

# Sheep and Goat Utilization, Risk Management and Marketing in Pastoral and Agro Pastoral Production Systems in Chifra District of Afar, Ethiopia

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**Keywords** Sheep; Goat; Pastoral; Agro pastoral Production systems

**Abbreviations** ANOVA: Analysis of variance; APPS: Agro-pastoral production system; PPS: Pastoral production system; HH: Household; N: Number of respondents; SD: Standard deviation

## Abstract

The study was conducted in Chifra district in Awsi-Resu Zone of Afar Regional State to explore the utilizations, risk management and marketing of sheep and goats in pastoral and agro pastoral production systems. Cross sectional survey with systematic random selection of 180 households (90 households from each production system). Descriptive statistics, t-test, chi-square test, analysis of variance, ranking method were employed in analyzing data using JMP5 software. In the two production systems indicated that slaughtering of sheep and goats for family/home consumption is done mostly during religious festivals and wedding ceremony.

The consumption preferences of sheep and goat were significantly ( $P \leq 0.05$ ) different between the two production systems. Consuming both sheep and goat in were significantly ( $P \leq 0.05$ ) different along the production system. Fresh milk, fermented milk, whey, and butter were among the common milk products produced and consumed in the area. The major differences in risk management strategies between the two production systems were associated with feeds and water, diseases. Marketing of milk in the study area is not broadly known. Selling of skin to gain income was not common in the two production systems.

## Introduction

### Background

Livestock production is a major livelihood in the past oral areas of Ethiopia. In these dry lowland areas livestock are regarded as producers of milk and meat, income generators, and stores of wealth. Although herd building is a priority motivation for pastoral survival, past oralists in Africa traditionally have sold animals and animal products to obtain modest amounts of cash income [1].

Ethiopia constitutes the majority of the pastoralists in the Horn of Africa. The past oral sector represents 12% of the population [2]. In terms of proportion, about 17% are mobile pastoralists and 20% are agro-pastoralists [3]. The pastoralists inhabit in semi-arid and arid agro ecological zones of Ethiopia and cover about 67% of the nation all and area, with the range land falling in the low lands below 1500m.a.s.l. Currently, it is estimated to be 62% of the total land mass, where pastoralism as a production system is the dominant sector of the agriculture in the country [4].

The diverse agro-ecological zone of Ethiopia makes it suitable for the support of large number and classes of livestock including sheep and goats [5]. About three-quarters of sheep are owned by smallholder farmers in the highlands, whereas lowlands maintain about three-quarters of the goat population [6]. Therefore, the first consideration in planning and implementing sheep and goat development intervention, is to describe and understand the existing real constraints and performance levels of sheep and goats under the varying traditional management practices in relation to agro-ecological zones.

Communities on both pastoral and agro pastoral systems have their own long developed management and utilization as well as risk management strategies, natural resource management and marketing systems. Each system has different land use management, production potential and feed resources.

Afar region only covers 20% of sheep and 38% of goat production proportion of the national pastoral flocks. But in the current situation, the production system of sheep and goats is characterized by poor utilization and management, weak risk management strategies, poor marketing system.

On top of this; no livestock research is conducted including sheep and goat in pastoral and agro pastoral production systems [7]. Hence, in order to enhance sheep and goat productivity and economic returns to the producers, basic information and research must be done on utilization, risk management and marketing of sheep and goats in the pastoral and agro pastoral production system in the region.

## Objectives of the study

The overall objective of this study was to generate information on sheep and goat utilization, risk management strategies and marketing in relation to the pastoral and agro pastoral production systems as a basis for planning and implementing specific interventions for future development of the sector.

## Materials and Methods

### Description of the study area

The study was undertaken in Chifra district, zone one of the Afar Regional State by selecting sites that represented agro pastoral (Chifra Zuria and Mesgid) and pastoral (Jara and Weamaena Underkelo) production systems. The sites are located south west of Semera along the main road of Mile to Woldiya, about 162 km from the regional capital city (Semera) and bordered on the south by Mille, on the west by the Oromiya Zone (Amhara Region), on the north by the Administrative Zone four, and on the East by Dubti (Zone one). The total land area of the district is about 173,374 ha of which a large area is rangeland.

**Farming system:** The study area consisted of 19 pastoral associations of these 13 were pastoralist entirely dependent on livestock production and the remaining 6 associations were agro-pastoralists practicing both farming and extensive livestock rearing. The total land area covered by the pastoralists was 130,030.5 ha. The major crops grown include maize, sorghum and tef. Vegetables, fruits, oil crops and root crops are also cultivated in a limited range as source of food and income [7]. Live animals, especially cattle, goats, sheep and camels are the main species sold in the market.

**Demographic and cultural setting:** According to CSA [8], the human population size of the Chifra district has an estimated total population of 90,896, of which 39,706 are males and 51,190 females. About 1,209 or 1.33% of its population are urban dwellers the remaining live in remote rural areas [9]. Pastoral and agro pastoral group of the district comprises 7.48% of the total population of the region live in this district.

### Data collection and analysis

**Cross-sectional survey:** An exploratory study was conducted before cross-sectional survey, to understand the overall utilization, risk management strategies and marketing of sheep and goats in the pastoral and agro pastoral production systems. During this phase the following tasks were performed.

- Pretesting of questionnaires
- Identification of relevant issues for sheep and goats utilization, risk management and marketing.
- Market places representing the two production systems were identified

A cross-sectional survey, which is a formal and single visit technique, was employed in order to collect data on socio-economic settings, management, performance, utilization, risk management strategies and marketing of small ruminant in pastoral and agro pastoral production systems in Chifra district.

**Sampling design and procedures:** A purposive sampling design

was employed in selecting survey sites from both pastoral and agro pastoral communities. From a total of nineteen PAs, two pastorals and two agro pastoral PAs were selected in the bases of the prevailing production systems, availability of sheep and goat, and access to road. Mesgid, Jara, Weamaena Underderkelo and Chifra zureakebeles were selected to represent both communities. Chifrazurea and Mesgid represented the agro pastoral community while Jara and Weamaena Underkelo to represent the pastoral community. Ninety households from each community (pastoral and agro pastoral production system) were selected purposefully on the basis of possession of sheep and goats. Households were purposefully selected with the help of local development agents and informants. Priorities of selecting sheep and goat owning households (HHs) were given for HHs who keeps both sheep and goat. Minimum requirements of selecting a HH was having a flock of at least one breeding female and a minimum of one year experience.

**Methods of data collection:** Both primary and secondary sources were used to obtain qualitative and quantitative data. Data that were generated from the interview include; households' demographic characteristics, institutional settings, market and prices, economic status, socio-psychological aspects like perception, attitude and knowledge of the respondents, the bio-physical resources such as feeds, range- lands and water in connection with sheep and goats utilization, risk management strategies and marketing.

**Socio-economic settings production characteristics:** Pastoralist and agro pastoralist were interviewed about social, cultural and economic settings and relationships with sheep and goats utilization, marketing and marketing.

**Focus Group Discussions:** To cross check and complement the information collected using cross-sectional survey and to elicit data which were difficult to obtain using household/cross-sectional survey, focus group discussions were conducted to strengthen and gather additional information on the utilization of sheep and goats, risk management strategies and marketing. A total of four group discussions comprising of six to eight members with the involvement of key informants; Wereda and PAs administrative members, subject matter specialists, model pastoralist and agro pastoralist, and other concerned bodies, were involved.

**Market Monitoring Survey:** Market monitoring survey was carried out to extract data on the number of sheep and goat supplied, sold, selling prices, reasons for selling and buying in relation to the religious festivities, during normal days and other important household events in the pastoral and agro pastoral communities. The monitoring was conducted in one market place /area representing the two farming systems (pastoral and agro pastoral). The market monitoring was carried out once a week on a major market day (Sunday) in Chifra. A total of 650 observations were made for sheep and goats respectively in that market place of the district. The data were collected through interviews in the market when sellers and buyers come into agreement using market data collection sheet.

- Number of sheep and goats markets supplied and sold during festivals and normal events
- Sources of sheep and goats for the markets
- Perception of pastoralist and agro pastoralist about the supply and

demand of sheep and goats and its relation to religious festivities and risky situations (lack of staple food, urgent cash needs

- Market prices, type of seller, reason of selling, and buyer type of sheep and goats during Eid Al-Fetir, normal, Eid Al-Adha, and Christmas for a variety of sheep and goats.

**Data analysis**

**Descriptive statistics:** This statistical tool was used to compare educational levels of HHs, labor division of HHs, flock structure, offers and sales of sheep and goats and their price trends in the PPS and APPS.

**T-test:** Continuous response variables (land and livestock holdings, family size, cash income, and sale and slaughter rates) were tested using both equal and unequal assumptions of independent two sample t-test. The statistical model was as follows:

$$Y_{ij} = \mu + T_i + \epsilon_{ij}, \text{ Where,}$$

$Y_{ij}$  = Values of independent variables from the cross-sectional survey in the PSs

$\mu$  = Overall mean

$T_i$  = Production system effect where  $i$  = PPS and APPS

$\epsilon_{ij}$  = Is the random variation among individual subjects in the PSs

**Chi-square test:** The majority of responses of nominal and ordinal variables like cultural characteristics, land use, educational levels, labor conditions, production/farming characteristics, watering management, risk management strategies, purchased and supplemental feed use, housing issues, consumption frequency and preference, sales, purchases, and market information of sheep and goats were tested using Chi-square ( $X^2$ ) tests whenever important, followed by correspondence analysis to show the relationship between nominal variables.

**Analysis of variance (ANOVA):** Analysis of variance was applied to test the effects of utilization, risk management and marketing occasions, like; sheep and goats' body color, seller type and buyer type on prices of sheep and goats. Mean comparisons for the above test were carried out using Tukey-Kramer HSD test using JMP-5. The following statistical model was employed:

$$Y_{ij} = \mu + T_i + \epsilon_{ij}, \text{ Where,}$$

$Y_{ij}$  = Sheep and goats price in both PSs,

$\mu$  = Overall mean

$T_i$  = the ith dependant parameters (market events, seller type, buyer type) in case of market events,  $i$  = Eid Al-Fetir, normal, Eid Al-

Adha, and Christmass; for seller type,  $i$  = communities, traders; and in the case of buyer type,  $i$  = traders, farmers, consumers, butcher, and hoteliers

$\epsilon_{ij}$  = Is the random variation among observations.

**Rank analysis**

Livestock species preference, feed resources, specific uses of male and female sheep and goat, and production constraints was ranked using preference ranking methods. In preference (during utilization) ranking method, index was computed with the principle of weighted average and indexes were ranked each other using auto ranking with MS- excel 2007. The following formula was used to compute index as employed by Musa [10]:

$$\text{Index} = \frac{R_n \cdot C_1 + R_{n-1} \cdot C_2 + \dots + R_1 \cdot C_n}{\sum R_n \cdot C_1 + R_{n-1} \cdot C_2 + \dots + R_1 \cdot C_n}; \text{ Where,}$$

$R_n$  = Value given for the least ranked level (example if the least rank is 5th, then  $R_n = 5$ ,  $R_{n-1} = 4$ ,  $R_1 = 1$ )

$C_n$  = Counts of the least ranked level (in the above example, the count of the 5th rank =  $C_n$ , and the count of the 1st rank =  $C_1$ ).

**Results and Discussion**

**Utilization of sheep and goat**

**Consumption of meat:** Table 1 presents the reported events for slaughtering sheep and goats by households' in PPS and APPS. Consumption frequencies of sheep and goat meat were similar between the two Ps. The majority of respondents in the two Ps indicated that's laughtering of sheep and goats for family/home consumption is done mostly during religious festivals and wedding ceremony.

The respondents revealed that there were not cultural taboos and other believes which impede the utilization of sheep and goat products in the two production systems. Except unusual condition like sorrow, wedding and religious festivals, slaughtering of sheep and goats for regular family consumption was strictly uncommon. Tsedeke [11] indicated that sheep and goats are slaughtered for household meat consumption and major slaughter are made during festivals and various family and cultural events in Alabaareas of southern Ethiopia.

The consumption preferences of sheep and goat were significantly ( $P \leq 0.05$ ) different between the two production systems (Table 2). Sheep were more preferred than goats in PPS. Such preference was developed as a result of drought which affects sheep and forced the owners to slaughter them. Only a few number of pastoralists preferred goats' meat to mutton. Due to theirs believe that goat's meat has medicinal value. Whereas consuming both sheep and goat in were significantly ( $P \leq 0.05$ ) different along the production system.

**Table 1:** Households frequency of sheep and goats meat consumption in PPS and APPS.

Frequency of consumption	PPS	APPS	Test	
	N (%)	N (%)	X <sup>2</sup> - value	P-value
Four times a year	0(0.00)	0(0.00)		
Twice a year	9(10.23)	13(14.44)	0.94	0.543
During religious festival	21(23.86)	18(20.00)		0.512
Cultural (weeding) & religious festival	58(65.91)	59(65.56)		0.622

According to the respondents, it is not usual to slaughter female sheep and goats unless they have reproduction faller, health complications, over aged and severe injury. Apart from these female sheep and goats are kept essentially for breeding purpose. According to Tsedeke [11], the vast majority of sheep and goat owners commonly slaughter male flock than females. Based on this result suggestion could the need to feeding habit instead of depending on heavily during religious festivities only.

**Milk consumption:** Fresh milk, fermented milk, whey, and butter were among the common milk products produced and consumed in the area. However, cheese was not produced among the surveyed households. This is perhaps due to unfamiliarity with the processing of cheese. Traditionally, milk is consumed in the household as a staple food than any other food. Children are the major consumers of goats' milk at home. This result is consistent with Ahmed et al., [12] who noted that in the lowlands all segment of the population consume dairy products while in the highlands the major consumers primarily include children and some vulnerable groups such as the elderly and women. According to Tsegahun et al., [13], goats in the lowland area are kept both for milk and meat production, where as in the highlands they are mainly kept for meat. Similarly, Tsehay [14] reported that the main source of milk production in Ethiopians from the cow, but small quantities of milk obtained from goat and sheep is also used in some regions particularly in pastoralist areas.

Even though the amount of milk obtained from sheep and goats is low, marketing of milk in the study area is not broadly known. The system is not market oriented and most of the milk produced in it is retained for home consumption Ahmed et al., [12] or household processing. Processing is usually done using traditional technology. Milk and milk products are usually marketed through the informal market after the households satisfy their needs. Fluid milk production and consumption is limited by seasonal variations [15]. Milk in the lowlands is primarily used as fresh whole milk for consumption. Surplus milk during the rainy season is fermented and processed into butter [16].

**Skin and manure production and use:** Selling of skin to gain income was not common in the two production systems. Households utilized skin for different purposes such as sitting or bedding materials, water and butter container, knife cases, and equine harness, prayers rug and shoes. All of the respondents in the PPS and 98.5% of the respondents in APPS used skin for the above mentioned purposes while 1.5% of the respondents in APPS mentioned that skins are thrown away as wastes. Ethiopia has the capacity to supply 16 to 18 million pieces of hides and skins to local tanneries [17]. This suggests that there is a need to create awareness on improved skin utilization and production in the area.

The use of manure of sheep and goats as fertilizer and fuel was not common in PPS. The respondents in PPS reported that manure of sheep and goat are thrown away as wastes. This might be due to absence of crop farm, pastoral nature of production system, less knowledge for using fertilizer as fuel. While 98 % of respondents in APPS used sheep and goat manure as fertilizer for crop land, and the remaining 2% of respondents thrown it away as waste.

Using organic fertilizer for crop land has great advantages in which the fertility of the soil can be increased by increasing the available minerals. Hence, agro pastorals should be used sheep and goats manure for crop land in order to improve the crop production, there by crop by products will be improved and used as feed for sheep and goats. The results suggest that, their need to be better extension works to utilize sheep and goat manure in the form of organic fertilizer as wheal as in the form of fuel.

**Risk management strategies**

The major differences in risk management strategies during critical drought periods between the two production systems are presented in Table 3. These risks were associated with feeds and water, diseases, and overall livelihood of the communities. In relation to feed, 46.7% of the respondents in the PPS relied on both long distance migration and fallen pods while 71.1% of the respondent in APPS depended on crop residues and pastures located closer to their settlements. About 12.2% of the respondents in APPS revealed that they used fallen pods as a source of feed for their sheep and goats while the remaining 11.1% of the respondents employed destocking when a drought period looms. About 25.60% of the respondents in PPS used destocking as a coping mechanism and the reaming 26% of the respondents in PPS used long distance migration in search of pasture during critical drought periods. The result suggests that pastoral communities are exposed to different risks to the extent that they are forced to sell the animals they value most. In relative terms, agro-pastoralists had better options in coping with feed scarcity, including feed from crop residues, hay and weeds, and thus not urged to sell their animals as did the pastoral communities.

In relation to watering management strategies during critical season in the two production systems varied markedly between the two productions systems (Table 3A). About 100% of the respondents in APPS, communities were used the existed water /river as a source of watering points for their sheep and goats. While about 41.11% of the respondents in PPS, communities were travelled more distance in search of water and extracted new ponds and, 37.78% of respondents were travelled more distance in search of water and the reaming 21.11% of respondents were extracted new ponds for sheep and goats. The result suggests there is a significant difference in source of watering points during critical drought periods between the

**Table 2:** Households preferences of sheep and goat consumption in PPS and APPS.

Preference of consumption	PPS	APPS	X <sup>2</sup> - value	P-value
	N (%)	N (%)		
<b>Preference</b>				
Sheep	42(47.73)	21(23.33)	24.27	0.001
Goat	26(29.55)	16(17.78)		0.01
Both	20(22.73)	53(58.89)		0.001

two production systems. This difference might be due to the result of having no permanent river in the area of pastoral communities. Hence, they obliged to move long distance and extracting new ponds in search of water. While, agro pastoral communities used permanent river around their village. Hence, this opportunity contributes for better production performance of sheep and goat. Because they keep energy lose. Suggestions a need to plant/install hand pump around the villages of pastoral communities in order to minimize energy loss due to travelling long distance in search of water.

In relation to disease control strategies during critical drought period in the two production systems presented (Table 3B). About 53.33% of the respondents in PPS relied on both traditional and modern methods of treatments, 24.44% of the respondents used treatment and destocking and, the reaming 22.23% of the respondents only destocking was used as a means of controlling/protecting diseases of sheep and goats during critical diseases prevalence period. While

48.6% of the respondents in APPS relied on, treatment and destocking and 41.1% of the respondents only used destocking and the reaming 14.3% of the respondents was used both traditional and modern methods of treatments as a means of controlling and protecting diseases of sheep and goats during critical diseases prevalence period. This result is in agreement with kedihha [18]. Who stated that, livestock keepers are traditional ethno-veterinary medicines are used in the villages and make use of various herbs and drugs to treat their livestock during high prevalence of diseases in Mieso district of Ethiopia. The result suggests that pastoral communities have less controlling and protecting mechanisms options due to the less probability of getting and inaccessible to veterinary services during migration. Hence a need close extension works on early warning and disaster prevention mechanisms.

In relation over all livelihoods and risk management in the two production systems are presented in (Table 3 C). Risk management and way of livelihoods varied markedly between the two productions systems. About 57.78% of the respondents in APPS revealed

**Table 3:** Risk management strategies during critical drought seasons in PPS and in APPS.

A.	Risk averting strategies in r/n to feed and water	PPS Mean (SE)	APPS Mean (SE)	DF	t-value	P-value
	<b>Feed</b>					
	1.Crop residues and pasture	0.0(0.00)	64(71.11)	1	99.3	0.001
	2.Migration	24(26.67)	0.0(0.00)	1	27.6	0.001
	3.Purchased feed	0.0(0.00)	0.0(0.00)	1		
	4.Conserved feed	0.0(0.00)	0.0(0.00)	1		
	5.Destocking	23(25.56)	10 (11.1)	1	6.27	0.01
	6.Shacking trees pods	0.0(0.00)	11(12.2)	1	11.1	0.006
	7.2 and 6	42(46.67)	0	1	54.7	0.001
	<b>Water</b>					
	1Long distance trekking	34(37.78)	0	1	41.9	0.001
	2.Extracting new ponds	19(21.11)	0.0(0.00)	1	21.24	0.001
	3.Using existed river	0.0(0.00)	90(100)	1	180	0.001
	4.1 and 2	37(41.11)	0.0(0.00)	1	180	0.001
	<b>B. Risk averting strategies in r/n Diseases</b>					
	1.Treatment (both)	48(53.33)	13(14.3)	1	30.37	0.001
	2.Destocking	20(22.23)	37(41.1)	1	7.42	0.006
	3.Treatment & destocking	22(24.44)	44(48.6)	1	11.57	0.007
	<b>C. Risk averting strategies in r/n to Over all livelihood</b>					
	1.Crop and livestock	0.0(0.00)	52(57.78)	1	73.12	0.001
	2.Herd diversification	50(55.56)	6(6.67)	1	50.18	0.001
	3.Trading	0.0(0.00)	0.0(0.00)	1		
	4.Selling and restocking	18(20.00)	9.0(10.00)	1	3.35	0.06
	5.1 and 2	0.0(0.00)	23(25.56)	1	26.36	0.001
	6.2 and 3	22(24.44)	0.0(0.00)	1	25.01	0.001

**Table 4:** Factors for setting prices of sheep and goats in PPS and APPS.

Factors	PPS Mean (SE)	APPS Mean (SE)	t-value	P-value
Body size	11(12.22)	17(18.89)	3.39	0.334
Color	0(0.00)	0(0.00)		
Age	49(54.44)	46(51.11)		0.351
Fatness	21(23.33)	23(25.56)		0.532
Weight	4(4.44)	9(10.00)		0.335

that, crop and livestock production were used as a means of risk management in their livelihood to assist sheep and goats production. And about 25.56% of the respondents were used crop and livestock production with herd diversification and 10% of the respondents were used selling and restocking and the remaining 6.67% of the respondents were only used herd diversification. While 55.56% of the respondents in the PPS herd diversification were used and 24.44% of the respondents herd diversification and trading were used and, the remaining 20% of the respondents selling and restocking were used as a means of risk management in their livelihood to assist sheep and goats production. The existing production characteristics in the study area were in agreement with the report by ILRI [19], in which the livestock sub-sector comprises small scale mixed farming as a major production system for most African countries. Based on the result and the chi-square test there is a significant difference between the two production systems (Table 3). Hence to be more productive and beneficiary from sheep and goat production, strong extension works (especially training) should be given to the communities of both production systems on risk management strategies and improved husbandry systems of sheep and goats.

### Marketing of sheep and goats

**Factors for setting prices of sheep and goat:** Factors for setting prices of sheep and goat were presented in Table 4. Age, degree of fatness, body size and weight are the major factors that determine the price of sheep and goats in the two production systems in that order. Similarly, Solomon [20] found that animal in good body condition receive higher price than the skinny ones. In some parts of the study area color also a factor in determining the price of sheep and goats.

**Table 5:** Reasons for selling and market information in PPS and APPS.

Market issues	PPS	APPS	Test		
	N (%)	N (%)	DF	X <sup>2</sup> -value	P-value
Reasons of selling					
Culling/disposal	20(22.22)	0(0.00)	2		
Culling & cash need	27(30.0)	90(100.0) 0(0.00)	2	63.6	0.001
Cash need & risky situation	43(47.78)		2		
Source of market information					
Neighbors	14(15.56)	11(12.22)	2		0.153
Friends	6(6.67)	14(15.56)	2	3.74	0.164
Both	70(77.78)	65(72.78)	2		0.163

According to the respondents in the two production systems and traders, younger animals had better price than older animals, as a result most consumers do not purchase older animals or purchase them at a lower price. This is consistent with Gezahegn et al., [6] who reported that the meat of younger animal is tender than older animals. Price per animal increased with age but declined for older over matured animals for both sheep and goats. During my personal market survey and buyers in the two production systems revealed that, traders and ELIFORA agro industry enterprise also preferred to buy sheep and goats ranging in age from 1-1.5 years. The result suggested that, the communities of the two production systems should be oriented towards marketing of sheep and goats at younger ages, as dictated by the market demand.

**Reason for selling and source of market information:** Households sold small ruminant for reasons that varied between the two production systems (Table 5). Cash need and the appearance of looming situations forced the majority of the households in PPS to sell their sheep and goats while immediate cash needs triggered sheep and goat selling among the interviewed households in APPS. Similarly, Andargachew and Brokken [21] noted that, the supply of sheep and goat is affected by natural factors such as drought.

Selling animals to reduce potential risks was cited to be more important in PPS than in APPS. Perhaps this might be due to, the exposure of pastoral areas to severe and frequent droughts and lack of alternative feed resources. Generally, small ruminant are mainly sold for buffering risks during different risky situations like during shortage of crop for human food and feeds for animals (Ibid).

**Market price changes:** According to the respondents in the two production systems, the number of traders involved in small ruminant has increased in recent years. For instance, the average price paid for

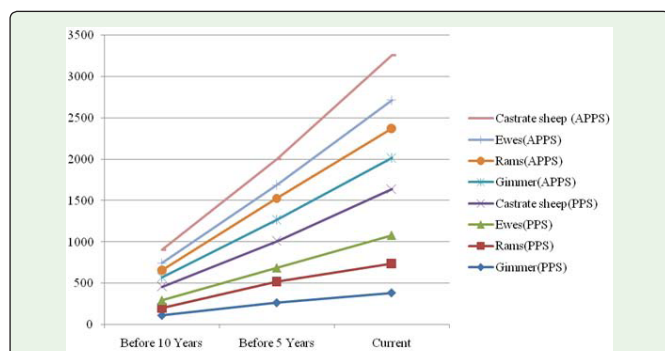


Figure 1: Change in price of different category of sheep estimated by households in PPS and APPS.

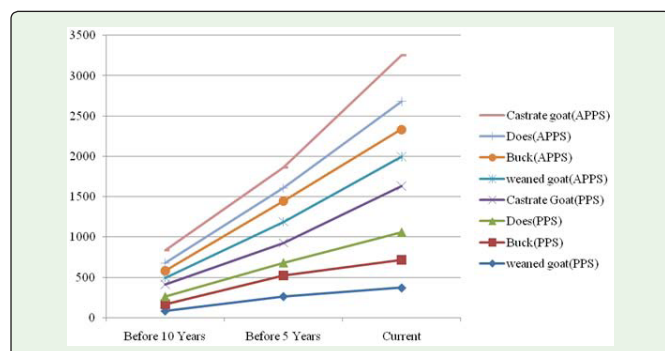


Figure 2: Change in price of different category of goats estimated by households in PPS and APPS.

a gimmer has increased from 112 to 386 birr over ten year period (Figures 1 and 2). Similarly, the average price of a buck has increased from 110 to 375 birr over ten years period.

The price increment over ten years period (1992-2002 E.C), for gimmer was 141%, for rams 134%, for ewes 139% and for castrated sheep 140%. This increment for weaned goats was 130%, for bucks 131%, for does 136%, and for castrated goats was 137%. This might be due to increasing the living standard of the people (increasing purchasing power), increasing population and increasing demand for goat meat and mutton. Similarly the human population in sub-Saharan Africa will be more than double by the year 2025; hence an increase in population, coupled with urbanization, will result in higher demand for meat per capita [22]. Sheep and goat production is an important component of livestock production systems [23].

In the pastoral production systems, the average price of castrated sheep before ten years was 161.16 Ethiopian birr and this has increased to 512 birr Ethiopian birr at the time of this survey (2010 G.C).

**Demand and supply of sheep and goats:** The demand and supply of sheep and goats in the study area depended on different market events such as, normal market days, fasting season of Christians, Christmas, Easter, New Year, Eid al Adha and Eid al Fetir. Higher supply and demand of sheep and goats in the markets was recorded during Christmas, Eid al Adha, and Eid al Fetir possibly due to the higher religious values of sheep and goats and religious dependent consumption patterns of societies. Similarly, USAID [24] reported that sheep and goats demand, varies throughout the year peaking during religious festivities in all countries. This result is consistent

with Andargachew and Brokken [21] who reported that both the quantity purchased and offered for sale considerably increases during religious festivals and the lowest demand for sheep is expected to occur during fasting periods.

**Marketing constraints:** As shown in Table 6 the major constraints for sheep and goat marketing identified and ranked by the herders in the PPS were seasonal fluctuation in the price of sheep and goats as the main marketing problems followed by distance of markets and low prices respectively. While low price, seasonal fluctuations, distance of markets, lack of market out lets and interference of broker were the main marketing problems in that order in APPS.

The price fluctuation might be due to the reliance of both production systems on domestic consumers whose demand is greatly influenced by the presence of the religious fasting period and festivities. Seasonality in marketing is a common phenomenon with most agricultural products including livestock in general and sheep and goats in particular [25]. According to the respondents distance traveled to market places of market and low price are the second and third marketing problems in PPS. This is due to the fact that, the majority of the pastoral communities live in remote areas isolated from main service centers, and sheep and goats are trekked 3-10hrs leading to lose weight, condition, and market value. Interference of brokers was not the issue of small ruminant marketing problem in the PPS.

## Conclusions and Recommendations

### Conclusions

Utilization of small ruminant in the two production system did not exactly match; in PPS small ruminant were primarily used for home milk consumption followed by live animal saving where as in APPS primarily used for income/sell followed by for home milk consumption. Consumption of meat for family/home is done mostly during religious festivals and wedding ceremony in the two Ps. Demand, supplies, sales and price, of sheep and goats were highly seasonal and reached peak during the major holidays in the two Ps, suggesting the need to tune fattening cycles to the occurrence of these holidays. Seasonal fluctuations in supply and demand, low price, and distance of market were the main constraints for sheep and goats marketing in PPS. While in APPS, low price, seasonal fluctuations and distance of market were the main constraints; in addition to these, lack of market out lets and interference of brokers were the additional

Table 6: Households ranking of sheep and goats market problems in PPS and APPS.

Problems/constraints	PPS	PPS	APPS	APPS
	N (%)	Rank	N (%)	Rank
Seasonal fluctuation	37(41)	1	34 (37)	2
Lack of market out lets	0(00)	Not ranked	5 (05)	4
Low price	24(28)	3	41(45)	1
Distance of markets	29(31)	2	7(07)	3
Interference of broker	0(00)	Not ranked	3(03)	5

constraints. Risk management and way of livelihoods varied markedly between the two production systems. PPS have less controlling and protecting mechanisms options than agro pastoral communities.

## Recommendations

The following recommendations are made based on the above conclusion.

1. Continuous training and awareness creation should be done on sheep and goat consumption, utilization and risk management patterns, so as to bring meaningful change in the livelihood of the two production communities.
2. Creating awareness in relation to accessing market information before selling sheep and goats, destocking of flocks prior to drought will help pastoralists to save their asset.
3. Develop marketing linkage between the producer, traders and consumer in and out of the two production systems. Empowering them by organizing producers' or business oriented cooperatives is one possibility so that they can have upper hand in dealing the prices.
4. Promote value chain production systems; input production marketing
5. Therefore the result of this study recommends more utilization; risk management and marketing studies need to be further detail analysis of study on pastoral and agro pastoral production systems.
6. Productive and beneficiary from sheep and goat production, strong extension works (especial training) should be given to the communities of both production systems on risk management strategies and improved husbandry systems of sheep and goats.

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