

Full Length Research Paper

Study on cattle management and marketing practices in Afar region

Philimon Teshome*, Kidanie Dessalegn, Endeshaw Terefe, Ashebir Kifle, Abebe Tafa, Weldegebrail G. Aregawi, Workinesh Seid and Woldegebriel T. Mariam

Ethiopian Institute of Agricultural Research, Werer Agricultural Research Center, P.O.Box 2003, Addis Ababa, Ethiopia.

Received 29 April 2015; Accepted 5 January 2016

This study attempted to assess cattle management and marketing practices in Afar region. 178 household heads were selected and interviewed from three major cattle producing districts, Aysaita, Chifra and Amibara. With an overall average cattle holding of 17.4 heads per household, cattle were kept by 95.5% of the herd owners mainly for milk production. Livestock sale, land rent and crop sale were the first, second and third major income sources for cattle owners of the study area, with index values of 0.455, 0.287 and 0.209, respectively. The major feed resource for livestock in the study area was natural pasture grazing (97.8%). 72.1% of the respondents used rivers as the main water sources for their cattle. 68.7% of the cattle owners sold male cattle at younger age; and 61.5% of them sold female cattle at older age. Most (70.4%) of the producers responded that middlemen were the major buyers of their cattle in the study districts. Feed shortage, diseases and drought were ranked as first, second and third major cattle production constraints, with an index value of 0.418, 0.193 and 0.178, respectively. 40.8% of the respondents stated dry season as the main season of feed shortage. The major prevalent diseases in the three districts were lumpy skin disease, sudden death and pneumonia that ranked first, second and third, with an index value of 0.323, 0.173 and 0.118, respectively. Cattle breeds and market availability can be considered as important opportunities of cattle production in the region though limiting constraints like feed shortage, diseases and drought are possible challenges.

Key words: Afar region, feed resources, cattle production, constraints, pastoral and agro-pastoral, production system.

INTRODUCTION

Livestock production is an integral part of the Ethiopian agricultural sector. The sub-sector contributes an estimated 12% to total gross domestic product (GDP) and over 45% to agricultural GDP (Ministry of Agriculture (MoA), 2010). On average, the pastoral livestock

population accounts for an estimated 40% of the total livestock population of the country. Livestock play a significant role, directly or indirectly, in achieving food self-sufficiency in the country. Apart from its direct provision of food, it also provides draught power and

*Corresponding author. E-mail: pteshome@yahoo.com.

income to farming communities, as well as means of investment and important source of foreign exchange earning to the nation (Ayele et al., 2003). Of the total household cash income from crop and livestock, livestock account for 37 to 87% in different parts of the country; and the higher the cash income, the higher is the share of livestock, indicating that increased cash income comes primarily from livestock (Ayele et al., 2003). According to Temesgen et al. (2015), the livestock sector in Ethiopia plays a vital role in the overall development of the country's economy. Yet, the existing income generating capacity of livestock as compared to its immense potentials in the country is not encouraging.

In Ethiopia, according to Community-supported agriculture (CSA) (2003), 99.4% of the total cattle populations in the country are local breeds and the remaining are hybrids and exotic breeds that accounted for about 0.5 and 0.1%, respectively. Indigenous cattle are preferred to exotic/introduced ones for their robust environmental adaptive capacity. Subsistence smallholders select particularly female breeding animals for a range of desirable attributes, but some of these attributes are related to behavior and body conformation of the animals, which are not directly related to production functions (Bondoc et al., 1989; Dereje, 2005).

New Partnership for Africa's Development-Comprehensive Africa Agriculture Development Programme (NEPAD-CAADP) (2005) indicated that the lowlands in Ethiopia cover about 60% of the country's land area and are situated below 1500 m.a.s.l. The lowlands are situated in the Eastern, Southern, and Western part of the Central highlands (Afar, Somali, Borena, South Omo, some part of Gambela and Benishangul). According to the same source, the sector is characterized as pastoral and agro-pastoral production systems, where about 20% of cattle, 25% of sheep and 75% of goats of the total national livestock population are found. Ethiopia's lowland breeds of cattle, sheep, goats and camels are highly demanded by neighboring countries as well as the strategic livestock markets of the Middle East (Addis and Dida, 2015; Belachew and Jemberu, 2003). According to the same authors, the relatively huge number of livestock resources, proximity to the export markets, conducive investment policies, the liberalization of the economy, the supports and attentions given by the government to export trade gives the country comparative advantages in livestock trade.

Afar region is one of the four major pastoral regions in Ethiopia, located in north eastern part of the country. The region is divided into five administrative zones, which are further subdivided into 29 districts. The region is predominantly pastoral area, with 90% of the inhabitants depending on subsistence livestock production. Livestock production in the region depends on rainfed natural pasture whose productivity is declining as a result of recurrent drought, land degradation, encroachment of agriculture, conflict and invasion of weeds. The feed

produced following the main rain season will last only two to three months and pastoralists are forced to migrate early (Joanne et al., 2005).

On the other hand some indicators justifies the potential of the region for livestock production; diversified genetic resources of animals adaptable to the harsh environmental condition, high interest of people towards livestock production, vast areas of rangelands and proximity of the area to export routes. However, there is limited information and understanding about cattle management and marketing practices of the region. In order to take advantage of the potential of the region for livestock production, and enhance the attempt in the improvement of beef and/or milk production, there should be clear and sufficient base line information about cattle production as well as underlying socio-economic characteristics of the region. Therefore, this study was conducted with the following objectives:

- To assess socio-economic characteristics of cattle producers in Afar region.
- To study existing cattle management and cattle marketing practices in the region.
- To identify major opportunities and challenges of cattle production in the region.

MATERIALS AND METHODS

Description of the study area

Afar is one of the nine regional states situated in the north-eastern part of Ethiopia. The altitude of the region ranges from 1500 m.a.s.l. in the western highlands to -120 m.a.s.l. in the Danakil/Dallol depression. It has an estimated population of 1.2 million, of which, 90% are pastoralists (56% male and 44% female) and 10% are agro-pastoralists. The livestock population is estimated to be about 4 million (Joanne et al., 2005). The region is characterized by arid and semi-arid climate with low and erratic rainfall. Temperatures vary from 20°C in higher elevations to 48°C in lower elevations. Rainfall is bi-modal throughout the region with a mean annual rainfall below 500 mm in the semi-arid western escarpments decreasing to 150 mm in the arid zones to the east (Joanne et al., 2005). Afar is increasingly drought prone. The region receives three rainy seasons. The main rain, *karma* accounts for 60% of annual rainfall and is from mid-June to mid-September. This is followed by rainy showers in mid-December called *dadaa* and a minor rainy season during March-April called *sugum*.

Methods of sampling and data collection

Both primary and secondary data were collected. Based on cattle resources and accessibility, three major cattle producing districts as well as three representative peasant associations (PA's) were purposively selected. Information about the socio economic characteristics of the area as well as cattle management and marketing practices were collected from individual interviews and focused group discussions. A total of 178 households were interviewed by using semi-structured questionnaires. Social and resource mapping of the study districts, personal observations at the time of visits and pre-testing of questionnaire were also conducted before actual data collection.

Table 1. Average age, sex and educational status of household head of the study districts.

Item	Aysaita	Chifra	Amibara	Overall	SE	P-value
HHH age	37.08	39.26	40.62	38.97	0.91	ns
No of male	2.70 ^b	3.07 ^b	3.93 ^a	3.23	0.16	**
No of female	2.44 ^b	3.00 ^{ab}	3.53 ^a	2.99	0.16	*
Male illiterates	0.18 ^b	1.62 ^a	1.95 ^a	1.24	0.12	***
Male basic education	--	--	0.02	0.01	0.01	ns
Male religious education	0.03	--	0.02	0.02	0.01	ns
Male primary education	0.33 ^b	1.15 ^a	0.88 ^a	0.78	0.08	***
Male secondary education	0.02 ^b	0.33 ^a	0.40 ^a	0.25	0.05	**
Female illiterates	1.61 ^b	1.69 ^b	2.60 ^a	1.97	0.15	**
Female basic education	1.09 ^a	--	0.03 ^b	0.39	0.08	***
Female religious education	0.11	--	--	0.04	0.03	ns
Female primary education	0.66 ^b	1.28 ^a	0.35 ^b	0.75	0.07	***
Female secondary education	0.39	0.11	0.13	0.21	0.06	ns

^{a, b} Means on the same row with different superscripts are significantly different ($p < 0.05$). SE = Standard error; HHH = Household head; ns= Not significant; * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$; -- = Zero value.

Data analysis

Data collected were analyzed using SPSS (SPSS, 2007). One way analysis of variance was carried out to test statistical variations among selected class variables (Districts, Sexes, Production systems). For class variables, means were separated using the Duncan multiple range test (DMRT). Indices were calculated for parameters that required ranking, which includes major feed type, major constraints in cattle production, and economically important cattle disease in the different districts. The indices were calculated with the following formula:

Index = Sum of (3 × number of household ranked first + 2 × number of household ranked second + 1 × number of household ranked third) given for an individual reason, criteria or preference divided by the sum of (3 × number of household ranked first + 2 × number of household ranked second + 1 × number of household ranked third) for overall reasons, criteria or preferences (Mula et al., 2006).

RESULTS AND DISCUSSION

Socio-economic characteristics of the study area

Household characteristics

The overall average age of the household heads was 39 years old, and ranged from 18 to 80 years (Table 1). This age was lower than 46.2 years old reported for cattle producers in North Gondar (Azage, 2009) and that of 44.3 years old reported for Fogera district (Belete, 2006). This result shows that young household heads are more common in lowland areas than the case in the highlands. As common to most pastoral areas in the country, the total number of persons in a household was big in the current study area. The average number of males and females in a household differed from district to district, though the male to female ratio was nearly equal. This

study also revealed that the level of literacy was generally low in the area. The overall average number of illiterate male and female was 1.24 and 1.97 person per household, respectively.

Income sources of households

The list of major income sources in the study districts are presented in Table 2. Accordingly, livestock sale took the first rank while land rent and crop sale were the second and third major income sources, respectively. Employment and trade were other income sources of the households though to a smaller extent. The index value for crop sale which was 0.209 shows that there are pastoralists/agro-pastoralists that also produce crop but it does not indicate the amount of its economical contribution to the household to call them “agro-pastoral” boldly. Daniel (2008) reported that the major (49.3%) sources of income for pastoral households in Borena are livestock and crop production.

Land and livestock holding

The average land holding in the three districts was 2.07 ha per household (Table 3). The current result is smaller than the average land holding of 5.28 ha per household in Metema district (Tesfaye, 2008). This could be due to communal (clan or sub clan based) ownership of most of the grazing and browsing lands of each district. The overall average cattle holding per household heads was 17.35 heads (Table 3). This value was much greater ($p < 0.05$) than the 8.7 heads per household reported for the North Gondar area (Azage, 2009) and 8.01 heads per household reported for the Mekelle area (Nigussie,

Table 2. Ranking of major income sources in the three study districts.

Item	Aysaita (mean index)	Chifra (mean index)	Amibara (mean index)	Overall
Livestock sale	0.429	0.459	0.478	0.455
Crop sale	0.368	0.219	0.039	0.209
Employment	0.050	0.014	0.055	0.040
Trade	0.000	0.000	0.009	0.003
Land rent	0.148	0.308	0.408	0.287
Others	0.005	0.000	0.011	0.006
Total	1.000	1.000	1.000	1.000

Table 3. Average land holding and livestock holding of respondents in the three districts.

Item	Aysaita	Chifra	Amibara	Overall	SE	P-value
Total land holding (ha)	2.11	1.98	2.50	2.07	0.25	ns
Cattle (n)	12.98 ^b	9.86 ^b	29.02 ^a	17.35	1.81	***
Sheep (n)	8.26	15.83	12.17	12.02	1.28	ns
Goat (n)	10.09 ^b	14.59 ^b	22.05 ^a	15.56	1.05	***
Horse (n)	0.06	--	--	0.02	0.02	ns
Donkey (n)	0.02 ^b	0.16 ^a	1.08 ^a	0.74	0.09	***
Camel(n)	1.07 ^b	3.71 ^b	13.12 ^a	5.96	1.04	***

^{a, b} means on the same row with different superscripts are significantly different ($p < 0.05$). SE = Standard error; ns= Not significant; *** $p < 0.001$; -- = zero value.

2006). However, the current finding was comparable to that of Tesfaye (2008) who reported an average cattle holding of 15.53 heads per household in Metema district. Cattle holding per household were significantly ($p < 0.05$) higher in Amibara (29.02) than that of Aysaita (12.98) and Chifra (9.86) districts. Regarding the composition of other herds in the three districts, the overall average number of sheep, goat, camel, donkey and horse were 12.02, 15.56, 5.96, 0.74 and 0.02 heads per household, respectively.

Livestock and crop production systems

In the present study, it was observed that both production systems existed in the districts. However, the extent of involvement of respondents in these two systems is variable among the districts. As presented in Figure 1, overall, 53% of the respondents were engaged in livestock production, while the remaining 47% were engaged in both livestock and crop production. There was no data in this study that indicate the magnitude of the economic contribution of these two productions to the household. As a result, it is difficult to judge that the 46.6% respondents that produce both livestock and crop are engaged in agro pastoral production system. A study by Mohammed and Abule (2015) indicated that crop production was practiced by agro-pastoralists in upper

altitudes of Chifra district, using irrigation water.

As prioritized by the respondents, maize, tomato and onion were the first, second and third major crops grown in the study districts. It was also noted that sesame, sorghum and cotton are also other crops grown in these districts, as mentioned by few of the respondents in the current study area.

Cattle management practices in the study area

Purpose of rearing cattle

The majority (95%) of the respondents reared cattle to produce milk for household consumption (Figure 2). However, very few of them mentioned 'market sale' (2.3% of the cases) and 'social security' (2.2% of the cases) as their major reason for cattle rearing.

Family labour for cattle production

In all the study districts, it was found that most of the field works were taken by the husband and boys, while the homestead works were left for wives and girls. As reported by 87.7% of the respondents, responsibility of selling and purchasing of cattle were handled by the

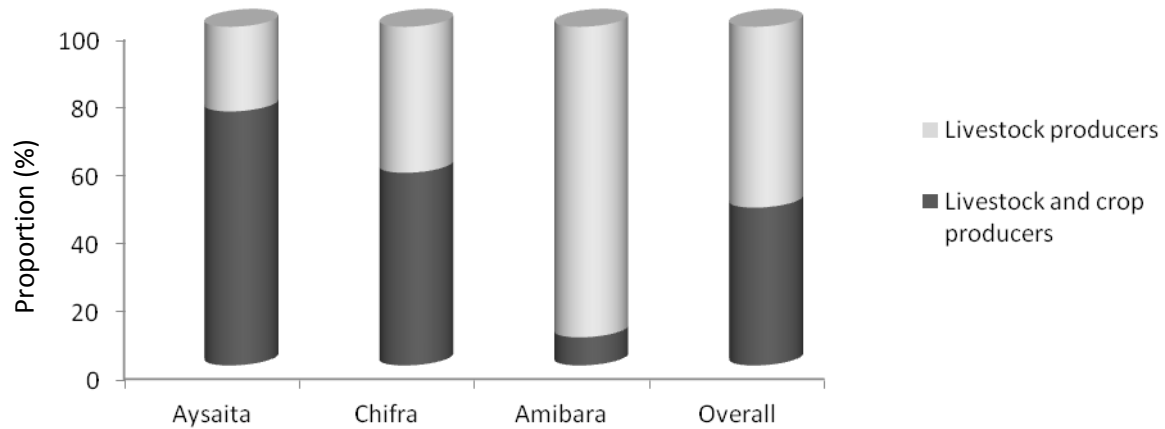


Figure 1. Proportion (%) of respondents to the main production systems they practice in the study area

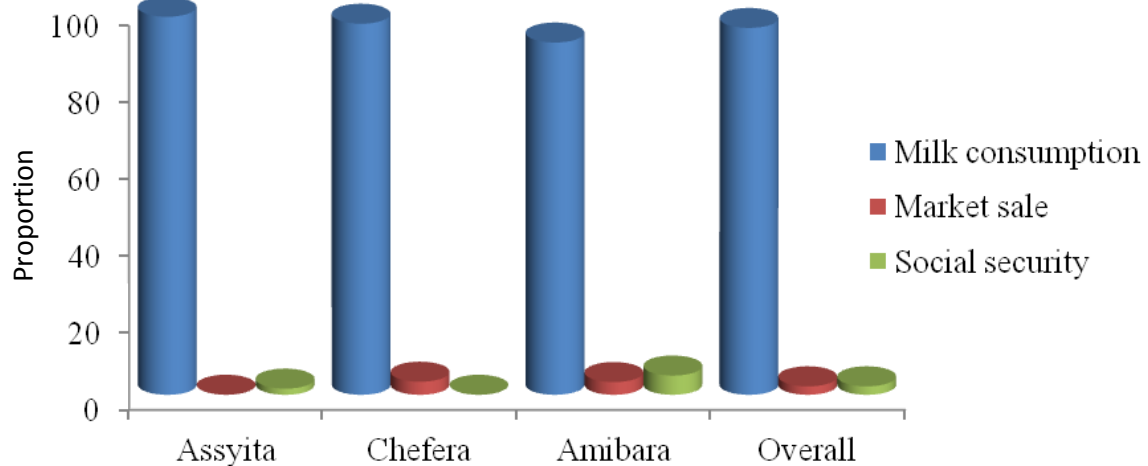


Figure 2. Proportion of respondents to major reason for cattle rearing in the study districts.

husband. Most of them (79.9%) also agreed that herding could be carried out by both husband and boys. On the other hand, activities such as cattle barn cleaning, taking care of calves, milking (except camels), milk processing and marketing were handled by wives and girls. According to CSA (2003), family workers constitute the highest proportion (56%) of the population in agricultural households who were engaged in agricultural activities at country level. In addition, about 38% of the working population was personal account workers working in their farms alone or with the help of family members, but without hiring labor.

Cattle feeding and housing practices

The major feed resource for cattle in the study areas was contributed by natural pasture. Almost all (97.8%) of the

respondents indicated that they allowed their cattle to continuously graze on communal pasturelands, though the availability and quality of feed greatly varied from season to season. In Assayita district, very few respondents began cultivation of improved forages in their backyards and thus attempted 'cut and carry' feeding practices (Table 4). This study also revealed that many of the respondents (67.6%) constructed barn for their cattle and other livestock, while the remaining (32.4%) of them gathered their animals in their homestead without fence (Table 4). This could be due to the practice of keeping large herds together, though each herd belonged to distinct households.

Drinking water sources

In the study districts, rivers, springs, tap water, ponds and

Table 4. Cattle feeding, forage cultivation and cattle housing practices in the study districts.

Item	Proportion of respondents (%)			
	Aysaita (n=60)	Chifra (n=58)	Amibara (n=60)	Overall (n=178)
Feeding practices				
Continuous grazing	93.4	100.0	100.0	97.8
Continuous and zero grazing	6.6	--	--	2.2
Forage cultivation practices				
Yes	18.0	10.3	1.7	10.1
No	82.0	89.7	98.3	89.9
Cattle housing practices				
Fenced barn	85.2	56.9	60.0	67.6
Unfenced barn	14.8	43.1	40.0	32.4

Table 5. Sources of water for livestock in the study districts.

Item	Proportion of respondents (%)			
	Aysaita (n=60)	Chifra (n=58)	Amibara (n=60)	Overall (n=178)
Rivers	95.2	41.4	78.3	72.1
Springs	--	--	10	3.3
Tap water	--	--	6.7	2.1
Rivers and wells	1.6	--	--	0.6
Multiple responses	3.2	58.6	5	21.9

Multiple responses: rivers, springs, tap water, ponds and wells; -- = not available.

wells were mentioned as important water sources of the study areas (Table 5). Most (72.1%) of the respondents mentioned rivers as the major sources of water for their animals, but other water sources were not sufficiently available throughout the year. When rivers dry up and critical water shortage occur, especially during dry season, few cattle producers use tap water and wells, while most others are forced to go too far watering areas as a coping strategy. However, these strategies were not consistent among the respondents of the three districts. This indicates a lack of commonly agreed utilization practices of water resources in the region (Table 5). According to Coppock (1994), the Borana mostly use ponds during the rainy season and wells during the dry season to avail water for human and livestock.

Cattle breeding techniques

Two types of mating systems, referred as controlled and uncontrolled natural mating systems, were practiced in the study districts. Accordingly, most of the herders (60.9%) used uncontrolled natural mating system while the rest (39.1%) used natural controlled mating system

(Table 6). Even though the proportion of respondents to the type of mating system they use for cattle breeding was variable among districts (Table 6), it is imperative to note that the natural controlled mating system is also recognized in the study areas. It is also clear that the degree of applicability of this system is prone to several factors including the commitment of herders, herd size and availability of desired bull. Traditionally, pastoralists cull inferior bulls and less productive cows regardless of the mating system they followed in cattle breeding. Most of the producers (59.3%) used their own bull for breeding purpose, some (17.3%) of them used neighbors' bull and the rest (23.5%) relied on any of the alternatives (their own, neighbors' and/or communal bulls). This could be also one of the reasons why both mating systems prevailed in the study districts.

The breeding season of cattle was also assessed in the three study districts. About 37 and 27% of the respondents revealed that calving usually took place during *kerema* (main rainy season) and *sugume* (short rainy season), respectively. However, 17% of the respondents mentioned that calving could occur during *giral* (dry season). This could be due to the difference in management of cattle (especially feeding and

Table 6. Matting systems and source of bull used for cattle breeding in the three study districts.

Item	Proportion of respondents (%)			Overall (n=178)
	Aysaita (n=60)	Chifra (n=58)	Amibara (n=60)	
Matting systems				
Natural controlled	18.0	56.9	43.3	39.1
Natural uncontrolled	82.0	43.1	56.7	60.9
Source of bull				
Own bull	57.5	62.0	58.3	59.3
Neighbor	18.0	24.2	10.0	17.3
Multiple responses ¹	24.5	13.8	31.7	23.4

¹Multiple responses: own, neighbor and communal bull.

Table 7. Reproductive traits of Afar cattle as reported by herders of the study districts

Item	Average age				SE	P-value
	Aysaita	Chifra	Amibara	Overall		
Age at first service (yrs)	2.96	3.16	3.34	3.15	0.06	Ns
Age at first mating (yrs)	3.41	3.53	3.64	3.51	0.07	Ns
Age at first calving (yrs)	3.79 ^b	4.17 ^a	4.32 ^a	4.09	0.06	**
Reproductive lifetime of bulls (yrs)	7.28 ^b	10.74 ^a	11.38 ^a	9.75	0.38	***
Culling age of breeding bull (yrs)	8.45 ^b	12.18 ^a	12.67 ^a	11.01	0.43	***
Culling age of breeding cow (yrs)	10.72 ^b	13.50 ^a	14.95 ^a	12.99	0.34	***
Reproductive lifetime of cows (yrs)	10.79 ^b	13.34 ^a	13.55 ^a	12.66	0.31	***
Calving interval (months)	13.36	14.98	14.00	14.11	0.36	Ns

^{a, b} Means on the same row with different superscripts are significantly different ($p < 0.05$). SE = Standard Error; ns= Not significant; *** $p < 0.001$; yrs = Years

watering) or extent of controlled mating among the districts.

The reproductive performance of Afar cattle

Under normal condition, calves reach the age of first sexual maturity at about 3.5 years, and the average reproductive lifetime of cows mentioned was 12.7 years (Table 7). Some of the reproductive traits of cattle in Aysaita district varied from that of Chifra and Amibara. This could be due to better feed and management conditions in Aysaita. Cattle in this district might be also from a different ecotype, as they appeared visually different from the rest in the region. Similarly, ecotype variation of cattle breeds was reported in South Africa (Sanarana et al., 2015).

Cattle marketing practices in Afar region

Live cattle marketing

During focus group discussion, several market places were mentioned as possible destinations for cattle

marketing by the respondents. The prominent were Dulecha, Awash, Werer, Chifra and Aysaita town markets. On the contrary, it was noted in this study that cattle were marketed by most (96.6%) of the respondents for several reasons. The possible reasons mentioned by them were to earn additional income, to replace old stock, to buy school materials for their children and/or to cover medication costs. They also discussed that cattle marketing was preferred at the closest market places for each district. Unfortunately, market places were farther than 20 km from settlement areas of pastoralists of Amibara and Chifra districts that favored middlemen to be the dominant actors of the market due to their capacity to easily access vehicles for transportation to settlement areas as well as market places.

Cattle could be sold at different ages and sexes in all of the study districts (Table 8). However, the majority (68.7%) of cattle owners preferred selling male cattle at younger age, while the remaining preferred selling their male cattle at different age. Most (61.5%) of them also preferred selling female cattle at old age. In both cases, the remaining respondents justified the reasons why male or female cattle could be sold at different age. They mentioned that health conditions, feed availability, production history of the cattle and immediate cash

Table 8. Proportion (%) of respondents for preferred age of male and female cattle to be sold.

Item	Aysaita (n=60)		Chifra (n=58)		Amibara (n=60)		Overall (n=178)	
	M	F	M	F	M	F	M	F
Immature	23.0	1.6	--	--	--	--	7.8	0.6
Young	45.8	6.6	81	13.8	80	20	68.7	13.4
Old	11.5	45.9	5.3	75.9	8.4	63.3	8.4	61.3
All	11.5	--	3.4	--	--	1.6	5	0.6
Immature and young	4.9	6.6	6.9	1.7	8.3	--	6.7	2.8
Immature and old	3.3	37.7	3.4	6.9	3.3	11.7	3.4	19.0
Not fertile (infertile)	--	1.6	--	1.7	--	3.4	--	2.3

--= The proportion is zero; M= male cattle; F= female cattle.

requirement by the producer were the possible reasons in this regard.

Dairy products marketing

Selling of milk and milk products is practiced by most (70.9%) of the respondents for similar reasons as that of the reasons for selling live cattle. On the other hand, few (29.1%) of them insisted that cattle products are meant for household consumption only, unless surplus production is obtained. During periods of surplus milk production, many (64%) of the respondents sell butter than milk and other milk products.

Opportunities and challenges of cattle production in Afar region

The opportunities and challenges of cattle production in the region are extracted and discussed here based on the results discussed and other supportive literatures. This implies that specific data were not collected for examining the opportunities and challenges of cattle production in the study area due to the dynamic and complex nature of pastoral production system. Thus, this study addresses only the most common and agreeable issues that were mentioned, discussed and/or observed by cattle producers, important stakeholders and researchers during the study period.

Opportunities of cattle production in the region

Availability of resources for production: It is clear that land, labour and capital are the major resources required for the production of most agricultural commodities. As discussed earlier, landholdings are generally higher in pastoral areas. Likewise, the three study districts have large area of grazing lands and many browsing plants, which has supported extensive cattle production to date. Availability of rivers and extensive irrigable lands are also

added opportunities in the area. In this regard, intensive beef or dairy production can be envisaged in Amibara and Aysaita districts. Pastoralism is the major production system in the region, where native inhabitants have long years of experiences in livestock production; and most members of a household are directly or indirectly involved in livestock activities. The region is advantageous in exploiting inter regional labour flow due to its geographical position in the country. As a policy strategy in the improvement of national economy, the government has created possibilities of obtaining loans and credits at different investment scales.

Afar cattle breeds as genetic source for livestock production in the region: Cattle herd sizes are generally large in pastoral areas (Asfaw et al., 2011). Similarly, larger livestock holdings per households were recorded in the study districts as compared to some areas in the country (Table 3). Traditionally, Afar pastoralists cull inferior animals and try to maintain the good ones. In most pastoral areas of the country, cattle are primarily reared for milk production (International Livestock Research Institute (ILRI), 2010), and similar practice was understood in this study. This may serve as genetic reserve of the breed in the region.

Market opportunity due to increased demand for beef consumption: Livestock has been continuously marketed between different regions of the country (Asfaw et al., 2011) due to the increased demand for meat consumption. Increasing trend of cattle off-take was recognized by pastoralists of the study area through intra and inter-regional market outlets. Increased demand for beef in the Middle East countries was reported by Daniel (2008), which can be considered as added opportunity.

Recent pastoral resettlement program: It was observed during the survey work that pastoralists began to settle and produce crops besides livestock production. This could be taken as an opportunity for the establishment of intensive livestock production for increased milk or meat production in these areas.

Table 9. Constraints of cattle production in the three study districts.

Item	Index values			
	Aysaita	Chifra	Amibara	Overall
Flood	0.046	0.005	0.000	0.018
Robbery	0.000	0.000	0.095	0.032
Conflict	0.000	0.000	0.069	0.023
Drought	0.071	0.235	0.231	0.178
Diseases	0.197	0.241	0.142	0.193
Predator	0.000	0.012	0.019	0.010
Feed shortage	0.566	0.426	0.259	0.418
Bush encroachment	0.035	0.023	0.022	0.027
Water shortage	0.057	0.052	0.151	0.087
Market problem	0.000	0.006	0.006	0.004
Vet. Services	0.028	0.000	0.006	0.011
Total	1.000	1.000	1.000	1.000

Table 10. Ranking of economically important cattle disease by pastoralists of the study districts.

Parameter	Index value			
	Aysaita	Chifra	Amibara	Overall
<i>Guduf</i>	0.781	0.051	0.119	0.323
<i>Gubulo</i>	0.054	0.242	0.053	0.115
<i>Migeda</i>	0.000	0.095	0.124	0.073
<i>Asdaho</i>	0.000	0.000	0.017	0.006
<i>Kida</i>	0.006	0.043	0.002	0.018
<i>Andero</i>	0.049	0.002	0.000	0.017
<i>Agara</i>	0.008	0.000	0.016	0.008
<i>Noke</i>	0.000	0.052	0.017	0.023
<i>Mesengeli</i>	0.022	0.037	0.294	0.118
<i>Abeb</i>	0.005	0.052	0.047	0.034
<i>Kilime</i>	0.019	0.000	0.116	0.045
<i>Kirbi</i>	0.052	0.003	0.086	0.047
<i>Fira</i>	0.003	0.422	0.105	0.173
Total	1.000	1.000	1.000	1.000

Challenges of cattle production in the region

Drought and critical periods of feed shortage: As reported by Joanne (2005), drought has been recorded in Afar region since 1988 and was recurring within an average of 10 years interval. However, pastoralists agreed during group discussion that drought occurred almost every year and the number of households being affected increased yearly since the last few decades. Feed and water shortage, drought, diseases, encroachment of bush to grazing lands, predator, robbery, conflict, flood, shortage of veterinary services and market problem were also mentioned as major constraints of cattle production in the region (Table 9).

Pastoralists recognized different seasons of feed shortage in the region, though variable responses were given for critical periods. In this regard, some (40.8%) of them prioritized *hagay* (hot dry season), and some others (20.1%) prioritized *gjal* (dry season), while the remaining (31.3%) mentioned both *gjal* and *hagay* as the seasons with worst conditions.

Cattle diseases problems: Cattle producers listed a number of economically important cattle diseases in the three districts, and ranked them according to their importance (Table 10). In overall, *Guduf* (lumpy skin disease), *Fira* (Anthrax) and *Mesengeli* (pneumonia due to pastuerollis) with an index value of 0.323, 0.173 and

0.118 were ranked as first, second and third major prevalent diseases, respectively. Accordingly, the result indicated that *Guduf* was the first prevalent diseases in Aysaita district with an index value of 0.781, though it was the third prevalent diseases in Chifra and Amibara districts with index values of 0.051 and 0.119, respectively. *Fira*, *Gubulo* (Contagious Bovine Pleuro Pneumonia) and *Migeda* (anthrax/Sudden death) with an index values of 0.422, 0.242 and 0.095 were ranked as first, second and third major prevalent diseases in Chifra district, respectively. Furthermore, *Asdaho* (Baberiosis), *kida* (unidentified), *andero* (Trypanosomiasis), *agara* (Mange mites), *noke* (paralysis/Tetanus), *abeb* (foot and mouth disease), *kilime* (tick infestation) and *kirbi* (Fasciolosis) were other diseases mentioned by the respondents.

Most of the respondents relied on government veterinary services, though the services were not sufficient and sustainable. The drugs supplied by the district agricultural bureau to the local clinics were not enough, especially during the occurrence of disease outbreak. As a result, pastoralists of the study area bought drugs from private veterinary drug suppliers with expensive prices. Sometimes, drugs purchased from the local market were poor in quality or totally expired, as discussed by the group.

Conclusion

As common to most pastoral areas of Ethiopia, grazing was the major feeding system practiced by these communities. River is the main source of water supply for animals in these areas. Most of the producers followed uncontrolled natural mating system. Most cattle producers sold their cattle to earn additional income, to replace old stock and/or to buy school materials for their children. Market areas were generally far in all of the study districts. Cattle were sold depending on their age and sex. Most respondents sold male cattle at younger age and female cattle at old age. In this study, lumpy skin disease, sudden death and pneumonia were mentioned as major cattle diseases in the area.

The constraints of cattle production system of sample households in the study area were feed shortage, water shortage, drought, diseases, encroachment of grazing land by bush/weed, predator, theft, conflict, flood, shortage of veterinary services and market problems. This study revealed that resources, cattle breeds and market availability can be considered as important opportunities of cattle production in the region though limiting constraints like feed shortage, diseases and drought are possible challenges.

Considering the huge cattle potential of the region; milk and meat production capacity of Afar cattle breed need to be scientifically studied to know the genetic potential and further improvement of the breed, technologies in feeds

and nutrition need to be generated to make better use of male cattle obtained from continuous culling process. The promotion and scaling up of proved forage production should be encouraged to solve the problem of seasonal feed shortage in the area. Training and extension advices should be regularly given to producers in the management and marketing of cattle to gain better from the resources. Cattle diseases should be well studied in depth to devise their control and prevention strategies in the region. There is the need to develop strategies by the government for the establishment of intensive cattle production in the region, either for domestic consumption or foreign market competition.

Conflict of interest

The authors have not declared any conflict of interest

REFERENCES

- Addis BA, Dida KG (2015). Review on factors affecting livestock market price in lowland area of Ethiopia. *Adv. Life Sci. Technol.* 37: ISSN 2224-7181.
- Asfaw N, Shahidur R, Berhanu G (2011). Livestock production and marketing: Ethiopia Strategy Support Program II (ESSP II), Working Paper 26. Development Strategy and Governance Division. International Food Policy Research Institute, Ethiopia.
- Ayele S, Assegid W, Belachew H, Jabbar MA, Ahmed MM (2003). Livestock marketing in Ethiopia. A review of structure, performance and development initiatives. Socio-economics and Policy Research Working Paper 52. ILRI (International Livestock Research Institute), Nairobi, Kenya. P 35.
- Azage T (2009). Transhumance cattle production system in north Gondar Amhara region, Ethiopia. International Livestock Research Institute (ILRI), Addis Ababa, Ethiopia.
- Belachew H, Jemberu E (2003). Challenges and opportunities of livestock marketing in Ethiopia. Proceeding of the 10th annual conference of the Ethiopian Society of Animal Production (ESAP), on challenges and opportunities of livestock marketing in Ethiopia, held on August 22-24, 2002 in Addis Ababa, Ethiopia. pp. 1-13.
- Belete AT (2006). Studies on cattle milk and meat production in Fogera woreda: Production systems, constraints and opportunities for development. MSc thesis. Hawassa University, Hawassa, Ethiopia.
- Bondoc OL, Smith C, Gibson JP (1989). A review of the breeding strategies for improvement of dairy cattle in developing countries. *Anim. Breed. Abstr.* 57:819.
- Central Statistics Agency (CSA) (2003). Statistics report on land utilization. Agricultural sample survey, Volume IV. CSA, Addis Ababa, Ethiopia.
- Coppock DL (1994). The Borena plateau of southern Ethiopia: Synthesis of pastoral research, development and change, 1980-91. ILCA (International Livestock Centre for Africa), Addis Ababa, Ethiopia.
- Daniel T (2008). Beef cattle production system and opportunities for market orientation in Borena Zone, Southern Ethiopia. MSc thesis. Haramaya College of Agriculture, School of Graduate Studies, Haramaya University, Haramaya, Ethiopia.
- Dereje T (2005). On-farm phenotypic characterization of cattle genetic resources and their production systems in south and north Wello zones of Amhara region, Ethiopia. MSc Thesis. Alemaya University, Ethiopia.
- International Livestock Research Institute (ILRI) (2010). Diagnostic study of live cattle and beef production and marketing: Constraints and opportunities for enhancing the system. (Unpublished). ILRI, Addis Ababa, Ethiopia.

- Joanne P, Asnake A, Kassaye H (2005). Livelihood emergency assessment in Afar region, OXFAM International. Addis Ababa, Ethiopia. P 44.
- MoA (2010). Ethiopia's Agricultural Sector Policy and Investment Framework (PIF) 2010 -2020 (Draft Report). Addis Ababa: Ministry of Agriculture and Rural Development.
- Mohammed A, Abule E (2015). Assessment of pastoral perceptions towards range and livestock management practices in Chifra district of Afar regional state, Ethiopia. *J. Food Sci. Technol.* 6(4):118-130.
- Mula J, Poler R, Garcia JP, Lario FC (2006b). Models for production planning under uncertainty: A Review. *Int. J. Prod. Econ.* 103:271-285.
- New Partnership for Africa's Development–Comprehensive Africa Agriculture Development Programme (NEPAD–CAADP) (2005). Ethiopia: Investment project profile 'Live Animal and Meat Export'-Preliminary options outline. P 3.
- Nigussie G (2006). Characterization and evaluation of urban dairy production system of Mekele city, Tigray Region, Ethiopia. MSc thesis. Hawassa University, Hawassa, Ethiopia.
- Sanarana Y, Visser C, Bosman L, Nephawe K, Maiwashe A, van Marle-Köster E (2015). Genetic diversity in South African Nguni cattle ecotypes based on microsatellite markers. *Trop. Anim. Health Prod.* 48(2):379-385.
- Statistical Procedures for Social Sciences (SPSS) (2007). (SPSS Version 16) INC. Chicago, Illinois, USA.
- Temesgen G, Aleme A, Mulata H (2015). Climate change and livestock production in Ethiopia. *Academia J. Environ. Sci.* 2(4):059-062.
- Tesfaye MD (2008). Characterization of cattle milk and meat production, processing and marketing system in Metema district. MSc thesis. Hawassa College of Agriculture, School of Graduate Studies, Hawassa University, Hawassa, Ethiopia.