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Production system of indigenous goat population reared in pastoral and agro-pastoral districts of South Omo, Ethiopia

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ABSTRACT

The study was carried out to document the production system of indigenous Woyto-Guji goats and the major limitations to goat production reared in two districts (Nyangatom and Maale) of South Omo, Ethiopia. Stepwise purposive followed by a random sampling method was used to select respondents. Based on the result, the households in Nyangatom district preferred to rear cattle, goats and sheep and less number of poultry when compared to those residing in the Maale district. The purpose of keeping goats in the district was primarily for tangible and intangible benefits. They are raised for their milk, meat, and blood as a source of wealth creation and insurance against emergencies. The results also indicated that the respondents in Maale district provide feed supplements. Communal grazing is prevalent in Nyangatom district, while in the Maale district, they interchangeably used both communal and private grazing lands; this all depended on the carrying capacity of the grazing land. Natural grazing and browsing the bush was the common form of feeding in both the study areas, while crop residues too were provided in Maale district. The sources of water varied across the study areas, the respondents in Nyangatom district relied solely on river Omo, 'Omo shesh' and 'kure shesh'. While the flocks in Maale district were provided with water in the nearby streams besides the river water. The frequency of delivering water in the districts showed that every alternate day at Nyangatom and daily in the Maale district. The major limitation towards goat production in Nyangatom district was the unavailability of feed mainly in the dry season, followed by incidences of diseases; while some also indicated the problems associated with erratic and decrease in rainfall, thefts of the livestock were the identified problems. In Maale district, disease prevalence was major problem in the area as well as feed shortages followed by shrinkage of grazing lands, predators and lack of herders to take the animals for grazing. The current result on the production and farming system of goats and the major problems associated with goat production in the district helps to design different intervention options for the district.

Keywords: Woyito-Guji goats, Husbandry practice, Nyangatom and Maale district, South Omo, Ethiopia

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Introduction

Livestock production is an essential part of the Ethiopian agricultural system. Smallholder farmers mostly own goats along with sheep and are an integral part of the livestock sub-sector (Workneh, 2000), and they are reared both for subsistence and income generation (EARO, 2000; Ehui *et al.*, 2000).

Excluding the values of draught power, manure and transport of people and products, livestock is an essential part of agriculture. The contribution of live animals and their products to the agricultural economy accounts for around 40% (Aleme and Lemma, 2015). According to CSA

(2020/21) the goat population in the country is about 52.46 million heads. These animals are widely distributed across the different agro-ecological zones of the country (EARO, 2000; Solomon *et al.*, 2014). The result from a study by Gizaw *et al.* (2007) indicated that the genetic structure of small ruminants in Ethiopia and goats, being no exception, is strongly associated with historical patterns of their migration, geographic isolation and interbreeding. However, The morphological diversity observed in the species follows the ecological patterns where they are raised (Gizaw *et al.*, 2007; Agaviezor *et al.*, 2012).

The Southern Ethiopia Region of Ethiopia is endowed with approximately 5.52 million heads of goats (CSA, 2020/21), and the South Omo zone accounted 3.11 million. The region is gifted with mixed agro climate and topography and is the resident of two goat breeds and several ecotypes within the breeds.

FARM Africa (1996) grouped Woyto-Guji goats to be related to the Arsi-Bale type of goat breed and occupy a vast area extending from South Omo to Southern Sidama and Wolayita. The Woyto-Guji goats are reared for different reasons, such as milk, meat, skins and manure production, besides playing an integral part in the socio-cultural functions (ESGPIP, 2009). As the breeding tract of the goats extends to the tse-tse fly-infested areas of the district, it is expected that the Woyto-Guji goats are also tolerant to trypanosome disease. Its varied uses and disease tolerance, it is perceived that this breed can also be included in the community-based breeding program, especially in areas infested with tse tse flies. However, as the breeding tract of this goat breed extends to many remote areas of the Southern region, there have been very few scientific reports of understanding the breed's situation in different communities.

There are also virtually no studies on the production system of the Woyito Guji goats, and very little information is at hand when it comes to the traditional caprine management practices employed in the study area (SARI, 2012).

The owners are also well aware of their livestock's production potential, feed requirements and disease tolerance and are well acquainted with the correlated traits manifesting such characteristics (Mbuku *et al.*, 2006; FAO, 2009).

Objectives

- To characterize the production system and major husbandry practices of WG goat breeds.

Materials and Methods

Description of the study area

Nyangatom district, which is located between 4°85'-5°67' N latitude and 35°75'-36°23'E longitude, bordering Dasenech woreda in the south, Bench Maji and Salamago woreda's in the north, Hammer woreda in east, Kenya and South Sudan in West has a total land area of 2,652 Km² and situated at about 730 km from the capital city of SNNPR, Hawassa. Similarly, Maale district is located between 5°48'-6°01' N latitude and 36°30'-37°E longitude, bordering Kamba woreda in the northeast, Uba Debretehay woreda in the north, Derashe woreda in the east, Konso woreda in the south-east, Bena-Tsemay woreda in the south-west and Baka-Dawula Ari woreda in the west. Maale woreda is located about 577 km from the capital city of SNNPR, Hawassa and has a

total land area of 1,432 km². Nyangatom district agroecology was kola/arid with an altitude of 400-450 asl, and Maale district agro ecology was semi-arid with an altitude of 600-1500 asl, (SOFEDD, 2016). Nynagatom district's mean annual temperature ranges between 33 and 42°C and Maale 18-35°C. The rainfall pattern of Nyangatom district is erratic, with mean annual rainfall ranging from 350-500 mm. The mean annual rainfall of Maale area was 800-1200 mm (SOFEDB, 2016). According to Tekleyohannes *et al.* (2012), households in South Omo zone had informed that the Woyto-Guji goats in the studied districts originated from Maale and Gofa areas. The goat rearers in the district believed that the Maale area goats were superior to the goats from the lowland pastoral districts regarding milk production, body size and prolificacy (Tekleyohannes *et al.*, 2012).

The two districts were selected purposively because they are situated in the breeding tract of the Woyto-Guji goats.

Livestock and human profile

According to CSA (2020/21), South Omo zone has a huge livestock population of 2.73 million cattle, 3.11 million goats and 1.42 million sheep. The district Maale is inhabited by 97,339 people and has 67.9 people per sq.km. While Nyangatom has 18,012 people and 7.6 people per sq. km population density (SOFEDD, 2016). According to the SOFEDD (2016), there are three ethnic groups residing in the Nyangatom woreda viz. Nyangatom, Kuwegu and Murule; while in Maale woreda is inhabited mainly by the Maale ethnic group.

Data collection procedure

Sampling techniques

The studied woreda's were selected based on the information provided by the relevant authorities. Stepwise purposive sampling was carried out to determine the kebeles based on the presence and distribution of the goat breeds. Those who were willing to cooperate with the researcher, having a flock of more than ten Woyto-Guji goats and residing on the vicinity of the all-weather roads were identified. Accordingly, 6 kebeles from Maale district and 4 kebeles from Nyangatom district were selected. From each kebele's, potential goat rearers of fifteen respondents were selected, i.e. a total of 150 households.

Information about goat management was collected using a semi-structured questionnaire pretested and then translated into the local language. Secondary data on socio-economic traits, livestock population, agricultural production, farming practices and description of the woreda's were collected from published and unpublished sources.

Data collection method

Formal and informal survey tools were employed to gather information on goat farming and production details. Discussions using checklists were also undertaken with zonal and district livestock experts, development agents and key informants in all the selected kebele's to collect information on all aspects of livestock (goat) production in the two studied areas. Before administration of the questionnaire, some re-arrangement, reframing and correcting was done by pretesting it in accordance with respondents' perception. The questionnaire was given to select household heads to randomly collect the following major information.

- Socio-economic characteristics of the household: sex, education level, household size, livestock possession, economic benefit of goat and major production constraints; and
- Routine husbandry practices.

Analysis of data

The collected data were analyzed using statistical software (SPSS, 2007). Non-parametric frequency procedure of the chi-square test (χ^2) was used to analyse the qualitative data from the questionnaire and presented using tables and figures.

Indices were calculated for all ranking data according to the formula:

Index = sum of (3 for rank 1 + 2 for rank 2 + 1 for rank 3) given for an individual reason (attribute) divided by the sum of (3 for rank 1 + 2 for rank 2 + 1 for rank 3) for overall reasons.

Results and Discussion

Sample household's general characteristics

The results presented in Table 1 indicate that most of the household heads in both districts were illiterate. Illiteracy levels were, however, higher in the Nyangatom woreda. Respondents in the age group 36-50 years dominated both in Nyangatom and Maale districts.

The age and family members of the respondents were different ($P < 0.05$) across the districts. The average age of the respondents in Nyangatom district was observed to be higher than those of the Maale district. The average family size of Maale district was higher ($P < 0.05$) than those of the pastorals in the Nyangatom district. In both districts, nearly all households are male-headed.

The results shown below in Table 1 indicate that most of the household heads in both districts were illiterate, with a higher proportion found in Nyangatom district. Illiteracy is a bane regarding the introduction of scientific technologies, and livestock development is no exception. It also leads to problems associated with recording the farm data and participating in a community-based breeding program where the respondents have to share a degree of responsibility in managing farm records. These observations are in close accordance with the reports of (Ntume *et al.*, 2015), who have indicated that illiteracy can be a major hurdle in scientific developments. The average family sizes observed in the study area are lower than reported by (Terefe *et al.*, 2010). However, the study further indicates that the average family size is higher in Maale area than among the pastoralists of Nyangatom district, which follows the observations of Solomon *et al.* (2013) for the Western lowland and Abergalle area and Tekleyohannes *et al.* (2012).

Table 1. Education, age, sex and family size of the respondents.

Descriptor	Districts	
	Nyangatom (n=60)	Maale (n=90)
Level of education (%)		
Illiterate	71.7 ^a	37.8 ^b
1-3 grade	18.3 ^b	28.9 ^a
4-6 grade	5.0 ^b	7.8 ^a
Above grade 6	5.0 ^b	25.6 ^a
Age group (%)		
20-35	8.3 ^b	26.7 ^a
36-50	53.3 ^b	63.3 ^a
51-65	33.3 ^a	7.8 ^b
>65	5.0 ^a	2.2 ^b
Sex of respondents (%)		
Male	95.0 ^b	100.0 ^a
Female	5.0 ^a	0.0 ^b
Average family size (Mean±SD)	3.9±1.3 ^b	4.9±2.1 ^a

^{ab}($P < 0.05$); Values across the rows differ significantly < 0.05 ; HH, household; n, number of respondents.

Livestock holding of the districts

As indicated in Table 2, the result showed that different livestock species are reared in both study districts. However, a difference ($P < 0.05$) in livestock holding/density of most of the species

was observed between the two districts. The households in Nyangatom district favoured rearing cattle, goats, sheep, and poultry compared to those in Maale district (Table 2).

Table 2. Households livestock flock structure in the study districts.

Livestock type	Nyangatom	Maale
	Mean \pm SD	Mean \pm SD
Cattle	22.7 \pm 16.8 ^a (0-93)	7.6 \pm 5.7 ^b (0-30)
Goats	59.6 \pm 32.2 ^a (16-200)	19.5 \pm 9.2 ^b (7-44)
Sheep	47.1 \pm 32.9 ^a (10-200)	2.5 \pm 1.5 ^b (1-8)
Donkey	1.9 \pm 1.0 (0-4)	1.4 \pm 0.9 (0-3)
Poultry	7.1 \pm 3.7 ^b (0-15)	10.4 \pm 4.3 ^a (0-20)

^{a,b}($P < 0.05$); Values across the rows are significantly different ; Values in the parenthesis indicate range.

The results of rearing several livestock species in the study districts indicate that the households use this to risk diversification, especially when problems are associated with limited natural resources. The flock size observed in the study area, was in close accordance with those of Tekleyohannes *et al.* (2012) from Hamer and Bena-Tsema district and Solomon *et al.* (2013). However, the average number of goats per household was higher than Alayu *et al.* (2014) reported in North Gondar and Hulunim *et al.* (2015) in Bati, Borena and Siti areas.

Purpose of keeping goats

The purposes of keeping goats and ranking the importance of these purposes are presented in Table 3. The table shows that the goats are raised in the district primarily for tangible and intangible benefits. They are raised for their milk,

meat, and blood as a source of wealth creation and insurance against emergencies. They are also important to socio-cultural and economic (exchange for goods and services). They are reared for their skin (for household usage and as dress), manure, and gifts such as dowry. The blood of the goats is used for different cultural and ritual ceremonies. However, despite all the above purposes, the primordial reasons the goats are raised are for income generation (wealth and insurance) and their milk.

The study further indicated that milk was the most important component among the pastoralists of Nyangatom district, followed by wealth creation, while the reverse was confirmed in the Maale district.

Table 3. Benefit derived from goats in Nyangatom and Maale districts.

Benefit of goat	Study districts with rank and index											
	Nyangatom						Maale					
	1 st	2 nd	3 rd	4 th	Index	Rank	1 st	2 nd	3 rd	4 th	Index	Rank
Milk	34	10	-	-	0.28	1	19	11	23	2	0.17	2
Meat	5	14	16	6	0.17	3	9	26	13	-	0.16	3
Milk and meat	16	0	6	3	0.13	4	3	24	8	2	0.11	5
Blood	0	5	3	-	0.03	7	0	6	2	12	0.04	6
Wealth and insurance (income generation)	5	24	12	15	0.22	2	57	19	14	0	0.34	1
Socio cultural role	0	6	17	14	0.11	5	6	4	27	52	0.16	4
Exchange	0	2	6	21	0.06	6	0	0	2	19	0.02	7

Index = sum of [4 for rank 1 + 3 for rank 2 + 2 for rank 3 + 1 for rank 4] for a particular purpose divided by the sum of [4 for rank 1 + 3 for rank 2 + 2 for rank 3 + 1 for rank 4] for all purposes.

The results in the above table 3 indicate the criteria for keeping goats as indicated by the respondents from the Maale district agree with agro-pastoral areas studies such as Dhaba *et al.* (2012), Tesfaye (2009), and Solomon *et al.* (2013) who reported that goats are kept primarily for income generation. This might be because small ruminants are easier to sell when compared to those bovines, which may be attributed to the fact that the price of a small ruminant is significantly lower than that of cattle. The

observations are in close accordance with the study of Endeshaw (2007). It could also be because small ruminants grow faster than cattle do, so income generation from the sale of a buck or doe can meet immediate family requirements.

The main purpose of keeping goats in the Nyangatom district was for milk. This may be because of the local customs prevailing among the tribes of the area, which keep goats around the vicinity and their dairy cattle far for grazing.

Similar observations have also been reported by several authors (Grum *et al.*, 2013; Sisay and Kefyalew, 2015). A study by Grum *et al.* (2013) also indicated that as the land holdings among the peasants are shrinking, so is their preference regarding the livestock species used for multipurpose, with the small ruminants replacing the bovines in many areas. The secondary purpose of rearing goats for income generation in Nyangatom is also in close accordance with Sisay and Kefyalew (2015). The rearing of goats for diverse purposes is in close accordance with the observations of several authors (Arse *et al.*, 2013; Tesfaye *et al.*, 2012), indicating the diverse role of goats among the agrarian community and highlighting the importance of the species at large. The primary purpose was, however, seconded by those of income generation, which is in close accordance with those of Dhaba *et al.* (2012), Tesfaye (2009) and Solomon *et al.* (2013).

Major husbandry practice of goats

Husbandry practice and feeding

The results in Table 4 indicate that the respondents in Maale district are provided feed supplements (leftovers of HH consumption, crop residue from maize, teff and sorghum). Communal grazing is prevalent in Nyangatom district, while in the Maale district, the respondents indicated that they interchangeably

used communal and private grazing lands. This all depended on the carrying capacity of the grazing land. Natural grazing and browsing the bush was the common form of feeding in both the study areas, while crop residues too were provided in Maale district.

The sources of water varied across the study areas, the respondents in Nyangatom district relied solely on river Omo, 'Omo shesh' and 'kure shesh'. While the flocks in Maale district were provided with water in the nearby streams besides the river water. The frequency of giving water to goats differs across the study locations, majority of the respondents indicated that water was provided to their goats every alternate day at Nyangatom district. However, in the Maale district majority of the goats received water on a daily basis.

The study further indicates that small ruminants (sheep and goats) are reared together without separate arrangements for either species. All the goats were housed in the traditional enclosure "kraal" at Nyangatom district. At the same time, it was seen that in the Maale district, most of the goats dwelled on the veranda (which is attached to the family house and shares the common wall) (Plate 1c) and also in the kraal (Plate 1b). It was also reported that some goats were housed below the granary (Plate 1a).



Picture 1. Different Housing system (Plate. a, b, c) in Maale area.



Picture 2. Housing system in Nyangatom area.

Table 4. Husbandry practice and feed-type questions.

Type of question	Nyangatom (%)	Maale (%)
Do you provide supplemental feed?		
Yes	0	8.9
No	100	91.1
Is there communal grazing?		
Yes	100	17.8
No	0	82.2
Grazing land ownership/usage		
Private	0	17.8
Communal	100	20.0
Both	0	73.2
Source of feed		
Natural grazing only	0	5.6
Natural grazing and Bushes/browse	100	54.4
Natural grazing and Crop residue		11.1
Natural grazing, Bushes/browse and Crop residue		28.9
Source of water		
River	100	33.3
Stream		22.2
River and stream		44.4
Frequency of watering		
Once a day	43.3	77.8
Every two day	56.7	22.2
Rearing and housing of sheep and goat		
Separated	0	8.8
Together	100	91.2
Goat housing		
Adjoining/around house		24.4
Goat house(kraal)	100	24.4
Around house and goat house both		42.2
Below crop store		8.9

Results, as indicated in Table 4 indicate that most of the respondents do not provide any sort of supplementary feed for their goats. It was reported by most of the respondents that the kids were separately herded and managed by women and children around the homestead until the kids could graze along with the main flock. This may be because the kids may not be able to walk for long distances and to protect them from any mammalian predators, the observations are in accordance with that of [Tesfaye et al. \(2012\)](#).

The Nyangatom pastorals rely on communal grazing for their goats. The communal grazing area in Maale district can be assessed by only a few respondents who live near government forests. The other respondents could not evaluate the grazing land as it is forbidden to do so by the authorities. The animals which were provided with the supplements were those which were castrated and used for fattening. The supplements were usually crop residues (stovers, maize sorghum and teff straw); the observations are in close accordance with those of ([Tesfaye, 2009](#); [Tesfaye et al., 2012](#)). It has been reported that in many places, many respondents prefer to fatten their livestock before selling them as these animals can fetch higher prices than those not fattened.

In Nyangatom district, the communal grazing is managed by the community elders. This ensures that the communal grazing lands are wisely managed; every respondent hires their herders who take the animals to the preselected grazing site as indicated by the village elders. The observations are in accordance with the findings of [Terefe et al. \(2010\)](#), who reported that most traditional communities prefer predestined locations. Such rotations ensure no overgrazing and proper rangeland management, and their findings are in close accordance with those of [Adugna and Aster \(2007\)](#). In favourable seasons when the rains are adequate, all livestock species, irrespective of age groups, are allowed to graze around the respective kebele's. The water for drinking is made available from the natural ponds ("Omo-shesh" and "Kure-shesh") and Omo River. During the dry season, milking cows, calves, goats, some sheep and old cattle are not allowed to wander away from home. The young and able livestock travel long distances in search of pasture and water to the border areas of Ethiopia-Kenya-South Sudan, especially known as 'Tirga' ([SOFEDD, 2016](#)). Goats and donkeys stay in the vicinity of the homes because both species can browse on bushes.

In Maale district, higher numbers of respondents provide water to their goats on a daily basis, while most of the respondents in Nyangatom district provide water to their goats once every alternate day. The respondents were viewed that providing water on a daily basis will leave their goats susceptible to diseases, and such animals are usually not well adapted to the harsh environment. Providing water to livestock on a daily basis is important as water is an important nutrient for the well-being and physiology of the animals, however providing water on every alternate day may be due to compulsion of the rearers but undoubtedly would influence the productivity and the well-being of the goats and may also be attributed to the death of the old, and even the kids (Abioja *et al.*, 2010).

Most of the small ruminants in both districts are reared together, possibly due to a lack of space or labor. Similar observations, too, have been reported by Sisay and Kefyalew (2015). It's more of a bane than boon, as there are chances that there might be competition amongst the different species and classes of small ruminants, which may further lead to mortalities among the old and infirm and may also lead to abortion in pregnant does/ ewes and death due to tampering in the neonate kids/lambs (Tsedeke, 2007).

The results further indicate that most of the dwellings of the goats are around the homestead. This might be attributed to fear of theft and predatory losses; it also assists the owners in inspecting their animals from time to time, especially during the night hours; the findings are in close accordance with those of (Tesfaye *et al.*, 2012; Dhaba *et al.*, 2012; Demissie *et al.*, 2014; Sisay and Kefyalew, 2015).

Major limitations of goat production in the study areas

The major limitations towards goat production indicated by the respondents in the two districts are presented in Tables 5 and 6. The results from Nyangatom district indicate that while the unavailability of feed especially in the dry season, followed by incidences of diseases, while some also revealed the problems associated with erratic and decrease in rainfall, livestock thefts were the identified problems. The respondents from Maale district indicated that disease prevalence was major problem in the area as well as feed shortages followed by shrinkage of grazing lands, predators and lack of herders to take the animals for grazing.

Table 5. Major problems of goat production in Nyangatom district.

Major problem	Ranking				Index value	Rank
	1 st	2 nd	3 rd	4 th		
Feed shortage problem	34	21	5	0	0.35	1 st
Disease problem	18	7	20	14	0.25	2 nd
Decreased rainfall	3	28	12	17	0.23	3 rd
Robbery with neighboring tribes	5	4	23	14	0.15	4 th

As indicated above in Table 5, the results showed that the primary problem pertaining to goat husbandry is feed shortage in Nyangatom area. This was followed by the difficulties associated with diseases. The scarcity of feed have also been reported by several authors (Terefe *et al.*, 2010; Arse *et al.*, 2013; Hulunim *et al.*, 2015). The shortage of feed may be a seasonal problem in the area and maybe throughout the year in case of years of poor rainfall. Poor and inadequate

nutrition will lead to poor immunity in the animals, invariably leading to problems associated with several communicable and non-communicable diseases. While the former may be due to poor levels of immunity of the goats, and the later may be related to diseases associated with nutrition. Therefore, it can be concluded that the two problems are interdependent. The observations agree with the findings of (Malede and Takele, 2014; Sisay and Kefyalew, 2015).

Table 6. Major problems of goat production in Maale district.

Major problem	Ranking				Index	Rank
	1 st	2 nd	3 rd	4 th		
Disease problem	30	21	28		0.310	1 st
Feed shortage problem	8	51	19	1	0.290	2 nd
Decreased grazing land	46	11			0.280	3 rd
Predators problem	4	3	16	10	0.087	4 th
Lack of herders	2	2	1		0.021	5 th
Increased human population		2			0.008	6 th

According to Table 6, in Maale district, the major problems associated with goat husbandry are diseases followed by feed and fodder; these two problems go hand in hand. The incidences of diseases (both communicable and non-communicable) are significant when the animals suffer from a lack of feed and fodder. In contrast, the former leads to anorexia, and lack of feed and fodder leads to disease. The results are in agreement with Tesfaye (2009); Solomon *et al.* (2013); Sisay and Kefyalew (2015); Lorato (2016).

Conclusion and Recommendation

According to the study result, households residing in Nyangatom district favored rearing cattle, goats, sheep, and poultry compared to those living in the Maale district. The purpose of keeping goats in the district was primarily for tangible and intangible benefits. They are raised for their milk, meat, and blood as a source of wealth creation and insurance against emergencies. The results also indicate that the respondents in Maale district provide feed supplements (leftovers of HH consumption, crop residue from maize, teff and sorghum). Communal grazing is prevalent in Nyangatom district, while in the Maale district the respondents indicated that they interchangeably used communal and private grazing lands. Natural grazing and browsing the bush was the common form of feeding in both the study areas, while crop residues too were provided in Maale district.

The sources of water varied across the study areas. Water was provided to their goats every alternate day at Nyangatom district. However, in the Maale district majority of the goats received water on a daily basis. Most of the respondents do not provide any sort of supplementary feed for their goats. The major limitations towards goat production in the districts were unavailability of feed especially in the dry season followed by incidences of diseases. The current result on goats' production and farming system and the major problems associated with goat production in the district help to design different intervention options.

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