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Opportunity and Constraints of Cattle Production System in Three Selected Districts of Ilu Aba Bor Zone, Ethiopia

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Abstract: This study was conducted in three district (Bedele, Chora and Gechi) of Ilu Aba Bor Zone, Oromia Regional State South Eastern Ethiopia. The objective of this study was to assess the opportunity and constraints of cattle production system. Multi-stage sampling techniques were employed to collect the data from a total of 216 households. Data were collected and analyzed using descriptive statistics. The study revealed that crop-livestock mixed type of farming system was the type of farming system practicing for major purposes of milk, draft and for cash sell ranked as 1st, 2nd and 3rd, respectively. Even though cattle were used for multipurpose, the production and productivity were dominantly limited due to the feed shortage and animal disease and parasite. Mainly feed shortage was occurred due to the expansions of crop cultivation and coffee plantation as well as the dependency of most of the households on the natural grazing and browsing type of feed resources for their livestock. However, crop residues including Maize, Sorghum Stover and Teff straw were the most dominant types of low quality feed resource in the study areas. Attention of the government service without fee, presence of man power, contribution of non-governmental organizations (NGOs) and contribution of Cooperative dairy farms offered the main opportunities for better improvement of the genetics of cattle. However, uncontrolled mating system, insufficient AI technology and loss of trust on technology, feed shortage and absence of multiple/alternative veterinarian service areas were identified as the limiting factors which limit the cattle improvement program.

Key words: Cattle · Feed shortage · Production · AI

INTRODUCTION

Livestock have diverse functions for the livelihood of farmers in mixed crop-livestock systems in the highlands of East Africa and also provide food in the form of meat and milk, non-food items such as draft power, manure and transport services as inputs into food crop production and fuel for cooking. In addition to the above, livestock are a source of cash income through sale of the following items; live animals, hides and skins other than acts as a store of wealth and determine social status within the community. Because of these important functions, livestock play an important role in improving food security and alleviating poverty. Moreover, they are central to nutrient cycling, important to the efficiency, stability and sustainability of farming systems in the East African highlands [1]. Ethiopia has large livestock population in Africa with very low production and productivity and even below the average for most countries in eastern and sub-Saharan African countries. This is due to poor nutrition, reproduction insufficiency, management constraints and prevailing animal diseases [2]. According to Hassen *et al*. [3]. Ethiopian highlands are inhabited by high human and livestock populations. High density of human and livestock population is one of the major reasons for severe degradation of the natural resource base [4] resulting in poor animal nutrition. This results in extremely low product and productivity in terms of milk, meat and draft power. An estimated population of Ethiopia cattle is around 55.21 million heads, 29.36 million sheep, 28.95 million goats, equine 7.17 million and about 4.5 million camels [4].

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Production of cattle is the most important livestock sub-sector in Ilu Aba Bor and meets multiple objectives that are desired by smallholder farmers for draft power, milk, meat, manure and source of household income among socio-economic importance. In addition, Ilu Aba Bor Zone has good potential of cattle production. However, so far there is no study carried out to identify the opportunities and constraints of cattle production in the study areas as well as characterization of livestock production systems hasn't been studied so far. Thus, this study aimed to assess the opportunity and constraints of cattle production as well as vital to characterize the type of cattle production system in the study areas.

MATERIALS AND METHODS

Study Area: This study was conducted in Ilu Aba Bor zone of Oromia Region, Ethiopia. The center of this zone is called Mettu and which is 600km distance from Addis Ababa towards South West Ethiopia. Exorbitantly, it is positioned between 7027'40" to 902'10" Latitude N and 34052'12" to 41034'55" east longitudes. This zone covers a total area of 1, 633, 156.56 hectares of land consists of 10% high land, 67% medium land and 23% low land. The altitude of the zone ranges from 500-2575 meter above sea level. It is mostly known for its vegetation coverage, suitability for coffee, crop, livestock and bee production. The dominant crops being Maize, Teff, Coffee, Sorghum, Barley, Wheat, different pulse crops, finger millet, fruits, vegetables, spices and rice. Annual precipitation ranges from 1500-2200mm with 6 to 9 months of rainfall. Agriculture is the mainly livelihood of people with a mixed farming system and livestock plays an integral role for agriculture [5].

Sampling Procedure: Multi-stage purposively sampling techniques were employed to select the districts and peasant associations with the consultation of zonal and district bureau of agriculture experts. Three districts Bedele, Chora and Gechi were selected based on the potential of cattle production and the agro-ecological similarity of the districts. Then, six kebeles were selected from each districts based on livestock production potential, willingness of the farmer to participate on the study and agro ecological differences within the districts. A total of 216 households (72 from each district) were interviewed proportional random sampling techniques from the selected three districts.

Data Collection: Both primary and secondary data were used for this study. General information of the area, vegetation cover, topography, climatic data and population size were obtained as a secondary data from district office of Livestock and Fisheries Agency. The primary data was collected using prepared semi structured questionnaires on types of livestock production system, feed resource availability, breeding practices and prevalence of livestock disease. The group discussions were held and consist of livestock experts, the extension agents and elder famers with sex and different age categories as well as the leaders of the peasant associations. The group discussants composed of 8-12 members. The check list for the group discussion aimed to assess the following information; animal (Breed, production), production system, feed resource and feeding system, breeding practices, prevalence of livestock disease with their prevention methods and about constraints and opportunities of livestock rearing.

Data Analysis: The collected data was entered into MS Excel spread sheet and then the descriptive statistics of the data was summarized using SPSS (Version 20:0). Indices were calculated to provide ranking to different parameters using the following index formula.

$$\text{Index} = Rn \times C1 + Rn\text{-}1 \times C2 \ldots + R1 \times Cn / ?(Rn \times C1 + Rn\text{-}1 \times C2 + \ldots + R1 \times Cn)$$

where, Rn = the last rank (Example if the last rank is 5th, then Rn = 5, Rn-1 = 4, R1 = 1).
Cn = the % of respondents in the last rank, C1 = the % of respondents ranked first

RESULTS AND DISCUSSION

General Household Characteristics

Family Size and Land Holding: An average family size and total land holding in hectare were presented in Table 1. As the result indicated in Table 2, the average family size per households of Bedele, Gechi and Chora districts were 5.98±0.22, 5.85 ± 0.23 and 7.10±0.28, respectively. Regarding to land holding and structure of the respondents as presented in the same table indicated that, the average cultivated and grazing land in hectare per household for Bedele, Gechi and Chora areas were 1.25±0.09 and 1.86±0.13, 1.91±0.13 and 0.17±0.03, 0.48±0.02 and 0.73±0.08 respectively. The present study revealed

Table 1: Average Family size and their land holding in hectare per household

Category	N	Study Areas: Bedele (Mean±SE)	Gechi (Mean±SE)	Chora (Mean±SE)
Family Size	72	5.98±0.22	5.85 ± 0.23	7.10±0.28
Land Holding				
Cultivated Land	72	1.25±0.09	1.86±0.13	1.91±0.13
Grazing Land	70	0.17±0.03	0.48±0.02	0.73±0.08
Forest	67	0.17±0.02	0.41±0.03	1.14±0.22
Home stead	72	0.19±0.01	0.22±0.13	0.48±0.65

N= Number of households

Table 2: Types of farming system and their source of income

	Study Areas: Bedele (N=72)		Gechi (N=72)		Chora (N=72)		Overall (N=216)	
Category	N	%	N	(%)	N	(%)	N	(%)
Source of income								
Livestock Sale	-	-	4	5.6	1	1.4	5	2.31
Livestock products	-	-	4	5.6	2	2.8	6	2.78
Both crop and livestock sale	60	83.3	64	88.9	64	88.9	188	87.04
Crop sale	12	16.7	-		5	6.9	17	7.87
Farming system								
Crop and livestock farming	72	100	72	100	72	100	216	100

N= Number of households

Table 3: (Mean±SE) of cattle population per each respondent in the study areas

Local Cattle	Study Areas: N	Bedele	N	Gechi	N	Chora
Ox	71	2.34±0.14	72	2.81±0.18	60	2.45±0.17
Cows	70	2.16±0.17	71	2.82±0.20	59	2.96±0.20
Bulls	21	1.57±0.20	44	2.00±0.19	36	1.94±0.18
Heifers	62	1.64±0.13	53	2.08±0.18	54	1.98±0.13
Calves	38	1.95±0.21	59	2.08±0.15	41	2.39±0.25

N= Number of respondents

that, more of the land covered by both cultivated and grazing land. However, the land holding size of the grazing land was smaller than that of the cultivated land. According to the surveyed result, the average cultivated and grazing land holds by the respondents were greater than that of the finding by Abdi *et al.* [6]. The report by Abdi *et al.* [6] revealed that the average cultivated and grazing land holding of the household in hectare from four selected districts of Western Harerge Zone were 0.8606 ± 0.039 and 0.0778 ± 0.0134, respectively. The average land for forest use and land used for homestead in hectare per household for Bedele, Gechi and Chora areas were 0.17±0.02 and 0.41±0.03, 1.14±0.22 and 0.19±0.01, 0.22±0.13 and0.48±0.65 respectively.

Farming System and Source of Income: According to the result presented in table 2, 100% of the respondents were practicing mixed farming system (Both crop and livestock). In relation to this, income source of the respondents in the present study was both from crop and livestock sale. As the result (Table 2) revealed that, 83.3%, 88.9% and 88.9% of the respondents were using crop and livestock sale as a sources of income for Bedele, Gechi and Chora districts, respectively. However, some of the respondents were practicing other sales as a source of income. Generally, the overall result presented in (Table 3) indicated that, 2.31%, 2.78% , 7.87% and 87.04 % of the respondents were practicing livestock sale, livestock products, crop sale and both crop and livestock sale, respectively as a source of income for their households. The report by Abdi *et al.* [6] revealed that, 93.9 %, 4.9 % and 0.6 % of the respondents were practicing mixed farming (Both crop and livestock), crop production and livestock raring, respectively as their main occupation.

Cattle Structure: Cattle structure of the study areas were presented in Table 3. According to the respondents, large proportion of oxen and cows were very important for draught power and milk production purpose. Table 3 reveales that, the average number of Ox per household for Bedele, Gechi and Chora districts were 2.34±0.14, 2.81±0.18 and 2.45±0.17, respectively. The higher proportion of oxen in the study area was agreement with Abdi *et al*. [6]. The average number of cows per households for Bedele, Gechi and Chora districts were 2.16±0.17, 2.82±0.20 and 2.96±0.20, respectively.

Purpose of Keeping Cattle and Limiting Factors: The primary purposes of keeping cattle in the study area were presented in table 4. According to the respondents, milk, draft and cash sale were ranked as first, second and third proposes of keeping cattle with an index value of 0.38, 0.31 and 0.19, respectively. The result of the present study was more or less similar with the findings of Abdi *et al*. [6]. The finding of this study is in accordance to the report of Abdi *et al*. [6] from Western Harerge Zone. The performance and effectiveness of cattle production depends on the various factors that affected the supply chain actors through different channels. The results of the assessment revealed that, feed shortage, diseases and parasite, marketing problems, drought, water scarcity and predators in ranking from decreasing order of importance were identified as the limiting factors hampering the expansion of cattle production system in three districts of study areas. As the overall result indicated in table 5, inadequate and poor quality animal feed, disease and parasite and lack of marketing infrastructure were ranked as the first three limiting factors affecting cattle production in the study area with an index value of 0.26, 0.22 and 0.16, respectively. Followed to them, drought and water scarcity were ranked as a fourth limiting factors with an equal index value 0.11. The first and second limiting factors of present study were similar with the study of Abdi *et al.* [6] and Belay *et al*. [7].

Source of Animal Feed: The result presented in table 6 indicated that, the main source of feed for cattle in the study areas were communal grazing/browsing (44.6%). The result was in accordance with the finding of Kedija [8]. The report by Kedija [8] indicated that, natural pasture was primarily fed by cattle as a source of feed in Mieso district. Whereas 40.4 % and 15.1 % of respondents were used cultivated improved forage crops and agro-industrials by products as sources of feed for their cattle, respectively. Feed from communal grazing and browsing land is also a source of animal feed and regarding to the current condition of such feed sources were presented on table 7. According to the assessments, the overall current condition of communal grazing and browsing land were decreasing (72.97%), Increasing (5.41%) and No change (21.62%). The decreasing of grazing and browsing land were due to the expansion of coffee and crop cultivation; which led for shrinking of the existing grazing lands and resulted for the shortage of animal feed and it was indicated as one of the constraints in cattle production. The result of this study was in accordance with the finding by Belay *et al.* [7].

An overall land holding per households for browsing and grazing land were presented on the same table. According to the interviewed, 63.81%, 8.57%, 8.57% and 0.48% of respondents had their own individuals land as an open grazing land; tree covered grazing land, bush/shrub land and swampy grazing land, respectively. But the rest 18.57 % of respondents weren't have their own individual grazing or browsing land. In addition to this crop residues were another source of feed in the study areas. Together withhigh incidences of diseases and mortality rates, feeds shortage lead to low livestock productivity Mutibvu *et al*. [9].

According to the results presented in table 8, maize, sorghum stover and teff straw were ranked as first, second and third major type of crop residues ranked by farmers with index values of 0.19, 0.16 and 0.12 respectively. According to *Kassam et al.* [10] the main constraint to increasing livestock productivity and output is the lack of adequate supplies of good quality livestock feed in the dry season produced at a competitive cost and without jeopardizing household food security.

Opportunity and Constraints of Genetic Improvement Programs: Table 9 displayes that, different type of opportunity and constraints were mentioned by interviewed households in relation to breeds of cattle improvement program. The overall result displayed on the same table indicated that, attention of the government (70%), service without fee (12.5%), presence of man power (5%), contribution of NGO (9.2%) and contribution of Cooperative dairy farms (3.3%) were the main opportunities identified for better improvement of the genetics of cattle in the study areas. According to Petrus *et al.* [11] use of improved breeds in developing countries presents farmers with a major challenge as the breeds require intensive management for them to realize full production potential.

Table 4: Purpose of keeping cattle ranked by the owners

	Study areas												
	Bedele District				Gechi District				Chora District				
	Rank				Rank				Rank				
Purposes	1	2	3	Index	1	2	3	Index	1	2	3	Index	Overall Index
Meat	0	3	9	0.040	0	4	11	0.060	1	5	15	0.064	0.05
Milk	69	1	0	0.500	18	44	6	0.320	8	53	6	0.311	0.38
draft	0	54	4	0.270	47	18	4	0.348	30	10	23	0.304	0.31
Breeding purpose	0	0	3	0.010	0	0	2	0.008	10	4	5	0.098	0.04
Manure	0	0	4	0.010	0	0	14	0.053	0	2	12	0.037	0.03
Hide	0	0	0	0.000	0	0	0	0.000	0	0	0	0.000	0.00
For cash sale	1	13	48	0.180	5	13	33	0.212	5	18	30	0.185	0.19

Index = [3 for rank 1) + (2 for rank 2) + (1 for rank 3)] for each of the purpose divided by sum of all of the purpose

Table 5: Cattle production limiting factors ranked by respondents and priority indices in different study areas

	Bedele					Gechi					Chora					
	Rank					Rank					Rank					
Limiting factors	1	2	3	4	Index	1	2	3	4	Index	1	2	3	4	Index	Overall index
Feed Shortage	72	0	0	0	0.301	36	25	8	3	0.213	46	17	8	1	0.256	0.26
Water scarcity	0	1	2	69	0.079	0	5	8	59	0.144	1	15	19	30	0.119	0.11
Drought	0	13	55	4	0.160	0	0	13	59	0.141	0	12	24	29	0.115	0.14
Disease and parasite	0	65	7	0	0.218	29	26	9	8	0.205	18	47	7	0	0.231	0.22
Predators	0	0	0	72	0.075	0	1	8	63	0.140	1	14	7	40	0.102	0.11
Marketing Problem	0	25	38	9	0.167	0	2	26	44	0.149	10	20	36	3	0.178	0.16

Index = [4 for rank 1) + (3 for rank 2) + (2 for rank 3)+(1 for rank 4)] for each of the factor divided by sum of all of the factors

Table 6: Source of animal feed

	Study Areas			
Variable	Bedele District (%)	Gechi District(%)	Chora District(%)	Overall(%)
Source of feed				
Cultivated Improved forage crops	50.9	36.0	30.0	40.4
Agro-Industrials by products	42.1	0.0	5.0	15.1
Communal grazing /browsing	7.0	64.0	65.0	44.6

Table 7: Grazing and browsing practices of interviewed respondents in percentage

	Study areas							
	Bedele		Gechi		Chora		Overall	
Communal Grazing	N	%	N	%	N	%	N	%
Current condition of communal grazing and browsing land								
Decreasing	-	-	43	75.4	11	84.6	54	72.97
Increasing	-	-	4	7.0	-	-	4	5.41
No change	4	100	10	17.5	2	15.4	16	21.62
Type of grazing /browsing land hold by individual								
Open grazing land	52	72.2	33	45.8	49	73.1	134	63.81
Tree covered grazing	7	9.7	8	11.1	3	4.5	18	8.57
Bush/Shrub land	-	-	4	5.6	14	20.9	18	8.57
Swampy Grazing Land	-	-	1	1.4	-	-	1	0.48
Haven't	13	18.1	26	36.1	-	-	39	18.57

N= Number of respondent (N=72)

Table 8: Crop residue ranked by the interviewed household owners

	Study Areas															
	Bedele					Gechi					Chora					
	Rank					Rank					Rank					
Type of crop residue	1	2	3	4	Index	1	2	3	4	Index	1	2	3	4	Index	Overall Index
Barely straw	0	65	7	0	0.107	5	28	0	0	0.082	0	16	18	27	0.113	0.10
Wheat straw	0	65	7		0.107	11	22	0	0	0.083	1	17	27	16	0.128	0.11
Teff straw	72	0	0	0	0.148	55	17	0	0	0.191	1	2	3	0	0.016	0.12
Maize Stover	2	72	0	0	0.115	58	12	2	0	0.192	55	11	6	0	0.271	0.19
Sorghum Stover	0	71	1	0	0.111	16	19	35	2	0.168	10	28	31	2	0.192	0.16
Oil seed cake	2	56	14	0	0.105	0	0	0	33	0.060	19	1	7	24	0.120	0.10
Legumes	0	50	22	0	0.100	0	4	28	1	0.071	9	2	4	26	0.078	0.08
Enset leaf and its by product	0	51	21	0	0.100	0	26	7	0	0.078	0	0	1	41	0.044	0.07
Potatos leaves	0	63	9	0	0.106	1	18	14	0	0.076	0	0	0	37	0.038	0.07

Index = [4 for rank 1) + (3 for rank 2) + (2 for rank 3)+(1 for rank 4)] for each of the crop residue divided by sum of all of the crop residue

Table 9: Opportunity and Constraints for running cattle breed improvement programs

	Districts							
	Bedele		Gechi		Chora		Overall	
Variables	N	%	N	%	N	%	N	%
Opportunities								
Attention of Gov't	24	70.6	32	61.5	28	82.4	84	70.0
Service without fee	0	0.0	15	28.8	0	0.0	15	12.5
Presence of man power	4	11.8	1	1.9	1	2.9	6	5.0
Engaged NGO's	3	8.8	4	7.7	4	11.8	11	9.2
Cooperative dairy farm	3	8.8	0	0.0	1	2.9	4	3.3
Constraints								
Absence of multiple/alternative service areas	20	5.1	40	9.6	25	7.3	85	7.4
Access of road	10	2.6	9	2.2	8	2.3	27	2.3
Animal Disease	25	6.4	24	5.8	23	6.7	72	6.3
Beneficiaries wrong opinion/perception	15	3.9	29	7.0	12	3.5	56	4.9
Distance of service area	15	3.9	11	2.6	13	3.8	39	3.4
Feed Shortage	45	11.6	38	9.1	40	11.6	123	10.7
Ineffectiveness of AI and Loss of trust on technology	62	15.9	64	15.4	63	18.3	189	16.4
Insufficient supplying of quality sperm	20	5.1	22	5.3	21	6.1	63	5.5
Lack of attention from beneficiary	10	2.6	12	2.9	11	3.2	33	2.9
Lack of information and awareness	47	12.1	29	7.0	2	0.6	78	6.8
Lack of well skilled man power	7	1.8	15	3.6	6	1.7	28	2.4
Religious custom	15	3.9	18	4.3	17	4.9	50	4.4
Silent heat nature of the cattle	25	6.4	25	6.0	24	7.0	74	6.4
Size and performance of cattle	8	2.1	10	2.4	19	5.5	37	3.2
Uncontrolled mating system	65	16.7	70	16.8	60	17.4	195	17.0

N = Number of observation

Likewise to the opportunity, the assessment of this study also revealed the constraints which denied for unsuccessfulness of the cattle breed improvement program in the study areas. As the result indicated in table 9, uncontrolled mating system, In effectiveness of AI and loss of trust on technology, feed shortage and absence of multiple/alternative service areas were the major factors which denied the improvement program with the overall value of 17.0%, 16.4%, 10.7% and 7.4% respectively. According to Birthal and pathasarathy Rao [12] Crossbreeding of low-yielding indigenous breeds with high-yielding exotic breeds has been widely acknowledged as a valuable strategy to improve animal productivity.

CONCLUSIONS

Type of mixed farming system was characterized as the farmers were applied with the intention of source income both from the livestock and crop sales. Feed shortage, disease and parasite and marketing problems were the major limiting factor of cattle production in the study areas. Communal grazing/browsing, improved forage and Agro Industrial by products were identified as a source of animal feed in addition to crop residue and conventional animal feeds. In line with the communal grazing land, there was decreasing of grazing land due to the expansion of coffee and crop cultivation; which resulted for the shortage of animal feed in the study areas. Regarding to cattle genetic improvement program, the attention of the government by providing service without fee, presence of man power , contribution of NGO (AGP and others) and cooperative dairy farms were observed as a good opportunity for the successful improvement of genetics of the cattle, however, uncontrolled mating system, Ineffectiveness of AI and loss of trust on technology, feed shortage and absence of multiple/ alternative service areas were identified as a major constraints for unsuccessfulness of cattle breed improvement program.

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