Volume: 1, Issue: 1
Page: 01-17
2019

Journal of Scientific Reports

Characterization of Natural Production Environment of Ogaden Cattle Breed in Wabeshebele zone of Somali Regional State in Ethiopia

Asefa Masha Mengesha and Yesihak Yusuf Mummed

Abstract

The objective of the study was to characterize natural production environment of Ogaden cattle breed. Questionnaire used for the study was designed using the general information developed by FAO (2012). 3 districts and 6 kebeles were purposely and 126 cattle keepers were randomly selected for data collection. The studied variables were farming, cattle breeding practice, purpose of keeping, selection criteria, feeding, health care and veterinary service, income and non-income function, and cattle production constraints. SAS version 9.2, 2008 software was used for data analysis. 30.16% were pastoral while 69.84% were agro-pastoral. Significant difference seen between districts in crop land holding, but no significant difference between districts in forage land holding. Cattle keepers prefer to keep local Ogaden cattle breed and were practicing pure breeding. Majority of them do not produce adequate pasture. They treat diseased animals by traditional method (57.94%). Male cattle were kept for socio-cultural purpose whilst female cattle were kept for milk production. None of the agro-pastoral respondents have recalled that they use draught power and manure of cattle. Cow milk in the study area has taken the first line consumed by the livestock owners and generating daily income for their family need among other livestock products making cattle the most important livestock species. Prolonged feed shortage was the first cattle production constraint. The cattle keeping society in the studied area appeared to have distinct culture and tradition of keeping and utilization cattle.

IJSB
Accepted 10 June 2019
Published 29 August 2019
DOI: 10.5281/zenodo.3381513

Keywords: characterization, natural, Ogaden cattle breed, production environment, traditional disease treatment methods.

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1. Introduction

The pressure of selection imposed by climate, soil type, altitude, available feed supply, endemic diseases and parasites, variability in management techniques and market demands is the source of the diversity of animal genetic resources we have at present (ESAP, 2013). Small and isolated communities may maintain unique animal genetic resources which are kept for cultural, religious or socioeconomic reasons in which they are found (FAO, 2012). Environmental changes (including the biophysical, socio-economic and management attributes of the production environment) are factors contributing to the change in animal genetic resource (Moyo, 1994). On-farm characterization provides information on location-specific production conditions and location-specific performance of individual animals or breeds, as well as on breed improvement options appropriate to particular systems (Peters and Thorpe, 1989). The objective of the study was to characterize production environment of Ogaden cattle breed under smallholder condition.

2. Materials and methods

2.1 . Descriptions of the Study Area

Characterization of natural production environment of Ogaden cattle breed was conducted in Wabeshebele Zone in Somali regional state in Ethiopia. Wabeshebele is located south-eastern portion of the Somali regional state of Ethiopia. The Zone is characterized by high temperature, erratic rainfall and totally arid lowland occupied by pastoral and irrigation based agro-pastoral population whose livelihood is mainly depend on range-livestock production. The landscape consists of dense shrub land, bush grassland and bare hills. The soil texture is sandy clay loam with alkaline pH, high phosphorus and potassium, moderate sodium and cation exchange capacity and low organic carbon content (Sisay, 2014).

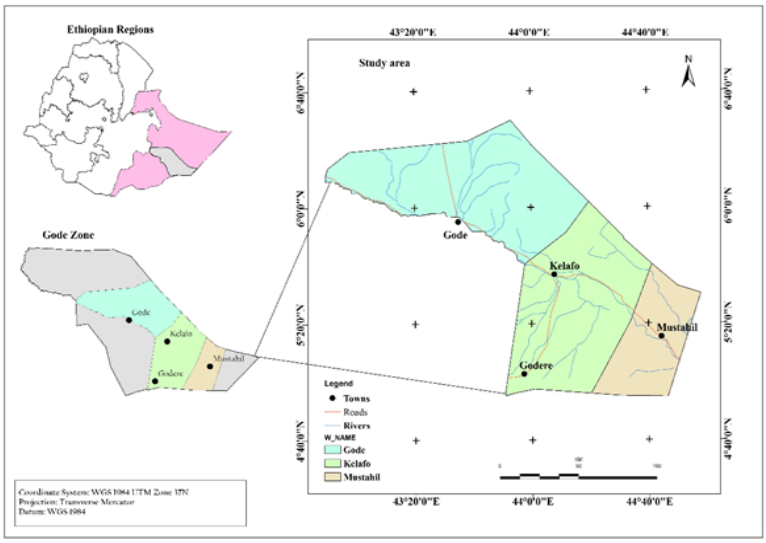

Figure 1: Map of the study area.

2.1 Data Collection

Secondary information was obtained from Wabeshebele Zone Agricultural Office and Agricultural Office of districts. The study was conducted in sample districts (Gode, Kalafo and Mustahil) which were selected based on the presence of relatively large proportion of cattle population and security of works according to the zone administration view. From each sampling districts, two sampling kebeles were selected based on the proximity to districts and security of works according to the district administration view. Then the chairman of the

selected kebele and tribe leaders and elders asked to recall about a total of 126 households based on the size and composition of cattle herd and who have experienced with cattle husbandry for years and sociability in personality for administration of semi-structured questionnaire. Selected households were aware of the objectives of research and they were told that they would get veterinary intensive for their diseased animals free of charge if they participate actively. This technique was created and used with the aim to avoid interview fatigue, to make the owners voluntary to allow collecting all required data and for active participation. Data were collected over a period of five months (mid-September, 2014 to mid-February, 2015) side by side On-farm phenotypic characterization of Ogaden cattle breed, which was published in this year. The studied variables were farming system and cultivated land holding, cattle breeding practice, purpose of keeping female and male Ogaden cattle, selection criteria for female and male Ogaden cattle, feeding Ogaden cattle, health care and veterinary service practice, income and non-income function of Ogaden cattle, cattle production constraints in the study area.

2.2 .Data Analysis

For data analysis, SAS version 9.2, 2008 software was used. Indices were calculated for ranking data according to a formula: Index = sum of (5x number of households ranked first + 4x number of households ranked second + 3x number of households ranked third +2x number of households ranked fourth + 1x number of households ranked fifth) give for each parameter divided by sum of (5x number of households ranked first + 4x number of households ranked second + 3x number of households ranked third + 2x number of households ranked fourth +1x number of households ranked fifth) for all parameters for those parameters ranked (1 to 5). The difference in frequency concerning specific variable of interest was tested and seen by chi-square test.

3. Results and discussion

3.1. Farming System and Cultivated Land Holding

Table 1 show farming system by district. 30.16% of respondents in the study area were engaged totally in livestock rearing (pastoral) while the rest 69.84% engaged in cultivating crop as second option in the study area (agro-pastoral). The study result reveals that there is difference in engagement in different farming system in different study districts within the same zone ($p<0.05$)

Table 1: Farming system by districts

Farming System	District						Overall	
	Gode		Kalafo		Mustahil			
	Freq.	%	Freq.	%	Freq.	%	Freq.	%
Pastoral	18	42.86	-	-	20	47.62	38	30.16
Agro-pastoral	24	57.14	42	100	22	52.38	88	69.84
Total	42		42		42		126	
χ^2	27.212							
P- value	<.0001							

$p<0.05$ shows significant difference

Table 2 shows cultivated land holding by district. Owners in the Mustahil district were producing relatively highest forages for their livestock than other districts whilst in Kalafo producing lowest. However, the number of owner producing both crop and forage together were relatively highest in Kalafo than other districts. The mean cultivated land was 0.67hectare, 1.38 hectare and 0.65 hectare per household for Gode, Kalafo and Mustahil

district, respectively. Of this, the mean forage land was 0.56 hectare, 0.47 hectare and 0.46 hectare per household for Mustahil, Gode and Kalafo, respectively. The crop land holding was higher in Kalafo district than in Gode and Mustahil districts, respectively and no significant difference between districts in case of forage land holding.

Table 2: Mean cultivated landholding by district

District	Cultivated land(ha)	N	Mean	SD	Min.	Max.
Gode	Crop land	42	0.20^{b}	0.35	0	1
	Forage land	42	0.47^{a}	0.65	0	2
	Total cultivated land	42	0.67^{b}	0.77	0	2
Kalafo	Crop land	42	0.91^{a}	0.21	0	1
	Forage land	42	0.46^{a}	0.49	0	2
	Total cultivated land	42	1.38^{a}	0.51	0.5	3
Mustahil	Crop land	42	0.10^{b}	0.26	0	1
	Forage land	42	0.56^{a}	0.71	0	2
	Total cultivated land	42	0.65^{b}	0.76	0	2
Overall	Crop land	126	0.41*	0.45	0	1
	Forage land	126	0.49^{ns}	0.62	0	2
	Total cultivated land	126	0.90	0.76	0	3

Ha=hectare; Means with different letter are significantly different; ns =non- significant; * significant at P<0.05, N= number of observation

The value observed for farming system and cultivated land holding can be better associated with the biophysical and cultural influence among tribes/clans, which discourage involvement in agricultural activities other than livestock rearing. This may be the indicator of tribe-based culture affects the level of dependency on specific farming system. The culture of east Africa gives the impression of having an agricultural foundation (Herskovits, 1996). The rain-fed livestock production system in arid and semi-arid tropics and sub-tropics is restricted to low primary productivity of land resulting from low rain fall and the more sever the constraint, the less important crops become in the system and the more livestock takes over as a primary income and subsistence source (Steinfeld and Maki-Hokkonen, 2015).

3.2. Cattle Breeding Practice

85.71%, 83.33% and 88.10% cattle keepers prefer to keep solely local Ogaden cattle breed in Gode, Kalafo and Mustahil districts, respectively. It was observed that artificial insemination was not yet practiced in the study area and cattle keepers have practiced pure breeding of Ogaden cattle breed (Table 3). No significant difference was observed on breed preference and application of artificial insemination between districts (p>0.05).

Table 3: Cattle breeding practice by district

Cattle breeding practice		District						χ^2	P- value
		Gode		Kalafo		Mustahil			
		N	%	N	%	N	%		
Breed preference	Local only	36	85.71	35	83.33	37	88.10	0.385	0.825
	Other than local	0	0		0		0		
	Together with any other new breed	6	14.29	7	16.67	5	11.90		
Castration	Yes		0		0		0	0.000	1.000
	No	42	100	42	100	42	100		
Heat	Observation of		100		100		100	0.000	1.000

detection method	anatomical, physiological and behavioral change								
	Use of teaser male/castrated		0		0		0		
Source of bull	Home bred only		0		0		0	0.000	1.000
	Neighbor		0		0		0		
	Any bull they could find	42	100	42	100	42	100		
Controlled mating	Random, non-seasonal	42	100	42	100	42	100	0.000	1.000
	Random, seasonal		0		0		0		
	Controlled, natural		0		0		0		
	Application of artificial insemination		0		0		0		

N=number of observation; P<0.05 shows the significant difference.

The value observed for preference of local cattle breed is possibly related to the social-cultural and economic value that they attach on their own cattle breed in maintaining the desired quality of their animals in the area. The recent research finding is similar to the finding by (Shiferawu, 2007 and Solomon, 2010). Artificial insemination was not yet practiced in the study area and cattle keepers have practiced pure breeding of Ogaden cattle breed. This indicates that breed improvement extension works have not yet implemented in the study area and admixtures and interbreeding with neighboring Borana breed. There is general concern that the genetic variation within East African cattle is disappearing through breed substitution, indiscriminate crossbreeding and the absence of breed development programs and increasing human population that has led to intensified settlement in pastoral areas thereby reducing the land available for livestock grazing and famine and civil conflict, which have severely affected localized populations and accelerated admixtures and interbreeding among breeds (Jahnke, 1982). The recent research finding is similar to the finding by Solomon (2010).

3.3. Purpose of Keeping Female and Male Ogaden Cattle

Table 4 shows purpose of keeping female cattle by district. The highest index value of 0.32, 0.41 and 0.32 of cattle owners keep females in the herd primarily for milk production in Gode, Kalafo and Mustahil districts, respectively. There was no significant difference between study districts purpose of keeping female cattle (p>0.05).

Table 4: Purpose of keeping female cattle by district

District	Purpose of keeping female cattle	Rank					
		1	2	3	4	5	Index
Gode	Milk production	36	4	2	0	0	0.32
	Cultural bride gift	4	34	4	0	0	0.27
	Cultural conflict resolution	2	4	28	3	5	0.19
	Meat production	0	0	3	29	10	0.12
	Ceremony slaughter	0	0	5	10	27	0.10
Kalafo	Milk production	38	2	2	0	0	0.41
	Cultural bride gift	2	36	4	0	0	0.33
	Cultural conflict resolution	2	4	27	4	5	0.24
	Meat production	0	0	3	28	11	0.15
	Ceremony slaughter	0	0	6	10	26	0.13

Mustahil	Milk production	35	5	2	0	0	0.32
	Cultural bride gift	5	34	3	0	0	0.27
	Cultural conflict resolution	2	3	28	4	5	0.18
	Meat production	0	0	4	30	8	0.12
	Ceremony slaughter	0	0	5	8	29	0.10
Significance between districts		χ^2			P- value		
	Milk production	0.723			0.696		
	Cultural bride gift	0.438			0.803		
	Cultural conflict resolution	0.208			0.901		
	Meat production	0.044			0.978		
	Ceremony slaughter	0.246			0.884		

P<0.05 shows the significant difference.

The highest index value of 0.32, 0.33 and 0.32 of respondents ranked cultural conflict resolution as first purpose of keeping male cattle in Gode, Kalafo and Mustahil, respectively (Table 5). Similarly, the value of 0.14, 0.13 and 0.15 ranked meat production potential as fourth purpose of keeping male cattle in Gode, Kalafo and Mustahil, respectively and none of them ranked it first. . Unique finding of the present study is that none of the respondents keep their male cattle for the purpose of draught power even in the agro-pastoral system in all districts. No significant difference was observed between districts on purpose of keeping male cattle in the herd (p>0.05).

Table 5: Purpose of keeping male in the herd by district

District	Purpose of keeping male cattle	Rank					
		1	2	3	4	5	Index
Gode	Cultural conflict resolution	38	2	2	0	0	0.32
	Ceremony slaughter	2	31	2	4	3	0.24
	Cultural bride gift	2	2	31	2	5	0.19
	Meat production	0	4	2	31	5	0.14
	Milk production	0	3	5	5	29	0.11
Kalafo	Cultural conflict resolution	40	0	2	0	0	0.33
	Ceremony slaughter	0	32	3	2	5	0.23
	Cultural bride gift	2	3	31	3	3	0.20
	Meat production	0	2	3	30	7	0.13
	Milk production	0	5	3	7	27	0.11
Mustahil	Cultural conflict resolution	38	2	2	0	0	0.32
	Ceremony slaughter	2	32	2	4	2	0.24
	Cultural bride gift	2	2	29	5	4	0.18
	Meat production	0	4	5	28	5	0.15
	Milk production	0	2	4	5	31	0.10
Significance between districts		χ^2			P- value		
	Cultural conflict resolution	0.686			0.709		
	Ceremony slaughter	0.141			0.931		
	Cultural bride gift	0.155			0.925		
	Meat production	0.366			0.832		
	Milk production	0.929			0.628		

P<0.05 shows the significant difference.

3.4. Selection criteria for female and male Ogaden cattle

The ranking made by the respondents showed that the highest value of 0.28, 0.29 and 0.30 of respondents ranked body conformation as first selection criteria for female cattle in Gode,

Kalafo and Mustahil, respectively (Table 6). No significant difference was observed between districts on selection criteria for female cattle in the herd (p>0.05).

Table 6: Selection criteria for female cattle by district

District	Selection criteria for female cattle	Rank					
		1	2	3	4	5	Index
Gode	Body conformation	30	2	2	4	4	0.28
	Coat color	2	31	2	4	3	0.24
	Hump position and size	2	2	31	2	5	0.19
	Temperament	4	4	2	27	5	0.16
	Body condition score	4	3	5	5	25	0.13
Kalafo	Body conformation	33	0	2	3	4	0.29
	Coat color	0	31	3	3	5	0.23
	Hump position and size	2	2	31	3	4	0.19
	Temperament	3	3	3	28	5	0.15
	Body condition score	4	6	3	5	24	0.14
Mustahil	Body conformation	33	2	2	4	1	0.30
	Coat color	2	32	2	4	2	0.24
	Hump position and size	2	2	30	4	4	0.19
	Temperament	4	4	4	25	5	0.16
	Body condition score	1	2	4	5	30	0.11
Significance between districts		χ^2			P- value		
	Body conformation	1.094			0.578		
	Coat color	0.092			0.954		
	Hump position and size	0.030			0.984		
	Temperament	0.260			0.877		
	Body condition score	3.390			0.183		

P<0.05 shows the significant difference.

Table 7 shows selection criteria for male cattle by district. The highest index value of 0.30, 0.30 and 0.30 of respondents ranked hump position and size as first selection criteria for male cattle in Gode, Kalafo and Mustahil, respectively. No significant difference was observed between districts on selection criteria for male cattle in the herd (p>0.05).

Table 7: Selection criteria for male cattle by district

District	Selection criteria for male cattle	Rank					
		1	2	3	4	5	Index
Gode	Hump position and size	29	5	4	2	2	0.30
	Temperament	5	31	3	2	1	0.26
	Coat color	4	3	28	2	5	0.20
	Body conformation	2	2	2	31	5	0.14
	Body condition score	2	1	5	5	29	0.10
Kalafo	Hump position and size	31	3	3	3	2	0.30
	Temperament	4	30	6	1	1	0.26
	Coat color	3	6	26	3	4	0.20
	Body conformation	2	1	4	28	7	0.14
	Body condition score	2	2	3	7	28	0.10
Mustahil	Hump position and size	31	5	3	2	1	0.30
	Temperament	5	32	2	2	1	0.26
	Coat color	3	2	28	4	5	0.19
	Body conformation	2	1	5	29	5	0.15
	Body condition score	1	2	4	5	30	0.10
Significance between districts		χ^2			P- value		
	Hump position and size	0.395			0.819		

Temperament	0.138	0.933
Coat color	0.122	0.940
Body conformation	0.382	0.826
Body condition score	0.108	0.947

P<0.05 shows the significant difference.

The value observed for purpose of keeping female and male cattle, and for selection criteria for female and male cattle, respectively can be better associated with distinct socio-economic and cultural interest of cattle keepers for separate sex of the same cattle breed in the study area. The findings for purpose of keeping female cattle (Table 4) are in close agreement with the finding of (Rege and Tawah, 1999 and DAGRIS, 2009). The findings for purpose of keeping male cattle (Table 5) are in contrast to (Steinfield and Maki-Hokkonen, 2015). Indigenous cattle of East Africans provide draft used in cultivation of crops and large component of the manure essential to agriculture (Jahnke, 1982).

3.5. Feeding Ogaden cattle

Table 8 shows feeding supplementary feed by district. The highest index value of 0.42, 0.5 and 0.5 of respondents ranked cereal crops and their by-products as first supplementary feeds in Gode, Kalafo and Mustahil, respectively. No significant difference was observed between districts on supplementary feeding practice (p>0.05).

Table 8: Feeding supplementary feed by district

District	Supplementary feeds and their source	Rank			
		1	2	3	Index
Gode	Source is Own farm	16	26	0	0.46
	Source is Off-farm	26	16	0	0.54
	Cereal crops and their by-products	42	0	0	0.42
	Industrial by-products	0	33	9	0.32
	Tree crops	0	9	33	0.26
Kalafo	Source is Own farm	16	26	0	0.46
	Source is Off-farm	26	16	0	0.54
	Cereal crops and their by-products	42	0	0	0.5
	Industrial by-products	0	29	13	0.28
	Tree crops	0	13	29	0.22
Mustahil	Source is Own farm	18	24	0	0.48
	Source is Off-farm	24	18	0	0.52
	Cereal crops and their by-products	42	0	0	0.5
	Industrial by-products	0	29	13	0.28
	Tree crops	0	13	29	0.22
Significance between districts		χ^2		P- value	
	Source is Own farm	5.303		0.070	
	Source is Off-farm	5.303		0.070	
	Cereal crops and their by-products	0.000		1.000	
	Industrial by-products	1.998		0.368	
	Tree crops	1.255		0.533	

P<0.05 shows the significant difference.

The value observed for feeding supplementary feed might be associated with land ownership problem, capital limitation for irrigation based production and cultural background of cultivating land. In Asia, increased crop production and feed availability is an important way

of intensifying and maximizing animal productivity, however, the prospects for increasing cultivation area are limited (Steinfield and Maki-Hokkonen, 2015).

3.6. Health care and veterinary service practice

Majority (57.94%) of respondents have reported that they treat diseased animals mostly by traditional method and the rest (42.06%) reported they apply traditional disease treatment sometimes (Table 9). The study result reveals that there is significant difference on application level of traditional disease treatment, distance from veterinary service and provision of veterinary service between districts ($p<0.05$) but no significant difference was observed between districts on availability of professional veterinary service and isolation practice of sick animals from healthy animals ($p>0.05$).

Table 9: Health care and veterinary service practice by districts

Health care practice and service		District			overall	χ^2	P-value
		Gode %	Kalafo %	Mustahil %	%		
Isolation of sick animals from the healthy	Practical	0	0	0	0	0.000	1.000
	Impractical	100	100	100	100		
Traditional disease treatment	Applied mostly	30.95	66.67	76.19	57.94	19.449	<.0001
	Applied sometimes	69.05	33.33	23.81	42.06		
	Not applied at all	0	0	0	0		
Distance from vet. Center	Near	100	0	0	33.33	125.000	<.0001
	Far	0	100	100	66.67		
Effective and efficient veterinary service	Adequate	0	0	0	0	125.000	<.0001
	Inadequate	100	0	0	33.33		
	Lack	0	100	100	66.67		
Certified vet. Professional	Adequate	0	0	0	0	0.000	1.000
	Inadequate	0	0	0	0		
	Lack	100	100	100	100		

$P<0.05$ shows the significant difference.

According to respondents, the traditional disease treatment methods that when swelling of abdomen caused by high accumulation of gases in the rumen resulted from consumption of some species of poison grasses, they treat this disease condition by using food oil mixed with tomato of one tea cup. According to the respondents, the other disease conditions that can be treated traditionally were locally called *"shimbirekodure"*. The symptom of this disease condition is dropping of tongues, misshaping the mouth, prolonged opening of mouth and high saliva excretion. According to their report, they treat this disease condition traditionally by using root of specific tree/shrub species on mountain. They treat by brushing the mouth of diseased animal or oral administration of its fluid. The other disease condition that owners in the study area treat traditionally is locally called *Shimbirdiba'a"*. The symptom of this disease condition is loss of appetite, restlessness, emaciation and highly pelleted feces. They reported that the traditional treatment of this disease condition is burning of the head (around the

joint of upper and lower jaws) and nostril. This disease conditions occur suddenly and not seasonal (one of disease outbreak) in the study area. The value observed for cattle health care practice is better associated with lack and or inadequate veterinary service in the study area that forced owners to inefficient traditional disease treatment practice. The present finding is similar with the findings by Shiferaw (2007) who reported on Kereyu cattle breed that nearly half of the households depend on the indigenous practice to treat their sick animals. The recent finding is in contrast to the findings by Solomon (2010) who reported on Boran cattle breed that only 11.2% use tradition disease treatment to treat their sick animals.

3.7. Income and non-income function of Ogaden cattle

Table 10 shows income function of cattle by district. The highest index value of 0.37, 0.36 and 0.37of respondents ranked milk production as first income function of cattle in Gode, Kalafo and Mustahil, respectively. No significant difference was observed between districts on ranking of income function of cattle ($p>0.05$).

Table 10: Income function of cattle by district

District	Income function of cattle	Rank				
		1	2	3	4	Index
Gode	Milk production	34	4	2	2	0.37
	Sale of live animal	4	28	7	3	0.28
	Hide production	2	7	27	6	0.21
	Meat production	2	3	6	31	0.14
Kalafo	Milk production	34	3	3	2	0.36
	Sale of live animal	2	30	7	3	0.28
	Hide production	4	6	27	5	0.22
	Meat production	2	3	5	32	0.14
Mustahil	Milk production	34	4	3	1	0.37
	Sale of live animal	4	26	9	3	0.27
	Hide production	3	8	25	6	0.22
	Meat production	1	4	5	32	0.14
Significance between districts		χ^2		P- value		
	Milk production	0.031		0.984		
	Sale of live animal	0.587		0.745		
	Hide production	0.933		0.627		
	Meat production	0.055		0.972		

$P<0.05$ shows the significant difference.

Table 11 shows daily income source livestock in the study area. The highest index value (0.33, 0.36 and 0.33) of respondents ranked cattle as first daily income source livestock species in Gode, Kalafo and Mustahil, respectively. However, the significant difference was observed between districts on ranking frequency of income source livestock species.

Table 11: Daily income source from livestock species

District	Daily income source livestock species	Rank					
		1	2	3	4	5	Index
Gode	Cattle	39	2	1	0	0	0.33
	Donkey	0	39	2	1	0	0.26
	Goat	1	0	39	2	0	0.20
	Sheep	2	1	0	39	0	0.15
	Camel	0	0	0	0	42	0.06
Kalafo	Cattle	42	0	0	0	0	0.36
	Donkey	0	42	0	0	0	0.29
	Goat	0	0	42	0	0	0.21

		Sheep	0	0	0	42	0	0.14
		Camel	0	0	0	0	0	0
Mustahil		Cattle	35	2	5	0	0	0.33
		Donkey	0	35	2	5	5	0.27
		Goat	5	0	35	2	0	0.23
		Sheep	2	5	0	35	0	0.17
		Camel	0	0	0	0	0	0
Significance districts	between		χ2			P- value		
		Cattle	8.280			0.015		
		Donkey	8.280			0.015		
		Goat	7.906			0.019		
		Sheep	7.567			0.022		
		Camel	125.0			<0.0001		

P<0.05 shows the significant difference.

Daily income generating livestock product is presented in Table 12. The highest index value of 0.33, 0.34 and 0.36 of respondents ranked sale of cow milk as first daily income generating livestock product in Gode, Kalafo and Mustahil, respectively, followed by draught power of donkey. Even those who rear camel ranked sell of camel milk fifth and none of them ranked camel milk first, second, third or fourth in the study area. The study result reveals that there is significant difference on sell of cow milk, donkey draught power and sell of camel milk between districts (p<0.05) but no significant difference was observed between districts on sell of goat milk and sell of sheep milk (p>0.05).

Table12: Daily income generating livestock product

District	Daily income generating livestock product	Rank					
		1	2	3	4	5	Index
Gode	Sell of cow milk	39	3	0	0	0	0.33
	Draught power of donkey	3	39	0	0	0	0.27
	Sell of goat milk	0	0	26	16	0	0.17
	Sell of sheep milk	0	0	16	26	0	0.16
	Sell of camel milk	0	0	0	0	42	0.07
Kalafo	Sell of cow milk	29	13	0	0	0	0.34
	Draught power of donkey	13	29	0	0	0	0.31
	Sell of goat milk	0	0	30	12	0	0.19
	Sell of sheep milk	0	0	12	30	0	0.16
	Sell of camel milk	0	0	0	0	0	0
Mustahil	Sell of cow milk	42	0	0	0	0	0.36
	Draught power of donkey	0	42	0	0	0	0.29
	Sell of goat milk	0	0	31	11	0	0.19
	Sell of sheep milk	0	0	11	31	0	0.16
	Sell of camel milk	0	0	0	0	0	0
Significance between districts		χ2			P- value		
	Sell of cow milk	19.744			<0.0001		
	Draught power of donkey	19.744			<0.0001		
	Sell of goat milk	1.547			0.461		
	Sell of sheep milk	1.547			0.461		
	Sell of camel milk	125.00			<0.0001		

P<0.05 shows the significant difference.

Figure 2: Transport of cattle milk from rural area to urban for food exchange

The highest index value of 0.40, 0.40 and 0.40 of respondents ranked conflict resolution as first non-economic/income function of cattle in Gode, Kalafo and Mustahil, respectively (Table 11).

Table13: Non-income function of cattle by district

District	Non-income function of cattle	Rank		
		1	2	Index
Gode	Conflict resolution	42	0	0.40
	Bride payment and gif	33	9	0.36
	Draught/traction or drag on	9	33	0.24
Kalafo	Conflict resolution	42	0	0.40
	Bride payment and gif	36	6	0.37
	Draught/traction or drag on	6	36	0.23
Mustahil	Conflict resolution	42	0	0.40
	Bride payment and gif	34	8	0.36
	Draught/traction or drag on	8	34	0.24
Significance between districts		χ^2	P- value	
	Conflict resolution	0.738	0.691	
	Bride payment and gif	0.738	0.691	
	Draught/traction or drag on	0.000	1.000	

P<0.05 shows the significant difference.

The value observed for income function of cattle (Table 10) is associated with economic importance of cattle to supply milk. The base of wealth is cattle, which supply an appreciable portion of food of the east African tribes and constitutes one of the most noticeable element in their culture and cattle have become the dominant culture of these people and distribution of the cattle in east Africa demonstrates its applicability to African cultures (Herskovits, 1996). In central and southern America, particularly in Brazil, under smallholder condition, milk

tends to be a more important output from cattle than meat (Steinfeld and Maki-Hokkonen, 2015). Indigenous cattle are vital to subsistence and economic development in eastern Africa, contributing 50% of the total food production from livestock and they sustain the employment and income of millions of East Africans, two-thirds of whom are rural-based (Jahnke, 1982). The value observed for identification of daily income generating livestock species and products (Table 11 and 12) can be associated with primary socio-economic preference of cattle than other livestock species. The recent finding reveals that cattle was the most important livestock species in the pastoral and agro-pastoral system in the study area followed by donkey and goat among other livestock species for the fact that camel was reared by only some wealthy individual of Ogadeni tribe whilst cattle were reared by all livestock owners regardless of effect of specific culture of existing tribes/ethnic groups due to the sum of its adaptive, productive, reproductive and behavioral characteristics over other livestock species managed under the same natural environment in the study area. In all East Africa, cattle constitute wealth and a man may have iron, produce from his fields, sheep and goats, implements of all kinds, but unless he has cattle, his wealth amounts to nothing so that the base of wealth is cattle, which supply an appreciable portion of food of the east African tribes and constitutes one of the most noticeable element in their culture and cattle have become the dominant culture of these people (Herskovits, 1996). But, in contrast, Yoseph *et al*. (2013) said that all interviewed households in Gode, Jijiga, and Shinille earned income primarily from camel which is followed by goat, sheep or cattle. The value observed for utilization of draught power of cattle (Table 13) is possibly related to low engagement background of cropping practice and lack of knowledge of importance of cattle draught power to cropping sub-sector. The result of the present study contrasts the stud by Steinfeld and Maki-Hokkonen (2015) who reported that cattle for animal traction are the main ruminant resource in arid and semi-arid tropics and sub-tropics countries (like Near east, South Asia, North Africa, Western United States and Mixco) practicing irrigated mixed farming system. And also by Moyo and Ntombizakhe (1996) who reported that cattle are kept in most cases for draught power and manure rank very highly. Cattle are considered to have been one of the first animals domesticated by man for agricultural purposes. They were tamed to provide milk, meat and hides and for draft purposes (Brute, 2015). But, agree with Herskovits (1996) who reported that the attitude of most of cattle keepers in east African was they feel that it is unethical to make their cattle work.

Abigar cattle breed of Gambella region of Ethiopia are used mainly for milk; they are used for their beef during traditional ceremonies; occasional taking of blood from young bulls for human food was common in earlier times (Rege, 1992). The Barotse is a docile animal and makes a good work animal. The Barotse are triple purpose cattle (beef, dairy and work), beef being the most important product. Pastoralist herders use the Boran mainly for milk; however, the commercial interest is for beef. Butane is used for milk, draught power and meat. The Danakil cattle are kept for triple purpose: milk, meat and work, but mainly for milk. The Ghana Sanga is used both for dairy and beef. Kennan is used for milk, draught power and meat. The Kenya Sahiwal is principally a dual-purpose (meat and milk) breed. They are improved simultaneously for dairy and beef. The N'Dama cattle are known for their beef conformation, although partial milking is frequently carried out in the traditional herds of West Africa. The Sheko is used mainly for meat and work). The Shuwa breed is used for work, meat and milk in that order of importance. They are also used for riding, as pack and draft animals (DAGRIS, 2009).

3.8. Cattle production constraints in the study area

Table 14 shows cattle production constraints by district. The highest index value of 0.30, 0.30 and 0.30 of respondents in Gode, Kalafo and Mustahil ranked prolonged feed shortage as the first cattle production constraint. There is significant difference on occurrence of conflict and availability of infrastructure between districts ($p<0.05$) but no significant difference was observed between districts in ranking frequency of prolonged feed shortage, disease and parasite problem and livestock –land use system ($p>0.05$).

Table 11: Cattle production constraints by district

District	Cattle production constraints	Rank					
		1	2	3	4	5	Index
Gode	Prolonged feed shortage	24	15	3	0	0	0.30
	Conflict	15	19	8	0	0	0.28
	Poor infrastructure	0	0	0	42	0	0.13
	Disease and parasites	3	0	31	0	8	0.18
	Poor livestock-land use system	0	8	0	0	34	0.11
Kalafo	Prolonged feed shortage	23	13	6	0	0	0.30
	Conflict	1	0	4	37	0	0.14
	Poor infrastructure	13	24	5	0	0	0.28
	Disease and parasites	5	0	27	5	5	0.19
	Poor livestock-land use system	0	5	0	0	37	0.09
Mustahil	Prolonged feed shortage	24	11	7	0	0	0.30
	Conflict	0	0	3	39	0	0.14
	Poor infrastructure	11	22	9	0	0	0.27
	Disease and parasites	7	1	23	3	8	0.19
	Poor livestock-land use system	0	8	0	0	34	0.10
Significance between districts		$\chi 2$			P- value		
	Prolonged feed shortage	1.915			0.3839		
	Conflict	50.31			<0.0001		
	Poor infrastructure	31.77			<0.0001		
	Disease and parasites	2.55			0.2794		
	Poor livestock-land use system	1.021			0.6004		

$P<0.05$ shows the significant difference.

Table 15 shows the causes of feed shortage by district. The index value of 0.35, 0.36 and 0.35 of respondents ranked prolonged dry season as first cause of feed shortage in Gode, Kalafo and Mustahil, respectively, followed by land degradation. All of the respondents ranked shrinkage of rangeland fourth and none of them ranked it first, second or third cause of feed shortage in the study area. No significant difference was observed between districts on ranking of no-income function of cattle ($p>0.05$).

Table 12: Causes of feed shortage by districts

District	Cause of feed shortage	Rank				
		1	2	3	4	Index
Gode	Prolonged dry season	27	8	7	0	0.35
	Rangeland degradation	8	30	4	0	0.31
	Lack of feeding strategy	7	4	31	0	0.24
	Shrinkage of rangeland	0	0	0	42	0.10
Kalafo	Prolonged dry season	31	6	5	0	0.36
	Rangeland degradation	6	27	9	0	0.29
	Lack of feeding strategy	5	9	28	0	0.25

	Shrinkage of rangeland	0	0	0	42	0.10
Mustahil	Prolonged dry season	27	8	7	0	0.35
	Rangeland degradation	7	29	6	0	0.30
	Lack of feeding strategy	8	5	29	0	0.25
	Shrinkage of rangeland	0	0	0	42	0.10
Significance between districts		χ^2		P- value		
	Prolonged dry season	0.793		0.672		
	Rangeland degradation	0.546		0.761		
	Lack of feeding strategy	0.318		0.852		
	Shrinkage of rangeland	0.000		1.000		

P<0.05 shows the significant difference.

Table 16 shows marketing problems by districts. The corresponding value of 0.34, of respondents ranked poor tax collection of method as first market problem whilst 0.35 in Kalfo and 0.36 in Mustahil ranked lack and inadequate market facilities as first market problem, respectively . No significant difference was observed between districts on ranking of no-income function of cattle (p>0.05), except tax collection method.

Table 13: Marketing problems by districts

District	Market Problem	Rank				
		1	2	3	4	Index
Gode	Poor tax collection method	30	4	4	4	0.34
	Poor market information	4	28	6	4	0.28
	Lack and inadequate market facilities	4	6	27	5	0.22
	Poor market demand for cattle	4	4	5	29	0.16
Kalafo	Poor tax collection method	5	6	27	4	0.23
	Poor market information	2	30	6	4	0.27
	Lack and inadequate market facilities	32	2	5	3	0.35
	Poor market demand for cattle	3	4	4	31	0.15
Mustahil	Poor tax collection method	4	6	26	6	0.22
	Poor market information	3	28	6	5	0.27
	Lack and inadequate market facilities	33	3	4	2	0.36
	Poor market demand for cattle	2	5	6	29	0.15
Significance between districts		χ^2		P- value		
	Poor tax collection method	27.163		<0.0001		
	Poor market information	0.432		0.805		
	Lack and inadequate market facilities	3.747		0.153		
	Poor market demand for cattle	0.320		0.852		

P<0.05 shows the significant difference.

The value observed for major constraints of cattle production (Table 14, 15, and 16) can be associated with biophysical factors (like harsh climate, farming system, livestock land use mismanagement and remoteness). Particularly ruminants in pastoral and extensive mixed systems in many developing countries suffer from permanent or seasonal nutritional stress and poor nutrition is one of the major production constraints in smallholder systems, particularly in Africa (Bruinsma, 2003). Major cattle production constraints are associated with management and husbandry, the nutrition-disease complex and the seasonality of feed availability, especially in the traditional system with communal grazing (Peters and Thorpe, 1989). Factors include increasing human population that has led to intensified settlement in pastoral areas thereby reducing the land available for livestock grazing and famine and civil conflict, which have severely affected localized populations of East African cattle (Okomo, 2002). High transportation and transaction costs involved in pastoral marketing process are

due to long distances, poor infrastructure and limited facilities were main marketing problems in pastoral societies (Hanotte, 2005).

4. Conclusion

Cultivated land holding was inadequate to nourish both human and livestock and livestock rearing was the mainstay in the study area. Culture of different tribes has affected proportion of livestock species between districts. Local cattle breed become the most important livestock among other livestock species and cattle keepers have practiced pure breeding of Ogaden cattle breed in the study area. Cow milk was the most important livestock product, which was the major portion of food for family and daily income source. Draught power and manure were cattle products not yet utilized by the cattle keepers in the study area. Lack and or inadequate veterinary service in the study area have forced owners to apply inefficient traditional disease treatment practice mostly. Major constraints of cattle production in the study area were associated with biophysical factors like harsh climate, farming system, livestock land use mismanagement and remoteness. Prolonged feed shortage which was related to prolonged dry season took first line of constraints of cattle production.

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Cite this article:

Asefa Masha Mengesha & Yesihak Yusuf Mummed (2019). Characterization of Natural Production Environment of Ogaden Cattle Breed in Wabeshebele zone of Somali Regional State in Ethiopia**.** *Journal of Scientific Reports,* 3(4), 1-17.
doi: https://doi.org/10.5281/zenodo.3381513

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