Vol. 9(9), pp. 238-245, September 2018
DOI: 10.5897/IJLP2018.0494
Article Number: 52467D458132
ISSN: 2141-2448

http://www.academicjournals.org/IJLP

ACADEMIC JOURNALS
expand your knowledge

International Journal of Livestock Production

Full Length Research Paper

Livestock production system characterization in Arsi Zone, Ethiopia

Tamrat Gebiso

Oromia Agricultural Research Institute, Asella Agricultural Engineering Research Center, Ethiopia.

Received 28 May, 2018; Accepted 3 July, 2018

Despite its vital role in the country's economic activities, livestock sector was considered as poor investment for development in Ethiopia. But currently, it is being given due attention in government policy planning, especially in the last two growth and transformation plans. Arsi zone is known for its own cattle breed known as "Arsi breed" (one of the six local breeds of the country) and has huge livestock population. However, the production system and constraints have not been studied. Therefore, this research was initiated to characterize the production system and prioritize associated production constraints in Arsi zone. In general, the livestock production constraints were studied to be identified and prioritized in order of their importance in each farming system. Overall constraints were categorized into five clusters as feed related constraints, health related constraints, breed related constraints and financial and human power related constraints. Therefore, to solve these constraints, establishment of feed development research program in nearby center (most likely in Asella Agricultural Engineering Research Center) and strong extension system to promote improved forages, better health care and use of improved breeds are suggested as a solution. Provision of credit system in order to enable farmers use all the services like purchase of initial livestock, concentrates and the like must be given due attention.

Key words: Livestock, Arsi zone, production system characterization, Arsi breeds, production constraints.

INTRODUCTION

Livestock plays a vital role in Ethiopian economy by contributing food, input for agricultural production (manure to manage soil fertility, draught power, transportation, threshing, etc), fuel source, raw material for industry, cash, employment for more than one-third of rural population and social functions (Solomon et al., 2003). According to MEDC (1998), AAPBMDA (1999) and CSA (2011), the livestock sub-sector contributes about 12 to 16% of total GDP and 30 to 35 agricultural GDP. Due to some structural changes in economic sector of Ethiopia, the share of livestock sector in national GDP is decreasing. For instance, the share of the sector in 2005 was estimated to about 14% of overall GDP (Gelan et al., 2012).

Nevertheless, livestock production was considered as a poor investment for development in the last years in Ethiopia. However, in few recent years, livestock issues are beginning to be raised on Ethiopia's development

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

agenda and livestock sector development was given great attention in Growth and Transformation Plan (GTP). This sector is expected to be promoted through expansion of fattening and milk production through breed improvement as well as pasture development and animal health (MOFED, 2010). The Ethiopia's ten years policy and investment road map (2010/11 to 2019/20) shows that agriculture is dominated by cereals (32% of agricultural GDP) and livestock (32%) while export crops and other agriculture accounts for 17 and 18%, respectively (MoARD, 2010).

Having about 53.4 million of cattle population (CSA, 2011), Ethiopia is reported to be endowed with largest livestock population in Africa. Out of this, more than 99% is indigenous breeds which have by-far low productivity in all aspects and only 1% of 30,000 are dairy cows. This proportion of cross breed is by far low as compared to neighboring countries like Kenya which is 3 million crossbreds (Tegegne and Hoekstra, 2011).

According to CSA (2015), Arsi zone is one of nationally and regionally known zones in terms of livestock population. However, the production system characterization and associated production constraints of livestock sub-sector was not yet studied. Therefore, in general, this research work tried to characterize the production systems, and related production bottlenecks of livestock sector in Arsi zone by taking samples from seven representative districts.

METHODOLOGY

Description of the study areas

The research was conducted in Arsi zone. Arsi was purposively selected since it is the main station of Asella Agricultural Engineering Research Center and most of the center's interventions were in this zone. Moreover, similar research works were undertaken by other research centers in the region in the rest zones of the Oromia regional state.

Arsi Zone is found in the central part of the Oromiya National Regional State. The zone astronomically lies between 6° 45' N to 8° 58'N and 38° 32 E to 40° 50' E. It shares borderlines with west Arsi, Bale, west/Hararghe and east Shewa zones. It has 25 administrative districts including one especial district. Asela is the capital town of the zone. It is located at 175 km from Addis Ababa on Addis Ababa-Adama-Bale Robe main road (BOFED, 2011).

As it is shown in table 1a and 1b, because of its great diversity in altitude, Arsi zone has great physiographic diverse also. Based on the altitude, there are four major identified physiographic divisions. The first one is the cool agro-climatic zone with altitude of above 3500 masl, which covers the highest altitudes areas of the zone and constitutes about 2.74% of the total area of the zone. The second one is the cool temperate agro-climatic zone that includes the mountain ranges, massifs and high plateaus of Arsi (2500 to 3500 m) that lies in the central part of the zone, stretching from the border of NNPSE (Nations, Nationalities and People of Southern Ethiopia) to Aseko district and belongs to the Arsi-Bale Massifs. It covers about 22.74% of the total area of the zone. The third is the warm temperate agro-climatic zone (1500 to 2500 m), which comprises low plateaus of the zone and covers about the 49.60% of zonal land surface. While the fourth is lowlands of the zone (less than 1500 m) constituting about 24.92% of the total area of the zone. This type of physiographic region of the zone is found in the Awash River valleys and southeastern lowlands. In general, the zone has the lowest altitude in extreme east of Seru district located in Wabe gorge which is 805 masl and highest point on peak of mount Kaka which is 4195 masl (BOFED, 2011).

Data type, source and method of collection

Both primary and secondary data sources were employed in this research. Primary data sources were farmers, agricultural and natural resource development offices and livestock resource development, health and marketing agency at different levels (regional, zonal, districts and PAs), rural land administration offices, different NGOs and stakeholders working on rural development. Secondary data were collected from different research output materials and other official reports of different offices. In general, data were collected by Rapid Rural Appraisal (RRA) and Participatory Rural Appraisal (PRA) methods, and household level interview methods through structured and unstructured survey schedule and focus group discussion, and key informants interview and discussion.

Sample and sampling mechanism

Multi-stage sampling techniques were used to select districts and peasant associations (PAs). Even though attempt was made to stratify the zone into three based on traditional agro-ecological classifications as highland, mid highland and lowland, considering the accessibilities and other production factors which have impacts on farming system characteristics, the zone was further stratified as mid highland wheat-belt and mechanized areas, high land barely belt areas, mid to low land teff-maize and spices majoring areas, mid altitude heavy soil areas, lowland maize majoring areas, mid highland and highland un mechanized wheat-barley belt areas and coffee and fruits majoring areas. From each cluster, one district was sampled and from each district, one or two peasant associations were selected for FGD. A total of 15 farmers FGD were held with each group having eight to fifteen group members who were systematically selected based on their farming experience, gender, educational background and etc. discussion with experts from each areas of agriculture, natural resource management and livestock were also conducted at each level. Development agents (DAs) at each peasant association were considered as key informants and they were interviewed separately. Finally, household level interview was conducted to supplement those community level data.

Data analysis method

Data analysis technique was used for the research and determined by types of data collected and purpose of research output (report). Therefore, in this case, since the data that were collected were more of qualitative in nature, descriptive and inferential statistics such as mean, median, cross tabulations and bar-graph methods of analysis were utilized in this study. The qualitative data collected through FGD, KII and transect walk were analyzed qualitatively using narration methods.

RESULTS AND DISCUSSION

Livestock production system of the study area

Livestock was found to be the most important farm

Table 1a. Basic information of sampled districts. Agro-ecologies and altitudes of the sample districts.

District	Percent of agro-ecology				
	Highland	Mid-highland	Lowlands	High altitude	Low altitude
Lemunabilbilo	80	20.00	0.00%	4180	1500
Shirka	24	56.00	20%	3700	500
Zuwaydugda	0	10.30	89.7%	1750	1600
Hetosa	26	47.80	26%	400	1700
Arsi-robe	24	62.00	14%	1150	800
Cholle	50	22	28%	3574	1040
Merti	10%	29%	61%	-	-

Table 1b. Basic information of sampled districts. Temperature and rainfall of the sample districts.

District	Average rain	Average temperature
Lemunabilbilo	1100	16
Shirka	1000	12.50
Zuwaydugda	650	25.50
Hetosa	800	21.00
Arsi-robe	1000	22.50
Cholle	1000	16
Merti	-	26

Source: Respective district's Office of Agriculture and Rural Development

Table 2. Livestock possession of households across districts

District	Oxen	Cow	Total cattle	Cross cattle	Ratio*	Sheep	Goat	Donkey	Poultry
L/Bilbilo	2.28	1.86	6.47	2.20	34%	4.2	1.9	1.4	2.5
Shirka	2.77	2.30	9.23	3.20	34%	4.9	0.7	1.4	3.6
Z/dugda	1.83	2.40	6.10	0	0%	2.4	1.8	0.9	3.3
Hetosa	2.37	0.94	4.80	0.5	6%	1.4	0.7	1.2	5.8
A/robe	1.83	1.90	6.40	1.40	13%	2.3	1.0	1.1	2.0
Chole	1.86	2.00	6.80	1.20	21%	2.9	1.3	0.5	4.3
Merti	1.50	1.40	5.30	0.40	6%	2.3	0.7	1.3	8.0
Total	2.11	1.80	6.20	1.20	15%	2.9	1.3	1.1	3.9

*Proportion of crossed breed cattle with total cattle.

activity in both agro-pastoral and crop-livestock mixed farming system. The overall mean livestock holding of the household was 7 TLU. However, there is difference in livestock type based on climate and intensity of crop farming across districts. The major livestock type was cattle with overall mean of 6.2 followed by poultry birds and sheep having means of 3.9 and 2.9 heads each per household, respectively. According to the responds in the FGD, the major cattle breeds in the zone were the local "Arsi breed" with mix of other local breeds like Boren and Arsi with exotic breed crossed breeds. In Merti district, there were about 36283 head of camel population (Tables 2 and 3). There was lowest cattle possession in Hetosa district which may be due to extensive crop production as expected and the highest cattle possession per household was found in Shirka and Chole districts.

Livestock breed improvement in Arsi zone

According to CSA (2015) (Table 3), Arsi zone was ranked first in livestock population having 2.5 million cattle, 1.66

Table 3. Livestock population in Arsi zone.

Livestock type	Total population	Indigenous	Hybrid	Exotic
Cattle	2,528,903	2,404,996	111,852	12,055
Sheep	1,662,797	1,662,797	-	-
Goats	738,729	-	-	-
Horses	240,559	240,559	-	-
Mule	20,337	20,337	-	-
Donkey	421,733	421,733	-	-
Camel	28,942	28,942	-	-
Poultry	1,885,492	1,784,449	70,947	30,096
Beehives	122,779	121,815[1]	0[2]	964[3]

Source: CSA (2015). [1] Traditional beehives. [2] Intermediate beehives. [3] Modern beehives.

million sheep, 0.74 million of goats, 0.24 million of horse, 0.02 million mules, 0.4 million donkeys, 0.03 million camels, 1.88 million poultry birds and 0.12 million beehives which shows that there is huge potential for this sector. In general, when considering the composition of cattle herd, each household has on average of 1.2 cattle per household with largest mean in Shirka and Lemu-bilbilo, each possessing 3.2 and 2.2 crossed breed, respectively.

Shirka district has largest proportion of crossed breed (about 34%) followed by Lemuna-bilbilo, Chole and Arsi-robe districts with mean proportion of 26, 21 and 13%, respectively (Table 2). Only 27% of the households used AI service to improve their breed quality, while 32% used neighbors' bulls for free and 8% used rented neighbors' bull. About 10% of them used their own bull and the rest did not use improved breed. Even though there is high livestock potential in the lowland maize-sorghum based farming system, there is no significant activity carried out so far to improve the breed. The KII result from Zuway-dugda revealed that Asella is the main dairy product supplier to Ogolcho town.

To classify livestock in terms of their keeping purpose, cattle especially, the male ones were majorly kept for draught forces, and followed by other social values (prestige) and beef, while female cattle were kept for breeding purposes, followed by milk production and social values. The mean milk production per household in Arsi zone was about 2.2 L per household per day. The productivity of local cow per day was 1.52 L/day/cow and productivity of crossed cow was 3.16 which was not significant. But the potential for both local and crossed breed were much higher than mean value, 6 and 26 L/day/cow, respectively. Therefore, working on all aspects of the dairy cows like feed and health can improve the production and productivity. Furthermore, livestock in Arsi zone were also important sources of household cooking energy (animal dung) especially in highland and mid highland areas.

Pack animals (donkey, horses and mules) were all important means of transportation in farm and non-farm activities (petty trading); productive and reproductive activities and both for human and agricultural products. In all clusters of farming system, these animals were ranked next to cattle (which are main sources of draught power) in terms of their economic importance.

Small ruminants were kept for immediate/emergency cash obligations, unplanned emergency issues, educating children, to purchase agricultural inputs like fertilizer, seed and chemicals. While poultry birds were mostly owned by children and female spouses, and used for household consumption and sold to purchase household consumables which were non-agricultural products (result from focus group discussion).

Livestock production constraints

Cattle and small ruminants production constraints

In general, the livestock production constraints were identified and prioritized in order of their importance in each farming system. Overall constraints were categorized into five clusters as feed related constraints, health related constraints, breed related constraints, and financial and human power related constraints (Table 4). Feed related constraints are ranked first in both farmers FGD discussion done with experts at each district and household level survey data in all farming system clusters.

With regards to feed, shortage of grazing land due to expansion of farm land to marginal areas, inaccessibility and high price of supplementary feeds, lack of improved forage varieties, lack of awareness and skill on improving nutritional value and palatability of aftermaths and straws due to poor extension service on livestock sector were the main production constraints in all clusters. High water shortage for their stocks were reported for lowland maize based crop-livestock mixed farming, agro-pastoralists of Merti areas and parts of wheat-barely based mid highland parts around Lemu-bilbilo districts (Sirbo, Siraro PAs, etc).

The main problems related with health were absence of

Table 4. Livestock production constraints in Arsi zone across different.

Constraint	District							
	L/bilbilo	Shirka	Z/dugda	Hetosa	A/robe	Chole	Merti	Overall
Feed related	81%	77	86	94	78	79	100	85%
Health related	45.3%	54	49	29	33	38	58	42%
Breed related	11.3	0	0	3	17	13	25	8%
Labor shortage	36	48	72	39	23	51	47%	58%
Capital shortage	16	51	13	76	34	69	39.7%	12%

Table 5. Overall poultry possession in Arsi zone.

Breed type	Mean number of birds	Standard deviation
Improved breed	0.88	4.2
Local breed	2.97	4.8

vaccines and medicines, poorly equipped animal clinics, shortage of skilled staffs in the clinics and location of health posts/clinics at distant places from farmers' villages. These problems forced farmers to use non-prescribed medicines without the knowledge of health professional and created drug resistant diseases, opened black marketing of drugs trading; high priced drugs and invited expired and ineffective drugs to the market.

Main problems related to breeds were absence of AI service in most districts and its ineffectiveness in most of the cases. According to the information from districts' experts, the ineffectiveness was due to three main reasons. The first one was unskilled inseminators, and the second was wrong approach of the hormone synchronization campaign which is centrally planned at regional level and did not consider the situation at each specific area. For instance, in some areas, program may start during peak dry season when animals body conditions were not appropriate for conceiving pregnancy. The third reason was inadequate facilities for AI service provision.

Absence of breeding policy in general where individuals participate without any control (uncontrolled breeding activities) which harm even the merits of local breeds, poor market linkage for output, low mechanization technological interventions both at production and processing stages, poor research and extension service on animal feed improvement were most important constraints identified by discussion with districts' livestock experts.

For small ruminants livestock, there was no recorded improved breed in Arsi zone which is similar to CSA (2015) report which show that there were no attempt to improve the existing breed. In Ethiopia in general, improved breeds of sheep were only found in Amhara region which may be due to high research and development intervention in the region. In Oromia also, there were two research centers (Yabello and Adami-Tullu) which were working on small ruminant improvements and Arsi zone has to use this opportunity to improve the breed in the zone. In the case of small ruminant, absence (supply shortage) of vaccine and medicines for treatment, feed shortage, low productivity of the breeds, and low extension support were the major constraints.

Poultry production and its constraints in Arsi zone

Highest household proportion of improved poultry breed possessors were found in Shirka, Arsi-robe, and Meri districts each accounting for about 54, 44 and 33% of households, respectively. But when considering the per household improved poultry birds possession, the highest was found in Hetosa district followed by Shirka and Arsi-robe each having 2.03, 1.69 and 1.33 birds per households. The overall mean improved poultry birds and local breed possession was 0.88 birds and 2.97 birds per household (Table 5).

Disease was the first ranked poultry production constraint where there all vaccine and medicine were not available or where it was available, indivisibility of vaccine was the main challenges in extension service provision. The available poultry vaccine was packed for 500 poultry birds and it did not consider the small scale production system of Ethiopia's farmers where a household is keeping on average, about 3 to 5 poultry birds. The second constraint was shortage of improved breeds and infertility of existing commercial improved breed. The third major production constraint was lack of poultry feed supply.

Beekeeping activities and its production constraints in Arsi zone

Only 16.8% of the households practice beekeeping and

Table 6. Reasons for not participating in beekeeping activities.

Reasons for not practicing beekeeping	Frequency	Non-practicing percentage	Rank
Inconvenience of weather condition	16	8.4	6
Ignorance	60	38.0	1
Fear of chemical	34	21.5	3
Feed shortage	23	14.6	4
Fear of stinging	20	12.7	5
Labor shortage	5	31.6	2

Table 7. Constraints of beekeeping activities in Arsi Zone.

Beekeeping constraints	Number of respondents	Rank
Chemicals applied to different crops	26	1
Bee forage and water shortage	15	2
Predators	7	3
High price and supply shortage of modern beehives	4	4
Labor shortage	1	5
Land shortage	1	2

Table 8. Feed type and season of their availability in the year.

Feed type	Percent of users	Time of most availability
Communal grazing	21.6	June-October
Own grazing	57.4	June-October
Crop residue	75	Throughout the year as contingency
Fodder	5.8	July-September
Crop aftermath	63	October to February
Cut and carry	45	July to September
Concentrate	34	When livestock get weak
Purchase straws and grazing land	74	April to October
Prepare feed at home from grains	19	During plowing (mostly for oxen)
Move livestock to other places	4	July to September

about 83% of the households did not practice beekeeping because of different reasons. The most important reason that was ranked first was because of own ignorance. But the rest were not practicing due to labor shortage, fear of chemicals and others (Table 6).

According to Table 7, application of chemicals on crops for different pests like herbicides, fungicides, pesticides were the most important beekeeping constraint in the study area. Bee forage and water shortages and predators like spiders, lizards and birds were also the next most important beekeeping constraints of the area.

Livestock feed availability status throughout the year

The most important livestock feed types were own/ purchased crop residue like straw (about 78%), grazing land (74%), crop aftermath (63%), own grazing land (57.4%), cut and carry (45%) and use of concentrate (about 34%). There is no single way of feeding animal and all household use one or more combination of these feeding systems (Table 8). From Table 9, it can be observed that forage production culture is too low (only about 6% of the respondents are producing) and there must be technological support in household level livestock feed preparation which could improve both nutritional and palatability of feeds like straw, crop aftermaths and grasses. From Table 9, it is observed that livestock feed is ample during the months September and October, at normal status during November, December and January while there is high feed shortage during February, March, April and May.

During period of feed shortage, farmers supplement their feed by buying other fodder, straws, hay from

Table 9. Animal feed availability status across the months of the year

Status	September	October	November	December	January	February	March	April	May	June	July	August
Ample	56	52	42	28	11	5	4	3	5	24	35	44
Short	20	11	10	15	38	55	56	57	56	42	35	30
Normal	23	37	47	56	50	40	40	40	40	34	30	26

Source: Own survey result.

purchased grazing land and concentrates. The per-annual mean cost of purchasing supplementary animal feed was estimated to be about 2105.47 Birr. The highest cost for supplementary feed purchase was recorded in Lemu-bilbilo, Shirka and Hetosa districts with 4030, 2790 and 2005 ETB per annum, respectively.

In most cases, the feed during dry seasons is insufficient and the farmers/keepers feed their animals only for survival. Because of this, the animals do not provide the intended output and the female ones do not conceive due to poor body conditions. Moreover, drinking water for livestock is the serious production constraint in all farming systems of the study area.

CONCLUSION AND RECOMMENDATION

Livestock production in Arsi zone is the most important sub-sector which is entirety of crop-livestock mixed farming system. It serves as farm power, manure, source of household energy for cooking purpose, means of transportation, source of income, etc. Almost all farmers have at least a type of livestock. But the sector is not given an attention equivalent to its importance. In this research, the production constraints in Arsi zone were categorized into four: feed related, health related, breed related, labor shortage and capital shortage.

To alleviate the problem of feed and feed related issues, training farmers on how to use the existing feed resources like grazing lands, crop straws and after mazes; how to prepare feeds from different sources and planting forages should be organized by experts. Supply of improved forage seed options should be given due attention. Despite the potential of livestock potential in the study area, there is less or/no research activity to improve and promote animal feed, whether it is forage development/ improvement or use of concentrates and demonstration of the feed technologies, skills and knowledge on animal feed importance and utilization.

In health related issues, the main problems were occurrence of seasonal diseases based on whether conditions, shortages of health facilities like clinics and health posts and illegal medicines in black market. Therefore, improving the capacity of health posts and livestock clinics established somewhere in terms of skilled manpower and equipment and establishing new ones to increase accessibility can reduce the potential risk. As mentioned earlier, majority of the livestock populations in the study area are comprised of local breeds having low production and productivity. Even though there is good start in cattle breed improvement using AI and improved bull system and supply of improved poultry birds, it is a drop in an ocean as compared to potential in the area.

In general, to increase the production and productivity of livestock in the study area, the sub-sector should be supported by research system in all aspects like breed improvement, health and forage development and demonstration and popularization of the technologies. Strengthening of the existing extension system is also a good option. Therefore, the researcher believes that establishment of research program in Asella could be the best solution to the problem. For the rest constraints, facilitating credit facilities should be planned by the government.

CONFLICT OF INTERESTS

The author has not declared any conflict of interests.

REFERENCES

AAPBMDA (Animal, Animal Products and By-products Market Development Authority) (1999). Market problems and measures to be taken. AAPBMDA, Addis Ababa, Ethiopia 19 p.

Central Statistical Agency (CSA) (2011). Agricultural Sample Survey 2010/11: Report on Livestock and Livestock Characteristics. Vol. 11. (Private peasant holdings). Addis Ababa, Ethiopia: Central Statistical Agency.

Central Statistical Agency (CSA) 2015. Agricultural Sample Survey 2010/11: Report on Livestock and Livestock Characteristics. Vol11. (Private peasant holdings). Addis Ababa, Ethiopia: Central Statistical Agency.

Gelan A, Engida E, Caria AS, Karugia J (2012).The Role of Livestock In the Ethiopian Economy: Policy Analysis Using A Dynamic Computable General Equilibrium Model for Ethiopia: Selected paper prepared for presentation at the

international association of agricultural economists (IAAE) triennial conference, FOZ DO IGUAÇU, Brazil, 18-24 August, 2012.
Ministry of Economic Development and Cooperation (MEDC) (1998). 'Annual Report on Macroeconomic Development in Ethiopia', Addis Ababa: MEDaC Policy Analysis Unit.
Ministry of Agriculture and Rural Development (MoARD) (2010). Ethiopia's Agriculture Sector Policy and Investment Framework: Ten Year Road Map (2010-2020), Addis Ababa, Ethiopia: Ministry of Agriculture and Rural Development.
Ministry of Finance and Economic Development (MOFED) (2010). Growth and Transformation Plan: 2010/11-2014/15, Volume I: main text, November, 2010, Addis Ababa, Ethiopia: Ministry of Finance and Economic Development.
Oromia Bureau of Finance and Economic Development (OBOFED) (2011). Physical and Socio Economic Profile of Arsi Zone and Districts'. The National Regional Government of Oromia, Bureau of Finance and d Economic Development –Regional Data and Information Core Process.
Solomon A, Workalemahu A, Jabbar MA, Ahmed MM, Hurissa B (2003). Livestock marketing in Ethiopia: a review of structure, performance, and development initiatives. Socio-Economics and Policy Research Working Paper 52, 32.
Tegegne A, Hoekstra D (2011). Mass artificial insemination interventions to enhance dairy and beef production in Ethiopia. Paper presented at a 'Livestock Exchange,' 9 -10 November 2011, ILRI, Addis Ababa, Ethiopia.