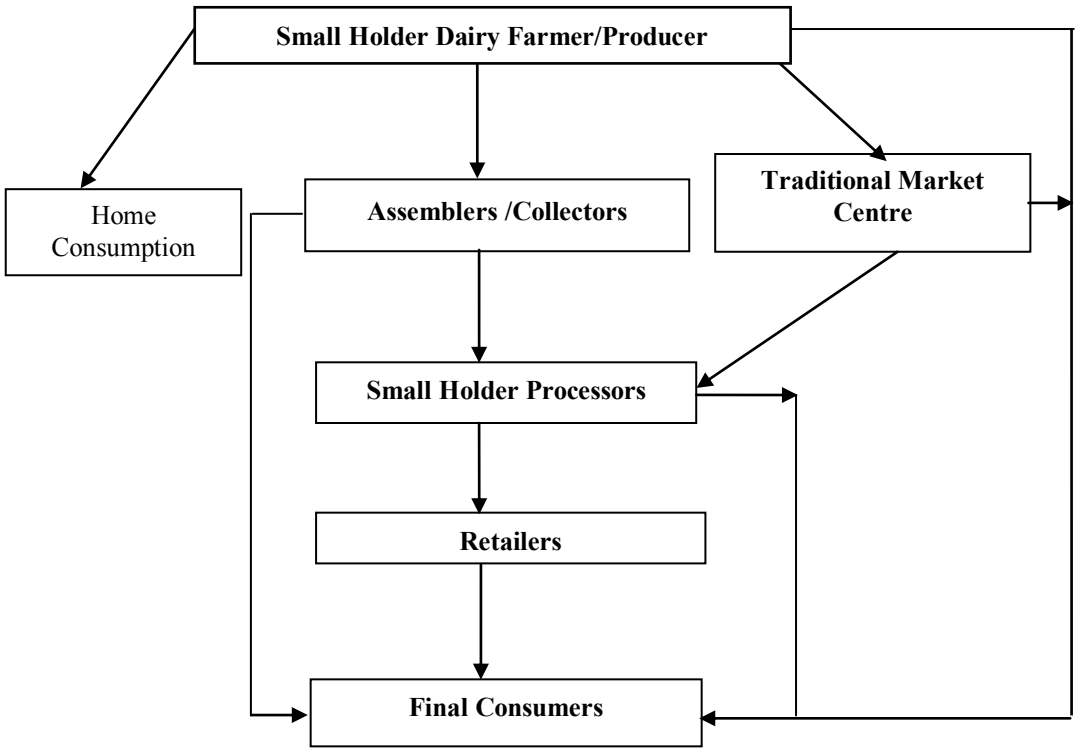

Figure 3: Flow scheme for dairy value chains in the Wa Municipality

the production and sale of soft cheese or wagashi, hard cheese, Burkina, and fura. Some of these processors produced yoghurt on a smaller scale and in a more formal manner. Most of the wagashi processors were women, who were either the herdsmen wives or relations.

Retailers

Ghana's small-scale dairy retailers are individual dairy product sellers who deal with the sale of milk and processed dairy products. They are either mobile or sedentary. They buy their supplies from herdsmen, processors or assemblers. Though the smallest among the major agents in small-scale dairy marketing and processing, they are interspersed in many towns and offer employment mainly to family members. At the secondary markets located in the Urban centres such as Fadama livestock market, Wa central market and Wa Zongo markets, retailers sold mainly processed milk and wagashi.

According to the Food and Agriculture Organisation (2025), the transformation of raw milk into processed milk and products can benefit entire communities by generating off-farm jobs in milk collection, transportation, processing and marketing.

Storage and Preservation of Milk

It was realised that majority of the respondents stored their milk (90%) while the remaining (10%) do not store their milk. Out of the respondents that stored their milk, most (67%) of them stored milk in plastic paint containers while the remaining (43%) stored their milk in calabashes. The milk was mostly (80%) stored for one day whiles a few (20%) stored for two days. The respondents also stored milk at various temperatures, where most of them (81%) stored at room temperature and the remaining (19%) stored at cold temperatures.

It was revealed that majority (89%) of the respondents processed milk into different forms of products through various methods before storage whiles 11% of them did not process milk into any form before storage. Also, most respondents (57%) resorted to heating of the milk, 23% of them resorted to adding salt, 14% resorted to churning milk into cheese/wagashi and 6% resorted to cooling by refrigeration. The study further revealed that, milk was processed before storage in the study area for diverse reasons, thus 42% processed milk to make it wholesome, 26% processed milk to remove excess water, 19% processed milk to make it attractive and palatable and 13% processed milk to add value to it.

The respondents also indicated that; processed milk products were stored in various forms. Most (68%) stored milk products as fresh milk, 14% stored it as pasteurised milk, 10% stored it as cheese/wagashi and 6% stored milk products as fermented/sour milk. However, these milk products were mostly (82%) stored at room temperature (20-30) whiles the remaining (10%) stored at a refrigerated temperature (<8) and 8% stored at pasteurising temperature (60-75).

Food and Agriculture Organisation (2025) reported that, the shelf-life of milk can be extended for several days using various storage and preservation methods such as cooling, fermentation, pasteurisation, and processing into butter and cheese. Also, milk can be preserved by various means including refrigeration, freezing, ultra-high temperature treatment, evaporation and drying to extend their usable life while maintaining its quality and safety (Sims, 2023).

Constraints to Milk Production

The study revealed a number of constraints that hindered increased milk production and marketing in the municipality, some of which were:

All the respondents in the study area indicated that they have not had any form of support from the Government or Non-Governmental Organisations (NGO's). Unfortunately, governmental and non-governmental organisations seem not to prioritise dairy farming and thus hardly assist farmers in obtaining high milk-producing cows.
Water and pasture/feed unavailability also impeded dairy production in the study area due to low rainfalls and frequent droughts. Water bod-

ies such as streams, rivers, ponds, and even dams dried up in the dry season. Thus, getting water to drink is often a big challenge to both animals and humans in many of the rural communities. Herdsmen had to lead their herds to very distant places in search of water to sustain the animals. In times of droughts, pasture or forage is highly scarce, even dry pasture is unavailable due to rampant bush burning. Severe thirst and starvation can result into under-reproduction, poor milk yields, and deaths of animals.

With regards to access to veterinary services and/or vaccines and drugs, the respondents indicated that indeed veterinary services/vaccines and drugs were inadequate and very difficult to access in very remote cattle-rearing areas. The few available veterinary services/vaccines and drugs were also very expensive and unaffordable to poor dairy farmers. This trend results in loss of interest in veterinary services and as such the health of the animal is negatively impacted, its reproductive performance, milk yield and quality drops as well.

All the respondents interviewed emphatically stated that they do not have nor ever had any support with improved breeds of cattle thereby reflecting on the poor milk let down no matter the feeding and season.

With regards to training in the proper handling and processing of milk, all respondents in the study area also stated that they have not had any form of training in the proper handling and processing of milk. This resonates in the unhygienic nature with which the fresh milk and other products are handled in market as observed during data collection.

The issue of pest and diseases encountered on the farms of the respondents at the time of this study were as a result of prolonged extreme weather conditions such as high temperatures which may lead to heat and oxidative stresses, metabolic disorders and suppressed immunity, increasing the incidence of diseases and deaths. These can also result in the emergence of new diseases and the re-emergence of others. However, some predominant conditions/diseases observed in the field were mastitis, bloat, foot and mouth, tick infestation, dermatitis, worm infestation, bovine pneumonia, bovine diarrhoea, foot rot, lumpy skin and stomatitis. It was also noticed that pests such as ticks, black flies, tsetse flies and worms were a nuisance to the animals, mostly in the rainy season.

Regarding housing structures, cattle were mostly housed in kraals which were often open and without roofs thereby exposing them to all forms of environmental hazards such as rainfalls, heat, cold and storms, among others which could have negative impact on milk production in the study area.

With regards to the availability of adequate and experienced labour to cater for cattle and handling of milk, the respondents indicated that they do not have enough experienced labour force on their farms due to high labour cost, inadequate technical know-how in handling animals and inadequate knowledge in pests/disease management on the farm. Similarly to this study, Gidiglo (2014) found some constraints to milk production and marketing in the Accra Plains of Ghana.

CONCLUSIONS

The survey confirmed the low milk yield in the dry season compared to the rainy season. Milk production was not the sole motive for cattle rearing in the area. Milk production was done manually at the farm with only a few not tying the tails and hind legs of cows. Milking was usually carried out by children as well as wives of Fulani herdsmen. Water supply, feed supply and the management of animals were constraints facing milk production. The most dominant breeds found in the study area were the mixed breeds (crosses between Sanga, Zebu and WASH). Majority of the producers were not formally trained in how to produce quality milk. Milk was marketed informally using a host of intermediaries, key among them were itinerant collectors who travelled from farm to farm col-

lecting fresh milk and selling to others in both the primary and secondary market centres. Cattle ownership was dominated by individuals, such that personal decisions were taken regarding cattle disposal. There is the opportunity for improving the genetic potentials of cows for milk production in the study area due to the abundance of feed for cattle in the rainy season. However, insufficient education and lack of financial support as well as little or no policies focus on milk production are barriers to the progress of farmers in the area.

RECOMMENDATIONS

The following recommendations could be considered for improving on the quality of milk and its marketability in the Wa Municipality.

- Government should establish collection centres in the Municipality so that milk can be sterilised before marketing to the consuming public.
- The government should increase access to veterinary services to farmers especially those in remote areas.
- The government should strive to increase access to watering sites in communities to cater for the dry season.
- The national breeding station should try and improve upon the breeds of cattle available in the country to increase their milk yield.

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