Journal of Science and Technology, Special Issue Vol. 1, No. 2 (2024), pp 1- 12

https://dx.doi.org/10.4314/just.v1i2.1s

CATTLE DEMOGRAPHY, FARM OPERATIONS AND CHALLENGES FACED BY HERDSMEN IN THE EJISU/JUABEN MUNICIPALITY OF THE ASHANTI REGION OF GHANA

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ABSTRACT

In Ghana, livestock production is largely managed by smallholding farmers. Many of the smallholder cattle farms are scattered in the country with varied challenges. This study was conducted to gather baseline data on cattle demography, characterize the farm operations, and identify the challenges faced by herdsmen on smallholder cattle farms in the Ejisu/Juaben Municipality of the Ashanti region of Ghana. The snowball method was used to identify 39 smallholder cattle farms and the purposive sampling method was used to administer a semi-structured questionnaire. Data collected were subjected to descriptive analysis using the SPSS version 22 (2013). In the study, all the herdsmen who responded to the questionnaire were men who practiced the Islamic religion. The nationalities of the herdsmen are Ghanaians (56.3%), Burkinabes (37.5%), Malian (3.1%), and Togolese (3.1%). About 65% of the herdsmen interviewed were between the ages of 16 and 45 years. Cow population per farm showed that about 81% of the farms had between 10 and 30 cows per farm. Destruction of crops (94%) by grazing cattle was the main challenge faced by the herdsmen. Followed by feed scarcity (90.6%). It was noted that some herdsmen (40.6%) could spend many hours in a day grazing and milking the cattle all year round without any day off for rest. Twelve and a half percent (12.5%) of the herdsmen also faced water problems. Apart from these challenges and the poor conditions of service for the herdsmen, the knowledge of the herdsmen in milk handling is also considered to be low.

Keywords: Cattle Farm Survey, Milk yield, Feed Scarcity, Milk Handling, Service Conditions, Training Herdsmen and Cattle Owners.

INTRODUCTION

Livestock farming, particularly cattle production, is a vital component of Ghana's agricultural landscape, predominantly managed by smallholding farmers (Villano *et al.,* 2019). These smallholder cattle farms are often situated in remote and dispersed locations, a practice influenced by land tenure complexities and the imperative to minimize conflict with neighboring settlers over grazing land (Flintan *et al.,* 2021). However, this geographical dispersion poses significant challenges, limiting access to adequate grazing fields and impeding the implementation of targeted cattle development initiatives within municipalities and across the nation (Slayi *et al.,* 2023).

Despite the essential role these herdsmen play, issues such as low milk production and poor milk quality persist, attributed to factors including limited access to technical support and the scarcity of dedicated extension officers knowledgeable in livestock management (Hernández-Castellano *et al.,* 2019). Furthermore, comprehensive documentation of smallholder cattle farms' locations and the challenges encountered remain short, hindering efforts to improve farm productivity and establish traceability standards in line with global best practices.

The Ejisu/Juaben Municipality in the Ashanti Region harbors numerous smallholder cattle farms, yet comprehensive documentation of their locations and the challenges faced remains limited. Addressing these gaps in knowledge is crucial for enhancing productivity, improving milk quality, and establishing traceability standards. Moreover, the study's findings will provide actionable insights for policymakers, agricultural stakeholders, and development practitioners, ultimately contributing to the sustainable development of Ghana's livestock sector and enhancing the livelihoods of smallholder farmers and their communities.

This research endeavors to fill this critical knowledge gap by undertaking a comprehensive survey to gather baseline data on cattle demography, farm operations, and the myriad challenges faced by herdsmen in smallholder cattle farms across the Ejisu/Juaben Municipality. This study sought to elucidate the intricacies of cattle farming practices, identify key challenges hindering productivity, and propose targeted interventions to address these issues effectively.

MATERIALS AND METHODS

Study Area

The study was carried out in the Ejisu/Juaben Municipality in the Ashanti Region, Ghana. The Region is located at 06° 43' N, 01° 36' W of the equator at an altitude of 290 m above mid-sea level. The Ejisu/Juaben Municipality is located 20 km from Kumasi on the Kumasi-Accra highway. Its capital is Ejisu. The Municipality stretches over an area of 637.2 km^2 constituting about 10% of the entire Ashanti Region. The Municipality is in the central part of the Ashanti Region and shares boundaries with Asante Akim North, Asante Akim South, Bosomtwi – Kwanwoma, Oforikrom, Kwabre and Afigya Sekyere Municipalities (Coffie *et al*., 2015; (https://en.wikipedia.org/wiki/Ejisu-Juaben_Municipal_District).

Research Design

In this study, a survey research methodology was employed to examine 39 smallholder cattle farms. Although 39 smallholder cattle farmers were to be interviewed, only 32 gave consent. The survey research design was used to assess the thoughts and opinions of the herdsmen in the study area.

Sampling approach

The study utilized a snowball sampling method due to the researchers' limited knowledge of the locations of many cattle farms included in the study. Personnel at the Dairy/Beef Cattle Research Station, KNUST, Kumasi, assisted in locating herdsmen on various cattle farms who supplied milk to the Research Station. The herdsmen that were visited also helped in identifying the other cattle farms in the Municipality.

Research instrument

Semi- structured questionnaires were used to collect data on the smallholder cattle farms in the study area. Purposive sampling was used in administering the questionnaires on the various cattle farms that granted permission for the study. The collaborating herdsmen were interviewed to obtain answers to the questionnaires. A total of thirty-two (32) herdsmen on smallholder cattle farms gave their consent and were interviewed.

GPS Identification of cattle farms

A general position system (GPS) device (Germin GPSMAP 64) was used to take the coordinates of the cattle farms located in the Municipality. The coordinates were used to draw a map indicating the position of each cattle farm in the study area (figure 1).

Statistical Analysis

Data collected in the study were subjected to descriptive analysis using the Statistical Package For Social Sciences Version 22 (2013). The analyzed data were presented in tables.

RESULTS

Geographical locations of cattle farms in the Ejisu/Juaben Municipality

The geographical locations of the towns in which the cattle farms are situated are presented in Figure 1. The thirty – nine cattle farms located in the study area were scattered in eighteen communities. Most of the farms were located in the peri-urban areas of the Municipality. The towns and their respective number of cattle farms are presented in Table 1. Majority of the cattle farms were located in the Juaben (15.38%) area with 7.69% each in Abenase, Adadientem, Kwaso, Krapa and Ampabame

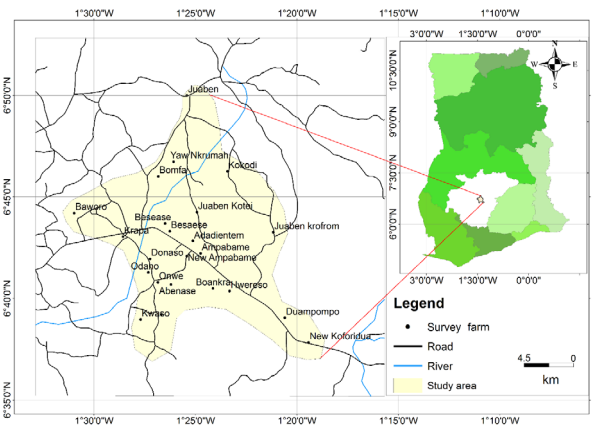

Figure 1: Map of study are

Table 1: Number of cattle farms located in each town in the study

SN.	Town	Number of Cattle Farms	Percentage
1.	Odaho	1	2.56
2.	Hwereso	1	2.56
3.	Besease	2	5.13
4.	Duampompo	2	5.13
5.	Juaben	6	15.38
6.	Donaso	2	5.13
7.	Abenase	3	7.69
8.	Boankra	2	5.13
9.	Adadientam	3	7.69
10.	New Koforidua	2	5.13
11.	Baworo	2	5.13
12.	Onwe	1	2.56
13.	Kwaso	3	7.69
14.	Assienimpong	1	2.56
15.	Yaw Nkrumah	1	2.56
16.	Krapa	3	7.69
17.	Ampabame	3	7.69
18.	Bomfa	1	2.56
	Total	**39**	**100.00**

Demography of Herdsmen

The demography of herdsmen found in the study area is shown in Table 2. All the herdsmen that responded to the questionnaire in this study were men who practised the Islamic religion and their ages were between 16 and 75 years (Table 2). The nationalities of the herdsmen are Ghanaians (56.3%), Burkinabes (37.5%), Malian (3.1%) and Togolese (3.1%). About 65% of the herdsmen interviewed were between the ages of 16 and 45 years and 34.3% were between 46 and 75 years. The study also revealed that majority of the respondents were Fulani (97%) and 3% Dagombas. Herdsmen who were married (84%) were 4 times more than the unmarried respondents. The married herdsmen had children ranging from 1- 6 with most of them having 4. Most (90%) of the herdsmen interviewed had spent between 1- 10 years on the cattle farms with 43.8% spending between 1 – 5 years; 3.1% spending 11- 15 years and 6.3% spending 16 – 20 years herding and milking cattle.

Cattle population

The cattle numbers in the study area ranged from 10 to above 100 (Table 3). Farms with cattle ranging from 10 to 60 (78%) outnumbered those with cattle populations of 61-90 (9%) by approximately 8-fold and exceeded by approximately 6-fold those with cattle populations exceeding 100 (12.5%) per farm. The cow population per farm showed

that about 81% of the farms had between 10 and 30 cows, and 18% had 51 -70 cows per farm. As indicated in Table 7, 84.4% of the herdsmen milked a minimum of 1 – 5 cows per day while 15.6% indicated they milked a minimum of 6-10 cows per day, 56.3% of the respondents milked a maximum of 6-10 cows per day, 21.9% milked 1-5 cows and about 18.5% milked a maximum of 11-20 while 3.1% milked above 20 cows per day.

Table 2: Demography of herdsmen on smallholder cattle farms in Ejisu/Juaben Municipality

Parameter	Response	Percentage
Gender	Male	100
	Female	0
Age, yr	16-25	21.9
	26-35	18.8
	36-45	25
	46-55	21.9
	56-65	9.3
	66-75	3.1
Nationality	Burkinabes	37.5
	Ghanaians	56.3
	Malian	3.1
	Togolese	3.1
Religion	Islam	100
Ethnicity	Fulani	96.9
	Dagomba	3.1
Marital status	Single	15.6
	Married	84.4
	Nil	31.1
Number of children	1	12.5
	2	9.4
	3	6.3
	4	18.8
	5	12.5
	6	9.4
Years spent on farm*	<1	18.8
	1-5	43.8
	6-10	28.1
	11-15	3.1

16-20	6.3
Total	100

***These years do not include months and years spent on other farms**

Table 3: Cattle and cow population on farms in the study area

Range of Cattle / Cow Population	Responses	
	Cattle Population (%)	Cows Population (%)
10-20	21.9	68.8
21-30	15.6	12.5
31-40	25	0
41-50	9.4	0
51-60	6.3	12.5
61-70	3.1	6.3
71-80	3.1	0
81-90	3.1	0
91-100	0	0
>100	12.5	0
Total	100	100

Role of individuals on the cattle farms

Table 4 outlines the roles that the farm operatives ie. Men, women and children play on the farms. Majority (59.4%) of the herdsmen were involved in restraining cows during milking with approximately 6.3% each for spouses and children involved in this activity. The involvement of spouses and children in restraining calves during milking was minimal (3.1 and 9.4% respectively) while 56.3% of herdsmen were engaged in this activity. The Milking of cows was mainly done by herdsmen (65.6%) followed by their spouses (15.6%). It is clear from Table 4 that the wives of the herdsmen do not take the cattle for grazing.

Table 4: Role of operatives on cattle farms in the Ejisu/Juaben Municipality

Parameter	Herdsman	Spouse	Children	Herdsman & spouse	Herdsman & children	Others*
Restraining cows during milking	59.4	6.3	6.3	12.5	6.3	9.4

Restraining calves during milking	56.3	3.1	9.4	12.5	6.3	12.5
Milking of cows	65.6	15.6	0	12.5	3.1	3.1
Conveying milk to bulk container	59.4	21.9	0	9.4	3.1	3.1
Processing of milk	3.1	28.1	0	0	0	65.6
Herding cattle	90.6	0	3.1	0	6.3	0

Others*: Friends, in – laws, siblings of herdsmen/spouse, nieces, nephews, middlemen or buyers

Training needs and willingness to undertake training

The data on the training needs of herdsmen and their willingness to undergo training are presented in Table 5. All the respondents interviewed expressed their willingness to be trained in cattle rearing, personal hygiene in milking, equipment and utensils hygiene, milk handling and processing. However, 3.1% of the respondents declined training in the milking of cattle.

Table 5: Areas of training needs of herdsmen

	Responses (%)	
Areas of training needs of herdsmen	Yes	No
Cattle rearing	100	0
Milking of cattle	96.9	3.1
Personal hygiene in milking	100	0
Equipment and utensils hygiene	100	0
Milk handling	100	0
Dairy processing	100	0

3.6 Milking routines, management and milk yield

It was observed that the herdsmen in the Municipality milk their lactating cows once a day (Table 6). Milking was done by hand and it started as early as 6:00 am. About 53% of the respondents started milking their cows at 6:00 am or 7:00 am but only 31.3% delivered the milk to the buyer by 9:00 am. About twenty percent of respondents were unable to deliver their milk within two hours after collection.

The minimum number of cows milked by most of the herdsmen (84.4%) ranged from 1 to 5 while the maximum number of cows milked was between 6 and 10 for 56.3% of

herdsmen, 11 – 15 cows were milked by 12.5% of herdsmen and 16 – 20 cows were milked by 6.3% of herdsmen (Table 7).

Total daily milk yield per cow was 0.7 – 3.5 liters on 34.4% of the farms studied and 11.0 – 14.00 liters on 25% of the farms, while 9.4% of the farms recorded above 14.00 liters of milk (Table 7).

Data on handling of the milk prior to marketing are presented in Table 8. Farmers were asked whether they pasteurize their milk or sieve before selling. It came out that the majority of the respondents (94.0%) sieved the milk and 34.4% of the respondents pasteurized their milk (Table 8). A total of 81.3% of the herdsmen responded that the buyers picked the milk early (Table 8).

Table 6: Milking and milk delivery times in the Ejisu/Juaben Municipality

Time	Responses to milking time (%)	Responses to delivery of milk to buyers (%)
6:00a.m	28.1	0
7:00a.m	25	0
8:00a.m	18.8	21.9
9:00a.m	9.4	9.4
10:00a.m	12.5	21.9
11:00a.m	6.3	12.5
12:00 noon	0	25
1:00pm	0	9.4

Table 7: Cows milked and daily milk yield recorded on cattle farms in the Ejisu / Juaben Municipality

Minimum No. of cows milked		Maximum No. of cows milked		Total Daily milk yield	
Range	Responses (%)	Range	Responses (%)	Milk yield* (L)	Responses (%)
<1	0	<1	0	< 0.70	0
1-5	84.4	1-5	21.9	0.70 – 3.50	34.4
6-10	15.6	6-10	56.3	4.20 – 7.00	25.0
11-15	0	11-15	12.5	7.70 – 10.50	3.1
16-20	0	16-20	6.3	11.20 – 14.00	25.0
>20	0	>20	3.1	> 14.00	9.4
Total	100	Total	100	Total	100

Table 8: Milk handling and marketing challenges in the Ejisu/Juaben Municipality

PARAMETER	YES	NO	TOTAL
Takes milk Proceeds (herdsmen)	100	0	100
Pasteurization before selling	34.4	65.6	100
Sieving before selling	94.0	6.0	100
Sale of milk to middlemen	87.5	12.5	100
Buyers do not pick up milk early	12.5	81.3	93.8*

***The remaining 6.2% did not give any response**

Milk prices

The price range per litre of milk produced was between GH¢ 0.86 and GH¢ 4.29. Most (37.5%) of the herdsmen sold their milk at GH ¢ 2.86 (Table 9).

Table 9: Milk Prices in the Ejisu/Juaben Municipality

Parameter	Price per litre (GH¢)	Response (%)
How much do you sell a litre of milk? (¢)	0.86	15.6
	1.43	28.1
	2.14	12.5
	2.86	37.5
	3.57	3.1
	4.29	3.1

Land and Land Use

The study on land and land use revealed significant insights into the ownership patterns and challenges faced by cattle farms in the Ejisu/Juaben municipality. Predominantly, approximately 90% of cattle farms are situated on land owned by the cattle owners themselves, highlighting a strong inclination towards private ownership within the community. However, 9.4% of respondents reported housing their cattle on community lands, indicating a smaller yet significant proportion of farmers who utilize communal resources for their livestock operations (Table 10) and pay royalties to the chief, underscoring a distinct aspect of local governance and land management dynamics.

Moreover, when examining the size of the land on which the cattle are housed, a wide range of land sizes was observed, varying from 526.01 to 3035.14 square meters (equivalent to 0.13 to 0.75 acres). This diversity in landholding is further clarified by the breakdown of land size categories, with 15.6% of respondents occupying 1 plot, 34.4% occupying 2 plots, and 6.3% occupying 3 plots. However, it is noteworthy

that a significant proportion (40.6%) did not provide a response regarding land size, suggesting potential variability or uncertainty in landholding among respondents.

In addition to exploring ownership patterns and land size, the study also investigated the challenges associated with land ownership. Approximately 15.6% of respondents reported experiencing difficulties as a result of land ownership, highlighting the presence of barriers or obstacles faced by a notable portion of cattle farmers in the municipality (Table 10).

Table 10: Land Ownership for cattle rearing in the Ejisu/Juaben Municipality

Parameter	Responses	Percentage (%)
Who owns the land on which the cattle are housed?	Owner	90.6
	Community	9.4
Do you pay royalties to the owner of the land?	Yes	9.4
	No	81.3
	Do not know	9.3
What is the size of the land on which the cattle are housed?	½ plot*	3.1
	1 plot	15.6
	2 plots	34.4
	3 plots	6.3
	No response	40.6
Do you experience any difficulty as a result of ownership of the land?	Yes	15.6
	No	71.9
	No response	12.5

plot = 100 m x 100 m

Herd management

Out of the herdsmen interviewed, 40.6% indicated that they graze their lactating cows before they milk them while 59.4% milk the cows before they take them to the field to graze (Table 11). This suggests a divergence in herd management practices among cattle farmers in the study area. This variance in approach could potentially impact milk production and overall herd health. Grazing lactating cows before milking may result in cows consuming fresh forage, potentially leading to higher milk yields due to increased nutrient intake. Conversely, milking cows before allowing them to graze in the field may provide the opportunity for more efficient milking routines but could potentially lead to lower milk yields if cows are not adequately nourished before milking. None of the respondents practiced zero grazing. Most of the herdsmen (71.9%) do not provide supplements to the lactating cows on their farms (Table 11). Those who fed supplements to lactating cows used cassava peels, plantain peels and brewer's spent grains and these provide additional nutrients to enhance growth, especially in the dry season.

Table 11: Supplementation of lactating cows in the Ejisu/Juaben Municipality

Parameter	Response	Percentage
Do you graze your lactating cows in the morning before milking?	Yes	40.6
	No	59.4
Do you provide supplements to your lactating cows?	Yes	28.1
	No	71.9
Why do you supplement?	To enhance growth	15.6
	Provide additional feed especially in the dry season	12.5
	Not applicable	71.9
Feed materials used as supplement	Cassava and plantain peels	21.9
	Brewer's Spent Grain	3.1
	Not Applicable	75

Working Conditions of Herdsmen

The monthly salary provided to herdsmen in the study area varied between GH¢50 and GH¢250. Among them, 53.2% received a salary of GH¢100 or below, while 46.9% received between GH¢120 and GH¢250. A small percentage of herdsmen, 3.1%, received salaries exceeding GH¢120 (Table 12).

Additionally, aside from their salary, some herdsmen received supplementary benefits, including food (65.6%) and accommodation (100%). Furthermore, all herdsmen retained the income generated from daily milk sales.

Table 12: Working conditions of Herdsmen in the Ejisu/Juaben Municipality

Parameter	Response	Percentage
What does the cattle owner remunerate you with?	Cash	75.0
	Both cash and in kind	25.0
How much are you paid per month? (GH¢)	50.00	12.4
	70.00	9.4
	100.00	31.3
	120.00	15.6
	150.00	21.9
	200.00	6.3

	250.00	3.1
What does the cattle owner use to pay you in kind?	Cattle	6.2
	Foodstuffs	18.8
	None	75.0
Who accommodates you?	Owner	100
Does the cattle owner give you food?	Yes	65.6
	No	34.4
Do milk proceeds go to the herdsman?	Yes	100
	No	0

Problems faced by herdsmen

When discussing challenges faced by cattle farmers in the community, it became evident that a multitude of issues impact both the farmers and their livestock. A staggering 94% of respondents highlighted the persistent problem of their cattle destroying people's crops, indicating a significant source of conflict between farmers and the broader community (Table 13). Additionally, 90.6% of respondents reported experiencing feed scarcity, further worsening the challenges of maintaining healthy and well-fed cattle herds. Moreover, 84.4% of respondents expressed concerns regarding inadequate grazing fields, highlighting the need for improved land management practices and access to suitable pasture areas (Table 13).

Beyond these major challenges, it's crucial to address the welfare concerns of the herdsmen themselves. Alarmingly, 40.6% of respondents reported never having days off, underscoring the demanding and relentless nature of their work. Furthermore, issues raised by the community, such as complaints about the stench from cattle dung (37.5%) and fear of cattle attacks (46.9%), underscore the need for greater collaboration and dialogue between farmers and residents to mitigate tensions and foster mutual understanding (Table 13).

Another challenge faced is theft of lactating cows emerged as a significant concern, with 34.4% of respondents reporting incidents of cattle theft. This not only poses a financial loss to the farmers but also disrupts the stability of their livelihoods. Moreover, attacks on cattle (28.1%) and incidents of cattle falling into pits (44%) further compound the challenges faced by farmers, highlighting the need for enhanced safety measures and infrastructure improvements in the community (Table 13).

Water scarcity and pollution also emerged as pressing issues, with 25% of respondents reporting unavailability of water and 12.5% reporting polluted water sources where available. Access to clean and reliable water is essential for both human and livestock welfare, underscoring the urgent need for sustainable water management practices in the community (Table 13).

Table 13: Challenges herdsmen face in the course of their work

PARAMETER	YES	NO	TOTAL
Destruction of crops	94.0	6.0	100
Stench of dung	37.5	62.5	100
Fear of cattle attack	46.9	53.1	100
Stealing of cattle	34.4	64.6	99
Attacks on cattle	28.1	71.9	100
Cattle fall into pits	44.0	56.0	100
Water pollution problems	12.5	87.5	100
Water unavailability problems	25.0	65.6	90
Poor remuneration	78.1	21.9	100
No days – off	40.6	59.4	100
Inadequate grazing fields	84.4	15.6	100
Feed scarcity	90.6	9.4	100

Availability of Technical Assistance to Cattle Farmers

The details on the level of technical assistance available to smallholder cattle farmers and the expectations from an association (if formed) are presented in Table 14.

The main technical assistance given to the cattle farmers was veterinary services (65.69%). However, the animal production services to the cattle farmers were inadequate as only 19.0% of the farms used for the study had access to the animal production services. It was observed that 12.5% of the herdsmen were members of cattle farmers associations whilst 87.5% did not belong to any association.

All the herdsmen were willing to join cooperative associations if there was one for them to join. Expectations of these herdsmen were that the association would play an advocacy role (81.0%), solve disputes (71.9%), procure protective clothing (62.5%) and drugs for cattle treatments (81.0%). It was encouraging to note that the desire of the herdsmen to undertake training and attend workshops (69.0%) was high and the establishment of permanent grazing fields by the association was also a major desire (Table 14).

Table 14: Technical assistance available to smallholder cattle farmers and the expectations from their associations

PARAMETER	YES	NO	TOTAL
Assistance from animal production officers	19.0	81.0	100
Assistance from veterinary officers	65.6	34.4	100
Assistance from cooperative officers	12.5	87.5	100
Are you ready to join any cattle farmers' cooperative association?	100	0	100

Advocacy role	81.0	19.0	100
Resolve disputes	71.9	28.1	100
Do you need support in getting protective clothing?	62.5	37.5	100
Training and workshop	69.0	31.0	100
Permanent grazing field	78.1	21.9	100
Do you need drugs for cattle treatments?	81.0	19	100
Do you need support in getting equipment and machines?	37.5	53.1	90.6

DISCUSSION

Factors Influencing the Spatial Distribution of Cattle Farms in Ejisu/ Juaben Municipality

Cattle farms were located in peri – urban areas. The farmers settled in these areas probably due to the possible low prices of land in the peri – urban areas as compared to land in urban areas (Table 13). This could explain why Juaben which is far from Ejisu, the main commercial town had 6 farms. However, Jabber (1994) and Omotayo (2002) reported that farmers also stay in areas where they will be able to find a ready market for their milk and other dairy products. The 1 to 2 farms per locality (Table 1) was not surprising since some people in the communities engaged in crop farming and the activities of the cattle in the localities will not be encouraged by them as huge cattle numbers will lead to conflicts and disorder in the communities (Manu *et al*., 2014).

Profile and Composition of Herdsmen Population in Ejisu/Juaben Municipality

The high young population in cattle rearing in the study area can serve as a motivation to other young people in the country to venture into cattle farming. However, about 44% of these young people are foreigners (Table 2) and can abandon the care given to the cattle at any time if the conditions in their countries become much better. The origin of the foreigners in this study was not different from what Tonah (2002) and Abbass (2014) reported in earlier studies since they intimated that the Fulani herdsmen were the predominant herdsmen in West Africa. The dominance of Fulani herdsmen in the municipality was not surprising as this observation was also made by Abbass (2014) for West Africa. Though 96.9% of the herdsmen were Fulanis, 56.3% of the respondents said they were Ghanaians. This means that over 40% of the Fulani herdsmen (Table 2) indicated that they were Ghanaians. Tonah (2005) reported that some Fulani herdsmen could describe themselves as Ghanaians since they had been born in Ghana.

Cattle population in Ejisu/Juaben Municipality

The total cattle population (Table 3) in the study area is low and could have implication on milk yield and other animal products. The low cow population on the various cattle farms studied would not have been much of a problem in the production of milk and other animal products if the farmers were to use well – developed dairy breeds like Jersey cows or Holstein Friesians in their milk production enterprises but these would have other significant challenges when introduced (Onono and Ochieng, 2008).

Farm operatives' role on a cattle farm in Ejisu/Juaben Municipality

Milking was mainly done by the herdsmen, supported by their spouses (Table 4). However, in restraining the cows and calves before and during milking any of the farm operatives could do it. An FAO (2004) report supports the findings that most of the respondents sold their milk to others to process while 28.1 % of the respondents' wives processed the milk obtained on their farms. Herding the cattle was largely done by the herdsman with support from his children (Tonah 2002). Wives of herdsmen did not take the cattle for grazing and the various roles of the individuals on the farms were not unexpected as they followed the Ghanaian culture which generally defines jobs for the males and females.

Milking routines, milk yield and handling in Ejisu/Juaben Municipality

Milking lactating cows once a day as observed in the study area was due to the calves depending on the dam for their nourishment. In addition, the cows are beef animals and have a low potential for milk yield. This practice according to Wall and McFadden (2008) and Bortacki *et al.* (2017) generally leads to a reduction in milk yield. The milk yield in this study (Table 7) was low. It was observed that though most of the respondents reported to milk between six and twenty cows, only 9.4% of them said they obtained more than 14 litres of milk per day. This means that most of the cows used were producing less than 2 litres of milk per day. Though the cows were milked once a day, if the yield per cow was higher than what was obtained and more cows were milked, the bulk milk obtained in the study area would have been much higher as reported by Wall and McFadden (2008) and Bortacki *et al.* (2017).

Delays in the delivery of milk have been reported by Mahari and Yamane (2016) to lead to a high load of microbes. A total of 22% of herdsmen (Table 6) delivered their milk to buyers after two hours. A similar trend was observed as 18.8% of the herdsmen milked their lactating cows between 10 – 11 am but up to 34.4 % of respondents delivered their milk to the buyers between 12 – 1 pm. It therefore means that 15.6% of the milk delivered between 12:00 and 1:00 pm was delivered to the buyers well beyond 2 hours after collection. This development is worrying especially as milk producers in the study area produce milk under poor hygienic conditions, do not refrigerate their milk before delivery and transport the milk through the sun without maintaining a cold chain. Milk consumers keep raising milk handling and safety concerns, especially as it has been reported that with the nutritious nature of milk (FAO, 2001), poor handling and unhygienic conditions (Maity and Misra, 2010) and poor transportation (Garedew *et al*., 2012) make milk easily contaminated. Milk quality can deteriorate quickly during transportation (Mahari and Yamane 2016) as 65.6% of the respondents indicated that they do not pasteurize their milk before they are delivered to the buyers and 94% just sieve the milk before delivery. Moreover, the milk is delivered to middlemen, as indicated by 87.5% of respondents (Table 8), who do not have their own means of transportation to the processing units or sales points. Though much of the milk produced is delivered after two hours to middlemen and other buyers, 81.3% of the respondents (Table 8) do not think that should be a worry to them. It may be because they lose nothing if the milk goes bad later after sales or have not been educated on the proper handling of milk. A system of milk payment whereby the chemical and microbial quality of milk is taken into consideration and training herdsmen in milk handling may be needed to make the

herdsmen more responsive to the needs of processors and the final consumers.

Milk Prices in Ejisu/Juaben Municipality

The price of a litre of milk ranged from Gh¢ 0.86 to Gh¢ 4.29 (Table 9). Most of the respondents (56.2%) sold a litre of milk between Gh¢ 2.14 and Gh¢ 4.29. Milk producers who sold their milk below Gh¢ 2.00 per litre were either in remote areas or did not have a ready market for their milk, and so the middlemen who went there to purchase the milk had to pay a relatively cheap price for it. Owing to the relatively cheap prices, Jabber (1994) and Omotayo (2002) reported that cattle rearers will want to settle in areas where they will be able to sell their products at fair prices.

Use of land in Ejisu/Juaben Municipality

Though only 9.4% of the respondents use community land, 15.6% of the herdsmen (Table 10) said they experience land ownership problems. These challenges are largely due to grazing and the route they use to the grazing areas. These land ownership and usage challenges are not new and the inhibitions posed by the community in one form or the other are worrying and could serve to demotivate the youth in engaging in cattle farming as most of them may not be able to raise high capital for the enterprise (LEISA, 2002; Manu *et al*., 2014), if large tracts of land will have to be purchased. Use of community land in the study area is similar to what herdsmen practice in Nigeria as reported by Okoro (2018).

Cattle management in Ejisu/Juaben Municipality

Low rate of supplementation (Table 11) of lactating cows could affect the lactating cows negatively as the nutrient requirement during lactation is high and inadequate nutrition adversely affects the milk yield of the lactating cows (Wanapet *et al*., 1999). The willingness of most of the herdsmen to be trained (Table 5) provides the opportunity for the herdsmen to be taught enhanced techniques in managing cattle and lactating cows in particular to produce milk and milk products that are high in quality and meet the demands of the final consumer (FAO, 2005). The study revealed that most (71.9%) of the cattle owners did not invest in supplementation. Since the proceeds from milk sales end up in the pocket of herdsmen, cattle owners see no reason why they should spend money on extra feed and get no direct benefit while the herdsmen also think that they do not own the lactating cows and therefore, cannot spend part of their perceived low remuneration on supplements for the lactating cows. The low rate of supplementation was contrary to the findings of Ngongoni *et al*. (2006) who noted in a study in Zimbabwe that all the farmers gave supplements to their lactating cows during milking. The Zimbabwean farmers may be better motivated to supplement their lactating cows because they use high-yielding cows and so stand a better chance of higher profit if the cows receive better nutrition.

Service conditions in Ejisu/Juaben Municipality

Although 78.1% of the herdsmen (Table 13) claimed their remuneration was poor, this is debatable. Apart from the monthly salary, herdsmen take proceeds from the sale of milk and any additional income (Table 12) arising from milk processing (FAO, 2004). In addition, all the herdsmen together with their families were accommodated and 65.6% of the herdsmen were given food by the cattle owners. The minimum daily proceeds according to the respondents was between GH¢ 0.60 and GH¢ 3.00 up to between

GH¢12.00 and ¢60.00. The amount could be more than the figure reported if daily milk yield increases. Cattle owners should quantify all the payments and benefits that are given to the herdsmen in monetary terms to prove to them that the remuneration they receive for taking care of the animals is not as low as they think. The owners should also be interested in the milk business and ensure that feed supplements are provided to enhance milk yield. The additional advantages of feed supplementation may include improved cow and calf nutrition, high reproductive efficiency, high calf growth rate and low calf mortality, which should motivate the owners to be part of a well-organized milk business.

Challenges faced by herdsmen in Ejisu/Juaben Municipality

Destruction of crops by grazing cattle was one of the major challenges (Table 13) faced by the herdsmen. This result agrees with the findings of Manu *et al*. (2014) who stated that the destruction of crops by cattle arises when cattle are raised in communities. The report also indicated clashes owing to field crop destruction as the two parties would do anything to retain the piece of land involved.

The next highest challenge was feed scarcity (90.6%). This was not surprising as the land used to house the animals on average was up to only about 1.8 acres which was inadequate for intensive cattle rearing. The scarcity, according to respondents was mainly due to dry season feeding inadequacies and long distances covered before the cattle could get enough grazing land. The fact that less percentage of respondents indicated that the grazing fields were inadequate compared with those that indicated feed scarcity, is not surprising as the cattle owners even though did not invest in pasture development, the cattle were extensively grazed on community fields and on fields where crops were harvested and crop residue were left as reported by Oppong- Anane (2006). Cattle owners should consider establishing their own paddocks or developing community paddocks for reliable grazing fields to help solve the feeding problems faced by the herdsmen.

It is disturbing that herdsmen could be spending several hours a day grazing cattle (Feldts and Schlecht, 2016) and milking the cows all year long without any day off for rest. This condition can negatively affect the health of the herdsmen.

It was revealed that a considerable number of the people in the communities feared for their lives as they were scared of possible attacks from the cattle (46.9%), and also complained about the stench of the cattle dung (37.5%). The fear of attack may emanate from the large and intimidating size of cattle, and the fact that many of the people in the communities are crop farmers who may know very little about animal behaviour.

The herds of cattle were also exposed to the risk of falling into abandoned and uncovered pits, underfeeding, attacks from people in the community and possible theft. Twelve and a half percent of the herdsmen faced water problems and the lactating cows mostly did not get enough water or travelled long distances especially in the dry season to be able to get water to drink. The present finding supports the study by Cardot *et al*. (2008). The energy used in travelling long distances in search of water affects production negatively (Holechek, 1980; Thorne, 2009).

Training and availability of technical assistance to cattle farmers in Ejisu/ Juaben Municipality

Cattle farmers had limited access to advice (Table 14) on animal production due to the fact that Extension Officers are few and the extension of agricultural services is more

towards crop production with a limited focus on animal production and management (Oppong – Anane 2006). If more agricultural extension officers could be engaged and some of them also specialize in animal production and management, it would go a long way to address the issues relating to cattle production in the Municipality.

In view of the inadequacy of the technical support given to the herdsmen, all the herdsmen were willing to join cooperative associations (if there was one for them to join). Expectations of these herdsmen such as advocacy from the associations confirm that some misunderstandings take place between herdsmen and people in the communities especially crop farmers (Manu *et al*., 2014). The high expectation of the herdsmen to get protective clothing and drugs from associations is not inspiring. It is the responsibility of cattle owners to provide protective clothing, drugs for the treatment of sick cattle and equipment and machines for handling and treating the animals but this was not effectively done. It is not surprising that some of these challenges were faced as the kraals were located in remote places making accessibility difficult hence some cattle owners found it difficult to frequently visit these sites to be able to provide services.

The present outcome (Table 5) confirmed the calls by Nchor (2010) and FAO (2011) to train herdsmen and other cattle farm operatives to help improve the management of livestock and handling and quality of milk produced on the various farms (Nchor, 2010). Training the herdsmen to adopt higher levels of technology according to Vargas *et al*. (1995) and Mekonen *et al.* (2010) increased the yield of milk on various cattle farms.

CONCLUSION

The study revealed the destruction of crops, poor condition of service, inadequate grazing fields and feed scarcity as challenges facing herdsmen. Despite all these challenges, some of the herdsmen do not have any day off to rest. Most (53.2%) of the herdsmen took a monthly salary of GH¢ 100.00 in addition to accommodation, food and income from the daily sale of milk. However, this condition of service for herdsmen was not well packaged and presented to the herdsmen making them think they are poorly remunerated. Low number of cows milked, use of beef cows for milk production and the number of times the cows were milked, inadequate grazing fields, feed scarcity and low rate of feed supplementation were identified as factors that could explain the low milk yield recorded in the study area. Many of the herdsmen neither pasteurized the milk nor refrigerated it before transporting the milk. In addition to these, some of them do not deliver the milk to the buyer or processor early enough which can easily lead to deterioration of the milk. Given these, it is recommended that herdsmen and cattle owners should be trained and further study on milk yield and quality assessment should be carried out in the municipality.

Credit Authorship Contribution Statement

G. Deku: involved in the conceptualization of the study, set the study up, collected and analysed data, and wrote the draft report. **C. Antwi**: Conceptualization, project administration, supervision, review and editing of write- up. **P. K. Karikari**: Conceptualization, project administration, supervision, review and editing of write-up and provided resources. **D. B. Okai:** Conceptualization, project administration, supervision, review and editing of write up. **A. B. Omojola :** Conceptualization, project

administration, supervision, review and editing of write up.

Declaration of interest

None

Funding

This study was funded by the authors

Acknowledgement

Special thanks go to Evans Tawiah Aboagye, Joshua Nabilla, Priscilla Blessing Owusu, Mercia Lionel Adjei, Mr. Bright Amponsah, Dr. Yaw Oppong Frimpong, Dr. Michael Kweku Edem Donkor and Prof. David Wemegah for helping in data collection, organization and analysis.

REFERENCE

Abbass, I. M. (2014). No retreat, no surrender for survival between Fulani pastoralists and farmers in Northern Nigeria. European Scientific Journal (8), 1.

Bortacki, P., Kujawiak, R., Piatkwoska, C. E., Kirdar, S. S., Wojik, J. and Grzesiak, W. (2017). Impact of milking frequency on yield, chemical composition and quality of milk in high dairy herd. Modern Animal Nutriton. doi: 10.15567/mljekarsto 2017.0307.

Cardot, V., Le Roux, Y. and Jurjanz, S. (2008). Drinking behaviour of lactating dairy cows and predicting of their water intake. Journal of Dairy Science 91(6): 2257-2264

Coffie, I., Annor, S. Y., Kagya-Agyemang, J. K. and Bonsu, F. R. K. (2015). Effect of breed and non-genetic factors on milk yield of dual-purpose cattle in Ashanti Region, Ghana. Small Research, 20(2.3): 0-20.

Feldt, T. and Schlecht, E. (2016). Analysis of GPS trajectories to access spatio-temporal differences in grazing patterns and land use preferences of domestic livestock in southwestern Madagascar.doi:10.1186/s13570-016-0052-2.

Flintan, Fiona E., Lance W. Robinson, and M. Allen (2021). A review of tenure and governance in the pastoral lands of East and West Africa.

Food and Agriculture Organization of the United Nations, FAO. (2001). Reports on the FAO E-mail Conference on Small-scale Milk Collection and Processing in Developing Countries. Animal Production Service. Animal Production and Health Division. Rome.

Food and Agriculture Organization of the United Nations, FAO. (2004). Employment generation through small-scale dairy marketing and processing: experiences from Kenya, Bangladesh and Ghana: A Joint study by the ILRI Market-Oriented Smallholder Dairy Project. Viale Delle Terme Di Caracalla, Rome.

Food and Agriculture Organization of the United Nations, FAO. (2005). Nutrition indicators for development by B. Maire and F. Delpeeuch. Rome.https://www.fao.org/docrep/008/y5773e00.htm.

Food and Agriculture Organization of the United Nations, FAO. (2011). World livestock 2011. Livestock in food security. ISBN978-92-5-107013-0.

Garedew, L., Berhanu, A., Mengensha, D. and Tsegay, G. (2012). Identification of gram-negative bacteria from critical control points of raw and pasteurized cow milk consumed at Gondar town and its suburbs, Ethiopia. BMC Public Health 12, 950 (2012). https://doi.org/10.1186/1471-2458-12-950.

Hernández-Castellano, L., Nally, J., Lindahl,

J., Wanapat, M., Alhidary, I., Fangueiro, D., Grace, D., Ratto, M., Bambou, J. C. and Almeida, A. (2019). Dairy science and health in the tropics: challenges and opportunities for the next decades. Tropical Animal Health and Production 51 : 1009-1017.

Holechek, J. L. (1980). Livestock grazing impacts on rangeland ecosystems. Soil and Water Conservation. 35: 162-165.

Jabbar, M.A. (1994). Evolving crop-livestock farming systems in the humid zone of West Africa. Journal for Farming Systems Research and Extension, 4 (3): 47 - 60.

LEISA, 2002. Managing Livestock Sustainably. 4(1): 36pp

Mahari, A. T. and Yemane, H. (2016). Cow Milk Handling Practices and Factors Contributing to Quality Deterioration in Ethiopia. Food Sci. Qual. Man, 48, 1417.

Maity, T. K., Kumar, R. and Misra, A. K. (2010). Prevalence of Entheropathogenic Escherichia coli isolated from Chhana Based Sweets in Relation to Public Health 12,950 (2012). Indian Journal of Microbiology 50(4), 463-467

Manu, I. N., Bime, M. J., Fon, D. E. and Ajaga, N. J. I. (2014). Effect of farmer-grazer conflicts on rural development: A Socio-Economic Analysis. Journal of Agricultural Science 4(3):113-120.

Mekonnen, M. M and Hoekstra, A. Y (2010). The Blue, Green and Grey water footprint of farm animals and animal products, Value of Water Research Report Series No 48, UNESCO-IHE, Deft the Netherlands.

Nchor J. (2011). Indigenous Knowledge in Small Ruminants Livestock Rearing and Its Implications for food security in the Tolon- Kumbungu district of Northern Ghana. www.udsspace.uds.edu.gh.

Ngongoni, N. T., Mapiye, C., Mwale, M. and Mupeta, B. (2006). Factors affecting milk production in the smallholder dairy sector of Zimbabwe. Livestock Research for Rural Development 18 (5) https://www.research gate.net/publication/294756507.

Okoro, J. P. (2018). Herdsmen-Farmers Conflict: Implication on National Development (Nigeria in Perspective). Presented at the 1st International Conference of Social Sciences (ICOSS'2018). Theme: "Imaged or Imagined: Africa and the Contemporary World – Issues in Security, Governance and Sustainable Development" National Open University of Nigeria.

Omotayo, A. M. (2002). A land use system and the challenge of sustainable agro-pastoral production in the South-Western Nigeria. The International Journal of Sustainable Development and World Ecology. 9:369-382.

Onono, J. O and Ochieng, A. (2018). Review of challenges and opportunities for dairy cattle farming under mixed system of Homa Bay County, Western Kenya Journal of Agricultural Extension and Rural Development. 10(10): 202-210. DOI: 10.5897/JAERD2018.0987.

Opong-Anane, K. (2006). Country Pasture/Forage Resources Profiles- Ghana. Food and Agricultural Organization of the United Nations (FAO). https://www.fao.org/ag/AGP/AGPC/doc/counprof/PDF%20files/Ghana.

Slayi, Mhlangabezi, Leocadia Zhou, and Ishmael Festus Jaja (2023). Constraints Inhibiting Farmers' Adoption of Cattle Feedlots as a Climate-Smart Practice in Rural Communities of the Eastern Cape, South Africa: An In-Depth Examination. Sustainability 15.20 : 14813.

Thorne, J. (2009). Kidnapping Westerners is a lucrative business in the Sahel. In the National 20 December. https://www.thenational.ae/news/worldwide/westerners-is-a-lucrative-in-the-sahel.

Tonah, S. (2002). Fulani pastoralists, indigenous farmers and the contest for land in Northern Ghana. African Spectrum, 2002. 37(1): 43-59.

Tonah, S. (2005). Inter-generational Differences in the relationship between the Fulani and the Mamprusi in Northern Ghana. Paper prepared for the first AEGIS Conference, School of Oriental and African Studies, London.

Vargas, H. E., Estrada, R. D. and Navas, E. F. (1995). Dual purpose cattle production in Guatemala: A case study. Animal production systems global workshop; San José (Costa Rica).

Villano, Renato, Bright Owusu Asante, and Boris Bravo-Ureta (2019). Farming systems and productivity gaps: Opportunities for improving smallholder performance in the forest-savannah transition zone of Ghana. Land use policy 82 : 220-227.

Wall, E. H. and McFadden, T. B. (2008). Use it or lose it: Enhancing milk production efficiency by frequent milking of dairy cows. Journal of Animal Science 86: 27-36. https://doi.org/10.2527/jas.2008-0318.

Wanapat, M., Pimpa, O., Petlum, A., Wchirapakorn, C. and Yuanklang, C. (1999). Participation shceme of smallholder dairy farmers in the Northeast Thailand on improving feeding systems.