Characterization of Smallholder Dairy Cattle Production Systems in Selected Districts of East Wollega Zone, Ethiopia

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Abstract: A cross-sectional study was conducted in GutoGida (Urban and Peri-Urban) and LekaDullacha (rural) districts of East Wollega zone from December 2014 to March 2015 with the objectives to assess smallholder dairy cattle production systems and identify major constraints in smallholder dairy farms in and around Nekemte town. A total of 105 households were individually interviewed with personal observation and focus group discussion. An average family size, land holding and herd size of the respondents were 6.07±2.11persons, 2.34±1.9 hectare and 12.19± 7.6 heads of cattle per household respectively.In urban areas, the majority 20(91%) of the respondents keep cattle for milk production and in rural area the majority 56(89%) keep cattle for crop production. More than 50% of the farmers use both AI and bull service where as 45% use natural breeding only for breeding their dairy cattle. The majority 70(66.7%) feed their dairy cattle through free grazing where as 10.5% and 11.4%use stall and combination of feeding system respectively. Trypanosomosis, Lumpy skin disease, Black leg, Pasteurellosis, Anthrax, Foot and Mouth Disease and ecto-parasite were the prevalent diseases and parasite of cattle in the study area. Feed and Land shortage, ineffective crossbreeding and disease prevalence were among the major constraints of smallholder dairy cattle production in the study area. Generally the status of smallholder dairy cattle production in the study area was poor and constrained by feed scarcity and lack of improved breeding system. Interventions with improved dairy extension packages may minimize the constraints and improve milk production.

Key words: East Wollega zone · Major constraint · Management practices · Smallholder dairy production

INTRODUCTION

Ethiopia's economy is based mainly on agriculture, including crop and livestock production, which contributes 45% of the national Gross Domestic Product (GDP), more than 80% of employment opportunities and over 90% of the foreign exchange earnings of the country [1].

An estimate indicates that the country is a home for about 53.9 million cattle, 25.5 million sheep and 24.06 million goats [2]. From the total cattle population 98.95% are local breeds and the remaining are hybrid and exotic breeds. The subsector contributes about 16.5% of the national and 35.6% of the agricultural GDP [3]. It also contributes 15% of export earnings and 30% of

agricultural employment [4]. Human population in Ethiopia is projected to reach 140 million by the year 2025 and the urban population will rise to 40 million. It is, therefore, obvious that milk and its derivatives will be in short supply unless both horizontal and vertical expansions of the dairy industry will take place [5]. Despite the role of cattle to the farming community in particular and to the national economy at large, the sector has remained underdeveloped and underutilized [6].

Despite high potential for dairy development, the performance of the dairy industry in Ethiopia has not been encouraging when evaluated against even the dairy performance of East African countries which have more or less similar agro ecology [7]. The annual milk production status of the country is very low, about 2.59 million ton

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per annum and growing at a rate of only 1.4 percent per year [8]. Per capita milk consumption in Ethiopia has sharply dropped to below 20 liters compared to the global average of 100 liters. For years, Ethiopia ranked first in cattle population in Africa, however, the dairy industry is not as developed as that of East African countries like Kenya, Uganda and Tanzania [9].

The average milk production capacity of the indigenous cow per head per lactation is estimated at 213 kg and average daily milk production per cow is 1.2 liters and the average calving interval 27 months [10]. The low productivity is due to a number of factors among which are quantitative and qualitative deficiencies in the feed resource base, diseases, poor animal performance level, weak livestock policies with respect to extension services, marketing and infrastructure and insufficient knowledge on the dynamics of the different types of farming systems existing in the country[11].

Like most developing countries, Ethiopia's increasing human population, urbanization trends and rising household incomes are leading to a substantial increase in the demand for livestock products, particularly milk and meat. In order to meet the growing demand for milk and milk products in Ethiopia, milk production has to grow at least at a rate of 4 percent per annum[12].

In East *Wollega* zone, especially in urban and peri-urban areas of Nekemte town, dairy development package interventions have been going on for the past two decades and the number of farmers owning crossbred dairy cattle and engaged on milk production and marketing has increased over years [13]. To develop appropriate interventions and assist smallholder milk producers requires a clear understanding of the dairy production systems and associated constraints. Little is known about the smallholder dairy production systems, reproductive and metabolic health disorders, major husbandry constraints and opportunities. In the study area, most of reported studies on the constraints of dairy cattle reproduction and production were focused on the work performed on research stations and institutional herds. Thus it is justifiable to generate scientific information on the production system and the major constraints of dairy cattle in the study area. Therefore the current study was conducted based on the following objectives:

- To characterize smallholder dairy cattle production systems in selected districts and,
- To identify major dairy cattle production constraints in the area

MATERIALS AND METHODS

Description of Study Area: The study was conducted in *GutoGida* and *LekaDullacha* districts of East *Wollega* zone, of Ethiopia from December 2014 to March 2015. The altitude of East *Wollega* zone ranges from 1200-2500 m.a.s.l and classified in to three agro ecological zones, temperate (7.18%), midland (51.08% and low land (41.74%). *GutoGida* district is one of the study districts of East *Wollega* zone and geographically lies between 9° 5'N and 36° 33'E, on an altitude of 2088 m.a.s.l. The human population of the district is about 174,412 from which 84,502 living in the town and 89,910 living in peri urban and rural area of the district [14].*LekaDullacha* district is another district of the zone located 27km from *Nekemte*. The district receives annual rain fall which ranges from1600-2000mm and range of minimum and maximum temperature 15⁰C-26⁰C respectively. The altitude of the district ranges from1500-2500 m.a.s.l. The cattle population of *LekaDullacha* district was estimated to be 95,858 heads [2].

Study Population and Sampling Procedure: For this study, two districts from East *Wollega* zone (*GutoGidda*and*LekaDullacha*) were purposively selected based on dairy cattle population potential and accessibility. Households possessing at least one dairy cow in selected districts and cattle owned by these households represent the study population.

From *GutoGida* district, two (2) peri urban PAs (*Gari* and *Dune Kane)*and one (1) town (*Nekemte*) were purposively selected to represent peri-urban and urban production sites. For the rural district (*LekaDullacha*), from 22 PAsonly 3 (*HordaQawwisa, JarsoGute*and*DigaFododo)* were randomly selected. Simple random sampling procedure was used to select representative herds or households for the study. For household questionnaire survey, the sample size was determined by using the formula recommended byArsham [16] for formal survey. N = 0.25/SE², SE= standard error, 0.05. Thus, N= 0.25/0.0025=100 households. But the total number of households used for questionnaire interview was increased to 105 to increase precision [LekaDullacha or rural site (63), periurban (20) and Nekemte or Urban site (22).

Study Design: A cross-sectional survey was conducted using questionnaire interview, participatory group discussion and personal observation to collect data on characteristics and management practices of smallholder dairy production systems and associated cattle

production constraints at three dairy cattle production sites, namely; urban, peri urban and rural dairy cattle production sites.

Methods of Data Collection: For this study, questionnaire interview of households and focus group discussion with livestock experts were used to generate relevant information.

Questionnaire Interview: A semi-structured and pre-tested questionnaire was used to interview selected households in each production sites. A total of 105 respondents (22 from *Nekemte* town, 20 from peri urban of *GutoGida* and 63 from rural) were interviewed. The questions mainly focus on socio-economic characteristics of the household, smallholder dairy cattle production system and management practices.

Focus Group Discussion (FGD): Informal group discussion with zonal and district livestock agency staff was done to generate relevant information about livestock production system and associated constraints. A checklist of different topics for focus group discussion was prepared and presented for participants and data was recorded for each topic. Points for discussion include: status of dairy cattle production, major crops grown in the area, major constraints of cattle and dairy production, available feed resources, dairy extension services, cross breeding activities and major diseases of cattle and associated constraints to health care services in the area. Group of 6 livestock experts at zonal (Urban) and 4 experts at *LekaDullacha* district (Rural) from extension, production, health, feeds and nutrition department were participated.

Data Management and Analysis: The raw data obtained from cross-sectional survey was coded and entered on a Microsoft Excel (2007) data spreadsheet for management. Analysis was done using Statistical Package for Social Sciences version 20.0 [17].

RESULTS

Socioeconomic Characteristics

Household Characteristics: From the result of the survey, it was indicated that the sex groups of sample respondents were male 95(90.5%) and female 10(9.5%). About 52(49.5%) of the age of the respondents falls in the range of 36-50 years, but 28.5% and 21% of the age of respondents fall in the range of 20-35 and 51-65 years respectively (Table 1).

Table 1: Distribution of age group of respondents

Age group(years)	Frequency	Percentage
20-35	30	28.5
36-50	52	49.5
51-65	22	21
>65	1	1
Total	105	100

Table 2: Marital status and educational level of the sampled respondents in 3 locations

	Production site			
Variables	Urban	Peri urban	Rural	Overall (%)
Single	1	0	0	1
Married	20	20	60	95
Widowed	0	0	2	2
Divorced	1	0	1	2
Total	22	20	63	100
Illiterate	0	1	8	8.5
Primary	2	5	25	30.5
Secondary	9	11	30	48
Higher education	11	3	0	13
Total(N=105)	22	20	63	100

N=number of observations,%= percentage

The minimum and maximum family size per HH was 1 and 10 persons respectively. An average family size of 6.07 persons (standard deviation of 2.11) per HH was identified. The marital status of the sample respondents were married (95%), widow (2%), divorced (2%) and single (1%). The educational levels of nearly half of the sampled respondents (48%) were secondary school complete and 30% were primary school complete. The rest 8.5% and 13% of respondents were illiterate and higher education respectively (Table 2).

Land Holding and Source of Income of the Respondents: The overall average of landholding for the sampled respondents was 2.34±1.9 hectares. From this average total land holding, 1.07 hectares of land was allocated for crop production and 0.88 hectare for grazing purpose. The rest 0.45 hectare was used for other purposes like tree plantation (Table 3).

Majority of the sampled respondents (62%) get their household likelihood income primarily from crop production and livestock as secondary source of income especially in the rural and peri urban areas. Others consider livestock production as the main source of household income with supplementary crop production (9.5%) and other side business activities (24.5) like shop, transport service, hotel and etc. only 3% of the households get their income from livestock only. The latter two were mainly the characteristics of urban dwellers (Table 4).
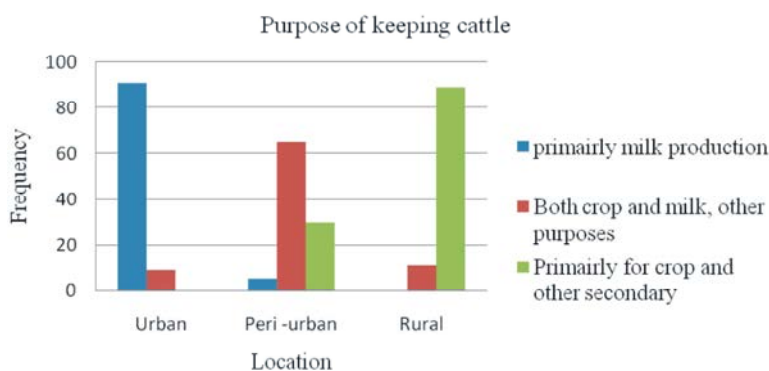
Fig. 1: Purpose of keeping cattle in the study area (n=105)

Table 3: Distribution of land holding (ha) of the households at different locations

Location	n	Total land Mean±(SD)	Crop	Grazing	Other
Urban	22	2.21(2.51)	0.22	1.28	0.90
Peri urban	20	2.15(1.01)	0.81	0.75	0.73
Rural	63	2.45(1.88)	1.51	0.79	0.17
Total	105	2.34(1.90)	1.07	0.88	0.43

n= number of observations, SD= standard deviation, ha= hectare

Table 4: A summary of source of income of the households in different location

	Location			
Variables	Urban	Peri urban	Rural	Overall (%)
From crop production (livestock secondary)	1	11	54	66 (62)
From livestock production(crop secondary)	1	3	6	10 (9.5)
From livestock production and side business (shop, restaurant, etc)	18	5	3	26 (24.5)
Livestock production only	2	1	0	3 (3)
Total (n=105)	22	20	63	105 (100)

n=number of observations,% percentage

Table 5: A summary of cattle herd composition and herd size of sample households (n=105)

Cattle type	Min.	Max.	Sum	Mean(±SD)
Cow	1	19	456	4.34(3.02)
Heifer	0	11	230	2.19(2.15)
Male Calves	0	7	194	1.84(1.1)
Female Calves	0	9	127	1.21(1.75)
Oxen	0	6	154	1.47(1.59)
Bull	0	6	119	1.13(1.26)
Herd Size	2	49	1280	12.20(7.6)
Local	0	29	901	8.58(6.7)
Crossbred	0	37	379	3.61(6.27)

n= number of observations, Min. =minimum, Max. =maximum

Purpose of Keeping Cattle: In the urban area 20(91%) of the dairy cattle producers keep cattle for milk and milk product and only 2(9%) keep for milk, crop production and other purpose. In the rural area, 56(89%) of the farmers keep cattle for crop production followed by milk production and other purposes. About 7(11%) of the rural cattle owners keep cattle for both milk production and crop production followed by other purposes. In peri urban areas of *Nekemte*, 13(65%) of the respondent keep cattle mainly for both crop and milk production followed by other purposes. But 6(30%) of the respondents in peri urban of *Nekemte*, keep cattle primarily for crop production followed by other purposes (Figure 1).

Dairy Cattle Management Practices: Breeds and Breeding: The mean herd size of cattle per HH was 12.19 heads of which 8.58 heads of local breed and 3.61 heads of cross breed. Herd size and breed composition at HH level in the study area was indicated (Table 5).

Table 6: Cattle breeding practices in the sampled households (n=105)

Variables		Location			Overall (%)
		Urban	Peri-urban	Rural	
Breeding system	Natural	9.5	4.6	31	45
	AI	2	2	0	4
	Both can be used	9.5	12.4	29	51
Source of bull	Selected from herd	6.5	5.9	29.5	42
	Purchased	3.5	5	5	13.5
	Neighbor bull	9	6.6	25.5	41.6
	Couldn't identify	1.5	1.5	0	3

n= number of observations,% percentages

Table 7: Types of dairy cattle housing system in East *Wollega* zone (n=105)

Housing system	Location			Overall (%)
	Urban	Peri-urban	Rural	
Open crush barns	0	9	43	52 (49.52)
Fenced and roofed shade	5	4	7	16 (15.23
Closed barn	17	11	7	35 (33.33)
No house	0	0	2	2 (1.90)
Total	22	20	63	105 (100)

n= number of observation,%=percentage

Table 8: A summary of different dairy cow feeding system in East *Wollega* zone

Feeding system	Frequency	Percentage
Free grazing on own pasture	70	66.7
Free grazing on communal pasture	8	7.6
Intensive feeding	11	10.5
Combination (Stall, grazing, cut and carry)	12	11.4
Tethering	4	3.8
Total	105	100

Different cattle breeding system practices were mentioned by the sampled households in the three locations. More than 45% of the respondents have used natural breeding by using bull service. Only 4% of the households were using artificial breeding through AI and majority of them (51%) have used both natural and artificial insemination for breeding their cattle. Households who were using natural breeding system get breeding bull from different sources. Majority (83.6%) of the households were using breeding bull either a selected bull from their own herd or neighbor bull. The rest of households (13.5%) were using purchased bull and only 3% did not able to locate source of bull (Table 6).

Housing Management: The result of the current study indicates that there are three types of dairy cattle housing system in the area. In the rural and peri-urban of *Nekemte* the traditional housing system (open crush barns) shares 49.52% of cattle housing system. Fenced roofed shades type of housing system was used in all locations and contributes 15% of housing type. Closed barn housing system was mainly used for urban dairy housing and 33.33% of the sampled households use closed type of dairy house (Table 7).

Feeds and Feeding System: Feeds and feeding system was the main constraint of cattle production in the study area. The result of this study indicates that the types of feeding systems noted were grazing (own and communal pasture), intensive feeding, combination (grazing, cut and carry and intensive) and tethering (Table 8). Majority of the sampled households (66.7%) feed their animals through free grazing on own pasture land and only 7.6% were using communal pasture. These two feeding systems were observed mainly in rural areas. Zero grazing and combinations of feeding systems were mainly the characteristics of urban and peri urban areas. Only 10.5% of the respondents use stall (intensive) feeding and 11.4% practice a combination of feeding system (Table 8).

This study also indicated that the major sources of feed for cattle in the study area are natural pasture, grass hay, crop-residues, improved forage plants (elephant
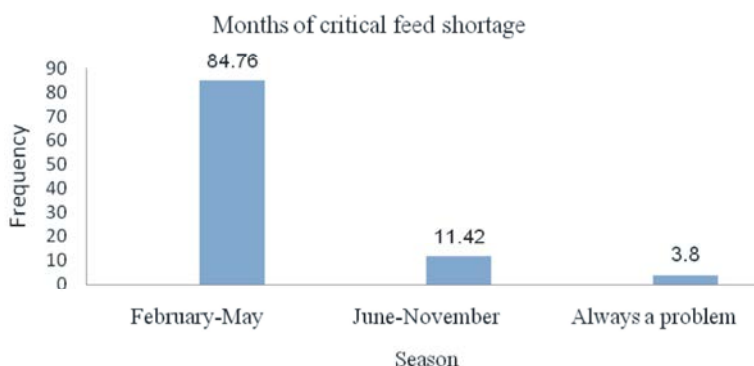
Months of critical feed shortage

Fig. 2: A graph showing months of critical animal feed shortage in the study area

Table 9: A summary of available feed resource in the study area

List of available feed resource	Frequency	Percentage
Concentrate feeds, grass hay, pulse crops hulls and improved forage	37	35.24
Natural grass, crop residue, leaf of trees, local brewery by product ("*Atela*")	68	64.76
Total	105	100

Table 10: Newborn calves management practices in the study area (n=105)

Newborn calves Isolation	Variables	Location			Overall (%)
		Urban	Peri-urban	Rural	
	Yes	13 (59)	4(20)	3 (5)	20 (19)
	No	9	16	60	85 (81)
Total		22	20	63	105 (100)

n=number of observations,%=percentage

Table 11: A summary of calf weaning age in the study area (n=105)

Weaning age (months)	Location			Overall (%)
	Urban	Peri-urban	Rural	
3-6	21	7	1	29 (27.61)
9-12	1	11	34	46 (43.8)
12-18	0	2	28	30 (28.57)
Total	22	20	63	105 (100)

N=number of observations,%=percentage

grass, Rhodes grass), concentrate feeds and non-conventional feedstuffs such as mill house by product (hulls and scrubs) and '*Atela*', locally produced brewery by product (Table 9).

Majority of the sampled households (84.76%) faced critical feed shortage during dry season from February to May. This is primarily the problem of rural and peri urban production system due to lack of grass for cattle to graze. On the other hand, 11.43% of respondents complained critical feed shortage during wet season from June to November because of shortage and costly price of concentrate feeds on local market. This wet season feed scarcity was the problem of urban and to some extent peri urban dairy producers in Nekemte and the area. Very small proportion of respondents (3.8%) in the study area faced animal feed shortage always as a problem (Figure 2).

The result of this study shows 20(19%) of the respondents isolate newly born calves within 2-3 days and use bucket feeding system. But the majority of the sampled households 85(81%) do not isolate the calves from their dams (Table 10). For Bucket fed crossbred calves in and around *Nekemte*, weaning age ranges from 3-6 months of age depending on the growth rate and body condition of the calf. Since there was no practice of isolating local calves from their dams mainly in the rural and peri urban areas, weaning age ranges from 9-18months of age (Table 11).

Major Diseases of Cattle and Health Care: The majority 91(86.66%) of the respondents have listed the major cattle diseases affecting production and productivity of their animals. These common diseases include:
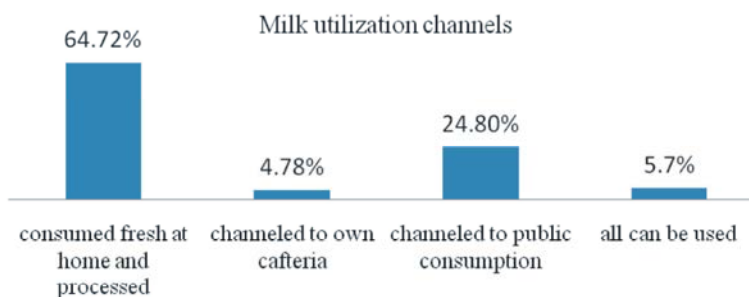
Fig. 3: Bar chart showing fluid milk utilization channels of the households in the area

Table 12: Common cattle diseases and their management at the study area

Type of disease and management	Frequency	Percentage
Trypanosomiasis, Lumpy skin disease, Black leg, Pasteurellosis, Anthrax, Foot and mouth disease	91	86.66
Tick and leech infestation, mastitis and bloating	14	13.33
Total	105	100

Trypanosomosis, Lumpy Skin Disease (LSD), Black leg, Bovine Pasteurellosis, Anthrax and Foot and Mouth Disease (FMD).A Small proportion of the respondents 14(13.33%) have listed external parasite (tick), leech parasite and mastitis as the main health concern for dairy production (Table 12).

Milk Production and Utilization: The rural milk producers utilize the milk produced through traditional churning of milk to make butter, the only marketable milk by- product and very small amount consumed fresh at home (given to HHH and young children). Majority 68(64.72%) of the respondents consume at home and process the milk produced. About 26(24.80%) of the respondents channel the milk produced to public market and 4.8% channel the milk to their own catering services. For 5.7% of the respondents all utilization routes are possible (Figure 3).

Participatory (Focus Group Discussion): According to the agreement of the discussants at zone and district level, cattle production is generally mixed crop-livestock production system (complementary to one another) in the rural area with market oriented smallholder dairy and fattening practices in and around larger towns in the zone. Market oriented dairy cattle production is still not popularized and stagnant in the area due to scarcity of inputs. In the rural areas of East *Wollega* zone cattle production is characterized by keeping local breed with low input low production and intended primarily for crop production. The milk produced is mainly processed to butter and selling milk is not cultural.

The Major crops grown in the area include Maize (*Zea mays*), "*Teff*" (*Eragrostistef*), "*Noug*" (*Guizotiaabyssinica*), Wheat (*Triticumaestivum*), Barley (*Hordeumvulgare*), Sorghum (*Sorghum bicolor*), Coffee, pulse and oil crops. Many points on constraint of cattle production were raised by the discussants at zone and district level but very important constraints were more stressed and summarized. These constraints include; lack of breed selection practices, unimproved management system, input scarcity, poor infrastructure and problems of cross breeding. From all constraints of cattle production, animal feed scarcity both in quantity and quality is the major problem of livestock production in East *Wollega* zone. Grazing land is decreasing from time to time due to pressure from crop production and overgrazing. Due to low conception rate of artificial insemination, there has been resistance from farmers to adopt cross breeding through AI and there was no detail investigation done on the cause of low conception rate after insemination.

The major feed resource available in the area are natural pasture, crop residue, natural grass hay, oil seed cakes, maize grain and improved forages. Animals especially during dry season starve and predisposed to health problems due to lack of feed in rural areas. Extension activities on development of forage plants are ongoing but adoption of the technology was minimal at farm level. The major animal diseases prevailing in the zone include: *Trypanosomiasis,* Lumpy Skin Disease (LSD), bovine *Pasterurellosis*, Black leg, Mastitis, reproductive health disorders, calf diarrhea, FMD, Internal and external parasites. Poor animal health extension system, very poor outbreak surveillance, lack of facilities, poor control of illegal drug market and lack of on job training were described by the discussants as main constraints to disease control and prevention strategy in the area. According to the result of the discussion,

awareness creations on cattle selection for milk production, estrous synchronization and insemination with training on dairy package are actively ongoing in selected districts. But due to very low conception rate of AI for unknown reason dairy cattle owners usually purchase crossbred animals from other places.

DISCUSSION

Socio-Economic Characteristics of the Households

Household Characteristics: The result of this study indicated that majority of sampled respondents were male headed (90.5%) and only (9.5%) were female- headed households. This result was in agreement with the result of similar activities in Ethiopia [18, 19] who reported majority of the respondents (87%) and (93.6) were male headed households respectively. It was also reported by Diriba *et al.* [13] that the majority of respondents (92%) at *Nekemte* and (88%) at *Bako* were male headed households. As it can be observed from the result of this study the majority of sample respondents were married (95%) whereas 2%, 2% and 1% of the respondent were widowed, divorced and single, respectively.

Almost the average age of the majority (76.5%) of respondents was between 20-50 years. But 21% of the ages of respondents fall in the range of 51-65 years (Table 1). This result indicates the majority of household heads are found in young working age group and it is important for livestock production and agricultural activities. The assessment study in parts of Ethiopia [20] shows the age group of majority, active working force ranges from 15-55 years which constitute 42% of the total. This figure is lower than the present finding maybe due to difference in study area and sampling technique. The result of the present study also indicates that, the average household level family size of the respondents was 6.07 with minimum and maximum number of (1 and 10) peoples respectively. A similar finding in different parts of Ethiopia shows no significance difference with this figure. Different research outputs [19, 21- 24] have indicated an average HH level family size of 6.22, 5.58, 7.09, 5.06 and 6.62 peoples respectively. However this finding is lower than that of Asaminew [25] and Berhanu *et al*. [26] and Solomon [27] who found an average family size of 7.71, 7.5 and 8.73 persons respectively. This difference might be due to socio economic difference of the respondents and difference in sampling procedure.

A summary of marital status and educational level of the HHs in the study area was presented in Table 3. The marital status of the sample respondents were married (95%), widow (2%), divorced (2%) and single (1%). As it was indicated, the majority of the informants were married (95%). This is in agreement with the finding of [21] who reported the marital status of the sample respondents were married (90.1%), widow and widower (4.4%), divorced (3.9%) and the rest single (Table 2).

Educational level of the farming households may have significant importance in identifying and determining the type of development and extension service approaches. The role of education is obvious in affecting household income, adopting technologies, demography, health and as a whole the socio-economic status of the family as well [28]. The educational levels of almost 50% of the sampled respondents were secondary school complete and 30% were primary school complete. This shows the growing of educational coverage which provides better opportunity to implement improved agricultural practices and wise use of scarce agricultural resources in the study area. The rest, 13% and 8.5% of respondents were at higher education level and illiterate respectively (Table 2). Only 8.5% of the household interviewed can't read and write. This result indicates at least about 88% of the respondents can read and write. The percentage of illiterate family members (8.5%) reported in this study was less than the reported figure in Amahara regional state by Adebabay [21] and Berhanu *et al.* [26] and Fiseha [29] which were 31.5%, 39.3% and 50%, respectively. This may be due to study area socio economic difference or increasing percentage of educated group in our society. Therefore, technology adoption may be easy for intervention of livestock development in the area.

Landholding and Source of Income: In average, the sampled respondents possess 2.34ha of land. From this average total land holding, 1.07 hectares of land was allocated for crop production and 0.88 hectare for grazing purpose. The rest 0.45 hectare was used for other purposes (Table 3). As it can be seen from the table, average land holding in urban area seems equal to both peri urban and rural areas. But this is not the reality in practice. The average total land holding at urban area was increased due to inclusion of government and non government dairy farms during sampling with relatively large land holding. Another study by Asaminew and Eyasu [20] found an average land holding per HH 2.66ha at Bahir Dar zuria which was greater than the current finding. This may be due to difference in location and population density difference in the two sites. Higher average land holding per HH was also indicated by

Teshager *et al*. [22] who found 3.06 ha in *Ilu Ababor* zone. The settlement structure of *Ilu Ababor* and East *Wollega* zones is not the same. Households were more sparsely settled in Ilu Ababor due to coffee plantation and forest. But, the current finding is greater than that of Yigerem *et al*.[30] who identified 1.1 ha average land holding at *Shashamane-Dilla* area. This could be due to population density difference in both sites.

Cattle owners of the sampled households generate income from different sources and for the majority of rural producers livestock is not the main income source. Majority of the sampled respondents (62%) get their household likelihood income primarily from crop production and livestock as secondary source of income especially in the rural and peri urban areas. Another scholar [31] reported that the contribution of dairying to the total household income in rural areas of Ethiopia was much lower (1.6%). Because of the very comfortable agro ecology of the area for cereal crop and coffee production more attention is given to crop production than livestock. Others consider livestock production as the main source of household income with supplementary crop production (9.5%) and other side business activities (24.5), like shop, transport service, hotel and etc. in the urban area, only 3% of the households get their income from livestock only. The latter two were mainly the characteristics of urban dairy producers (Table 4). The result of this study indicates that as one goes from urban to rural in the current study area, the contribution of livestock to be the source of income for household livelihood decreases and vice versa. Similar studies by Yigerem *et al*. [30] shows urban producers generate substantial (50% of their total income) level of income that dairy producers achieve from dairying. Contrary to this, dairying contributed only 1.6% to the total income of families in the rural areas.

The result of studies in the mid highland crop–livestock production system of Ethiopia have shown that depending on the distance from urban centers, the level of income share from dairying increases and ranged from 0.07 to 44% of the total income of farmers [32]. Contrary to this finding [24] in Hararghe zone found that contribution of cattle and crop production were equally major income sources of households as a whole. This is due to the study area difference in that in Hararghe area crop production may not be the larger contributor to household income due to ecology and geographical set up of the area when compared to the present study area.

Purpose of Keeping Cattle: Knowledge of reasons for keeping cattle is prerequisite for devising breeding goals [33]. Based on the results of this study, cattle were mainly

kept to satisfy both milk and crop production needs in the rural areas. In the rural area, 56(89%) of the farmers keep cattle for crop production followed by milk production and other purposes. This is in agreement with the finding of Asaminew [25] who reported that the first and second priority functions of cattle are draught power and milk production, respectively. Similar finding [34] reported that the primary purpose of keeping cattle in *Hararghe* was for draft power, milk production and for other purposes. About 4(6%) of the rural cattle owners keep cattle primarily for milk production followed by crop production and other purposes. In the urban area, 20(91%) of the respondents keep dairy cattle for milk and milk product, crop production and other purpose are secondary. In peri urban areas of *GutoGida* district 13(65%) of the respondents keep cattle equally for crop production and milk followed by other purposes. But 6(30%) of the respondents keep cattle primarily for crop production followed by other purposes (Figure 1). When compared to the urban area, Smallholder farmers in the peri urban of Nekemte town practice both dairy and crop production and benefit from the two sources than urban farmers. Very few farmers in the urban area practice crop production (mainly horticulture) on very small plot of land.

Dairy Cattle Management Practices
Breeds and breeding*: According to CSA [2] country livestock survey indicated that out of the total cattle population in the country, 98.95% are local breeds. The remaining are hybrid and exotic breeds that accounted for about 0.94% and 0.11%, respectively. According to the current study result, the mean herd size of cattle per HH indicates 12.19 heads from which 8.58 heads of local breed and 3.60 heads of cross breed (Table 5). This result was in agreement with the findings [35, 36] who reported 13 and 10.5 heads per HH at *Horro* district and *Boji* district of Western *Oromia* respectively. Very different figure was reported from *Iluababor* zone by Teshager *et al.* [22] that indicates the proportion of cross breed animal at HH level to be 1.1% and the rest indigenous breed. This difference comes from the fact that in the current study especially from urban areas HHs were selected purposively. In urban and peri urban areas of Nekemte, smallholder dairy farms mostly keep cross breed animals for milk production. Different cattle breeding practices were mentioned by the sampled households in the three locations. More than 45% of the respondents have used natural breeding by using bull service only. Only 4% of the households were using artificial breeding through AI and majority of them (50.5%) have used both natural and artificial insemination for breeding their cattle alternatively

(Table 6). The current finding is almost similar with the result of Belay[37] at Haramaya district shows Natural and uncontrolled breeding was the common method of mating animal in the study area and farmers who had no their own breeding bull shares from neighbors. AI service has been used in the area since two decades. But there is a resistance to use AI from the dairy producers due to low conception rate and birth of more male calves. Another scholar [13] found similar result that indicates the majority of dairy farmers in the area were observed to be more interested to use natural mating compared to AI, which indeed is induced by the widespread inefficiencies of the latter system. Another finding [38] also described the breeding practice similar to the current result. None of the Dairy Producers had breeding bulls mainly due to shortage of space and difficulties of management including shortage of feed. On the other hand all of the dairy Producers in Dire Dawa area had breeding bulls as an alternative to artificial insemination.

Housing Management*:* The result of the current study indicates that there are three types of dairy cattle housing system in the area (open crush, fenced shade and closed barns). But there were individuals who didn't house their cattle at all. In the rural district and peri-urban of Guto Gida about 49.52% of the respondents house their cattle in the traditional housing system (open crush barns). Fenced roofed shades type of housing system was used in all locations and contributes 15% of housing type. Closed barn housing system was mainly used for urban dairy housing in Guto Gida district and 33.33% of the sampled households use this type of dairy house. Only 1.9% of the respondents use no house for their dairy cattle (Table 7). In all locations great attention was given for crossbred animals housing than local breeds housing. Almost all local breed animals were housed in open crush barns and all crossbred animals were housed in either fenced shade or closed barns. But if local dairy cows were housed like crossbred ones the performance maybe improved. In the area usually as a tradition, local breed are multipurpose animals not only for milk production and all cattle types and even other species share same barn. A major problem in dairy herds regarding housing is the lack of sufficient space for age and physiological status of groups of animals, Martin, 1973 as cited in Emebet and Zeleke [38]. The need to group cows, based on their physiological status of production or reproduction was reported as mandatory, especially in large herds. Some of the most important reproductive problems were associated with the design of facilities and management of the environment [39].

Feeds and feeding management: Feeds and feeding system was the main constraint of cattle production in the study area. The result of this study indicates that the types of feeding systems noted were grazing (own and communal pasture), intensive feeding, combination (grazing, cut and carry and intensive) and tethering. Majority of the sampled households (66.7%) feed their animals through free grazing on own pasture land and only 7.6% were using communal pasture. These two feeding systems were observed mainly in rural areas. Stall (intensive) feeding and combinations of feeding systems were mainly the characteristics of urban and peri urban areas. Only 10.5% of the respondents use stall (intensive) feeding and 11.4% practice a combination of feeding system (Table 8). This study also indicated that the major sources of feed for cattle in the study area were natural grass, natural grass hay, crop-residues, improved forage plants (elephant grass, Rhodes grass), concentrate feeds and non-conventional feedstuffs such as pulse crop hulls and 'atela', locally produced brewery by product and cafeteria left over. As it was indicated in (Table 9), 35.24% of the sampled HHs use primarily concentrate feeds to feed their animals for milk production (mainly Noug cake and maize grain). Additionally as basal diet they feed their animal with grass hay, crop residue, non conventional feeds like pulse crops hulls and food left over. Adoption of improved forage varieties like elephant grass and Rhodes grass was also observed in urban and peri urban areas of Nekemte town; but not popularized among all smallholder dairy producers. Majority of respondents (64.76%) feed their animals exclusively on roughage (natural grass, crop residue) with non-conventional supplementary feeds like, leafs of trees, hulls and mill house scraps and "*Atela*". "*Atela*" is usually used by HHs who own small herd size. Similar study by Girma *et al*. [40] also found that higher proportion of small scale farms (35%) use *Atela*as protein supplement compared to medium scale (21%) farms in and around *Shashamane* town. Similar research output by Azage *et al.* [41], in different parts of Ethiopia also suggest dairy producers in the peri-urban and rural systems across all the production system ranked grazing natural pasture as their first priority followed by crop residues. The finding of the current study also agrees with report of Central statistical Agency [42] which indicates natural grazing method of feeding is supplemented with natural grass hay, crop residues such as straws of cereals and agro-industrial by-products mostly from the flour/oil industries and brewery residues. Dairy producers who keep improved dairy cows also cultivate improved forage crops such as elephant grass, oats, vetch and alfalfa to supplement grazing. There is a

seasonal critical feed shortage in the study area. Majority of the sampled households (84.76%) faced critical feed shortage during dry season from February to May. This was primarily the problem of rural and peri urban production system due to lack of grazing land. On the other hand, 11.43% of respondents complained critical feed shortage during wet season from June to November (Figure 2). This was complained by urban and peri urban smallholder dairy producers. During wet season in urban areas there is shortage and costly price of concentrate feeds on local market. This wet season feed scarcity was the problem of urban and to some extent peri urban dairy producers in Nekemte and the area. This result is in agreement with the result of Diriba *et al.* [13], which indicates seasonality and high feed cost to be one of the most critical challenges for dairy producers in western Oromia. Very small proportion of respondents (3.8%) said that animal feed shortage is always a problem in the area (Figure 5). In southern part of the country [43] found similar result regarding seasonal feed shortage indicating according to the study, feed supply is adequate from September to half of January while, half of January to half of April represented critical feed shortage time. These critical feed shortage problems arise from inadequate and slow introduction, promotion and expansion of improved forage production on these farms and shortage of land to grow forage crops on many farms, especially for the urban dairy producers who do not own land [44].

Major Cattle Diseases and Health Care in the Study Area: The result of focus group discussion with zonal and district livestock experts indicates that animal health and reproductive health disorders were among the factors that hinder dairy development in the area. According to the current survey result, 86.66% of the interviewed farmers and dairy producers have listed the major cattle diseases affecting production and productivity of their animals. These common diseases include: Trypanosomosis, Lumpy Skin Disease (LSD), Black leg, Bovine Pasteurellosis, Anthrax and Foot and Mouth Disease (FMD). A Small proportion of the respondents (13.33%) have listed external parasite (tick), Leech parasite and mastitis as the main health concern for dairy production. Leech parasite was very critical (but ignored) problem especially during dry season when feed and water shortage also a problem (Table 12). This finding was similar with Workneh and Rowlands [45] and Mekonnen *et al.* [35] who identified major cattle diseases of cattle in Oromia regional state including Trypanosomosis, Black leg, Anthrax, Pasteurellosis and FMD. Despite the presence of government and private veterinary clinics and

drug shops at both districts of east Wollega zones animal health care service is still with many problems. Every year, there has been a report of disease outbreaks in different parts of the zone at different times (example: LSD). As it was described by zone animal health staff during focus group discussion, the problem is lack of quality drugs at government clinics and illegal drug distribution in the area.

Milk Production and Utilization: There are two milk production systems in the area (fluid milk and butter system). The result indicates that, majority 68(64.72%) of the respondents consume fresh milk produced at home or process to butter. About 26(24.80%) of the respondents channel the milk produced to public market and 4.8% channel the milk to their own catering services. In the rural district, *Leka Dullacha*, farmers keep cattle mainly for crop production and milk and milk by product is considered as secondary benefit from cattle. The rural milk producers utilize the majority of milk produced for butter production the only marketable milk by- product and very small amount consumed fresh at home (given to HHH and young children). In the urban and peri-urban areas of *Nekemte* town, there is market oriented milk production system where the majority of milk produced is marketable to either through own catering services or informally to the consumer (Figure 3). This finding is in agreement with the report of Diriba *et al* [13] which indicates fluid milk and processed milk products obtained from traditional processing are the main items traded at Bako and Nekemte. By same author, at Nekemte, milk is primarily produced for market purpose and the larger share is channeled through informal market outlets. All respondents at Nekemte indicated that only little fraction of milk produced is retained for family consumption.In general, the high cost of milk found in the market in the study area is a reflection of the high cost of feed supplements used by the majority of dairy farms that are engaged in market-oriented milk production. This is especially true for those farms that maintain crossbreed and grade dairy cattle. The major problem is the lack of high quality forage feeds in dairy farms.

Participatory (Focus Group Discussion): The result of focus group discussion shows that, in East *Wollega* zone, Cattle production is generally mixed crop livestock production system. In the urban and peri urban areas, market oriented smallholder dairy cattle production is another system of cattle production. The discussants listed major constraints of cattle production including feed shortage, lack of knowledge on local breed selection,

unimproved husbandry practices, input scarcity, poor infrastructure, cross breeding problems and informal marketing of milk. Market oriented dairy cattle production is still not well exercised and at emerging stage in the area due to scarcity of inputs. In the rural areas of East Wollega zone cattle production is characterized by keeping local breed with low input low production and aimed for home consumption of milk and traditional processing to sell butter. This result was in agreement with the finding of Asaminew and Eyasu [20], who identified the most important constraints associated with milk production: feed shortage, disease prevalence and poor genetic potential of local cows for milk production, inadequate artificial insemination services and lack of milk collection centers. This result also agrees with the finding of Mekonnen *et al*. [35] in western Oromia that indicates the production system in the study area is mixed crop-livestock production system and constrained by grazing land degradation, shortage of feed, population pressure, diseases and parasite burden and lack of improved bull and inadequate extension service are the main problems that affect the productivity and survival of livestock in the study area. From all constraints of cattle production, animal feed scarcity both in quantity and quality was the main constraint raised by the discussants in East *Wollega* zone. It was said that grazing land is decreasing from time to time due to pressure from crop production and degradation. The major feed resource available in the area are natural grass, crop residue, local grass hay, oil seed cakes, maize grain and improved forages. Beside these resources, there is a critical feed shortage especially during dry season due to lack of appropriate conservation of crop residue, lack of animal feed processing plant in the nearby and more attention was given to crop production.

Livestock diseases are among the major factors that limit cattle owners' benefits as a result of mortality. According to the result of focus group discussion, the major animal diseases prevailing in the zone include: Trypanosomiasis, LSD, bovine Pasterurellosis, Black leg, mastitis, reproductive health disorders, calf diarrhea, FMD, Internal and external parasites. Poor animal health extension system and outbreak surveillance, lack of facilities, poor control of illegal drug market and lack of on job training were described by the discussants as main constraints of disease control and prevention in the area. This finding was similar withWorkneh and Rowlands [45] and Mekonnen *et al*. [35] who identified major cattle diseases of cattle in Oromia regional state including Trypanosomosis, Black leg, Anthrax, Pasteurellosis and FMD.

CONCLUSIONS

In light with this cross-sectional study, two main dairy production systems exist in the study area: market oriented urban and peri urban smallholder dairy and rural mixed crop-livestock production systems. The urban and peri urban production system is characterized by keeping mainly cross bred animals of unknown blood level and constrained by land shortage, feed scarcity, inefficient breeding practice and unimproved milk marketing system. The rural mixed crop livestock production system is characterized by keeping of local cattle primarily for the purpose of crop production and secondary milk production with interrelated constraints like prevalence of diseases, unimproved breeding practice and shortage grazing land especially during dry season. In rural smallholder production system, natural pasture and crop-residues are the major feed resources during wet and dry seasons, respectively. In urban and peri urban production system, grass hay, concentrate feed and non-conventional feed and improved forage are the feed resources with irregular availability. Trypanosomosis, Lumpy skin disease, Black leg; Foot and mouth disease, Anthrax, tick infestation and mastitis were prevalent. The main constraints of livestock production and productivity in the study area are land and feed shortage, livestock disease and parasites, low conception rate to artificial breeding, unimproved husbandry practices and poor livestock extension services. Thus, livestock experts and responsible stakeholders should intervene and discuss with the dairy producers of the districts to minimize the effect of constraints for improvement of milk production in the area

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