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# Seasonal and inter-market differences in prices of small ruminants in Ethiopia

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## Abstract

Hedonic price models were fitted to a sample of 1397 sheep and 1293 goats respectively for which data were collected from nine markets in Ethiopia over a 12 month period. The objective was to determine seasonal and inter-market differences in prices after controlling for the effects of different attributes of the animals, the buyers and the sellers. Results indicate that, controlling for attributes of the animals and of the buyers and sellers, there were significant differences in prices between seasons and markets. Seasons in which farmers faced severe cash shortages exhibited the lowest adjusted prices for animals they sold, indicating that although livestock may provide a fall back position for cash in times of crisis, terms of trade may be worst when farmers need cash the most. In general, there was no clear progression in price of sheep along the primary to terminal market chain ending in Addis Ababa as would be normally expected except that the farthest market had the lowest price. The reason for higher prices in some intermediate terminal markets could be partly explained by the fact that exporters and processors buy animals in these markets and they pay premium prices for best quality animals, and left over second or third grade animals may end up in Addis Ababa market, which then virtually becomes a sink market. In case of goats, price differences between markets followed to some extent the expected differences between primary, secondary and terminal markets. One possible reason is that in general highland is not a major production or consumption area for goats, so supplies come mainly from the lowlands, so the price movement followed the market chain from primary markets in pastoral areas to the terminal market in Addis Ababa,.

Key words: sheep goats, hedonic price, Ethiopia, Africa

## Introduction

In the highlands of Ethiopia, livestock as an important component of the mixed farming system perform multiple functions providing high quality food, draft power and manure for crop production, and cash income. Field studies in different parts of the country in the 1980s showed that livestock account for 37-87% of total farm cash income of farmers, indicating the importance of livestock in rural livelihood, especially as one moves from mixed farming in the highlands to agropastoral systems on the highland-lowland margins (Gryseels, 1988). However, despite the reasonably high share of cash income coming from livestock as a source of smallholders' livelihood, the production system is not adequately market-oriented and it is not yet a primary livelihood activity or a primary source of cash income for any significant number of communities or households. There is little strategic production of livestock for marketing except some sales targeted to traditional Ethiopian festivals. For example, a survey of 82 communities in the Oromiya region showed that livestock ranked 3 on average out of top five cash income sources in the sample communities, and it appeared as a secondary/tertiary livelihood activity or source of overall income for about 40% of the households in the region (Jabbar et al., 2002). Therefore increased market orientation of livestock production is essential for producers to be able to improve their livelihood through livestock.

The primary reason for selling livestock in the highlands is to generate income to meet unforeseen expenses. Sales of live animals are taken as a last resort and animals are generally sold when they are old, culled, or barren (Kebede and Lambourne, 1985; EARO, 2003). Prices depend mainly on supply and demand, which is heavily influenced by the season of the year and the occurrence of religious and cultural festivals on the one hand and occurrence of drought or other weather shocks on the other. For example, Northern Ethiopia's livestock supply is heavily influenced by the severity of the dry season; supply peaks after the main rainy season then drops rapidly. In the South, low sales volume characterize the July-September main rainy season, and the Lent fasting period (February-April), but trade peaks immediately following these periods (Tilahun, 1983; Kebede and Brokken, 1993; Davies, 2003; World Bank, 2001). Fachamps and Gavian (1997) found drought and pasture availability as important determinants of price variation in Niger.

Yearly price variation may also be triggered by general crop sector performance and weather patterns. It is often argued that in mixed farming systems livestock may serve as a hedge against risk of crop failure as livestock can be sold to derive cash in the absence of crop output and income. However, crop sector performance may act as a double-edged sword for livestock. A bumper crop harvest may reduce crop price in the absence of market stabilization mechanisms, hence reduce rural people's real demand for livestock, and a crop failure may also have the same effect. A fall in grain price is, however, beneficial for pastoralists because of more favorable terms of trade (Jabbar and Ayele, 2004). Thus, most producers remain vulnerable to the forces of market and do not always get good prices for their animals. In a survey of sample markets and traders in Oromiya, Amhara and Tigray regions in 2002, seasonal variation and unstable price, multiple taxes, non-transparent tax system, limited access to credit and weak demand for the types of animals offered for sale were perceived by traders as major problems of marketing (Jabbar and Benin, 2004).

In this paper, the results of a survey on seasonal and inter-market variation and other determinants of prices of small ruminants in selected highland and mid-altitude zonal markets are presented. Small ruminants play a major role in the livelihood of smallholder farmers in

the highlands. There are about 28 million small ruminants in the country, of which 75% are owned by smallholder mixed crop-livestock farms in the highlands and 25% by pastoralists in the lowlands. A little over 50% are sheep and others are goats. Understanding the sources of price variation may be helpful for producers to understand buyer preferences for specific characteristics of animals and target breeding, fattening, time and place for sales to gain from important market opportunities.

In section 2, the sampling method and data collection procedures are described. In section 3, the theoretical and empirical model for price determination is described. In section 4, the results are discussed with conclusions at the end.

**Selection of Markets and Collection of Data**

The capital Addis Ababa is the domestic terminal market for most of the small ruminants originating in the central highlands. On the other hand, majority of the marketed livestock from the pastoral lowlands in the east and south of the country are exported to the Middle Eastern countries and to Kenya. In fact, economic exchanges between the highland and the lowland are rather minimal as livestock export earnings from outside Ethiopia are used for importing consumable and other goods into the pastoral areas. Given the different supply hinterlands and structures of the highland and lowland markets, this study concentrated only on the markets in the central highlands taking Addis Ababa as the terminal market. Also markets in one transect covering up to 200 km towards south and southeast of Addis Ababa in Eastern Oromiya region were considered for sampling. In this transect nine markets were purposively selected. These are Addis Ababa, Akaki, Dire, Debreziet, Nazareth, Arerti, Methara, Meki and Shashemene (Figure 1) .

There are several market locations for sheep and goat in Addis Ababa. Some of the formal markets are equipped with better facilities while others are road side temporary exchange points. For the purpose of this study, Gulele market located in the northern part of the city was purposely selected to represent Addis Ababa based on volume of transactions and diversity of sources of animals transacted. .

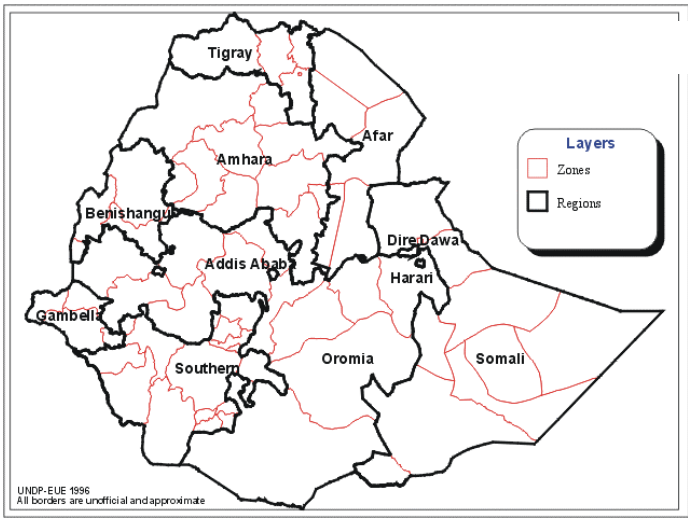
Arerti and Dire are primary markets and Akaki is a secondary market located close to Addis Ababa. Debreziet is a secondary market located halfway between Addis Ababa and Nazareth, the second biggest market in East Shewa zone, and supplies animals to both Addis Ababa and Nazreth. Methara is a primary market supplying animals to Nazareth. Meki is a primary market for both Nazareth and Shashemene, which is a large market located on the borderline between the highlands and the lowlands, and supplies animals to both Nazreth and Addis Ababa in one direction and also towards northern part of Ethiopia destined for export through Djibouti and Somaliland ports. There may be also two way movement, for example, between Nazreth and Debre Zeit, and between Meki and Shashemene. Meki also directly supplies to Addis Ababa

Each selected market meets at least two days per week, mainly on Tuesday, Wednesday, Thursday, or Saturday. Data were collected in each week in one of the main market day for a period of one year during September 2002 to August 2003, except for Nazareth where data were collected on two main market days. Five traded animals were randomly selected from

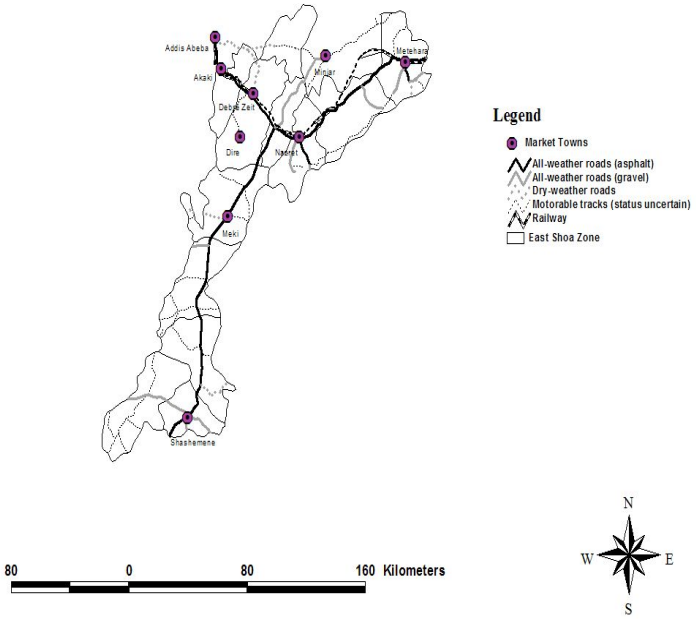
**Figure. 1 Location of sample small ruminant markets studied in East Shewa zone,**

## Oromia region, Ethiopia

### a. Administrative regions of Ethiopia




### b. Locations of sample markets in relation to Addis Ababa



each market every week. A total of 2690 animal transactions were recorded by jointly interviewing the seller and the buyer using a questionnaire. Of these, 1397 are sheep and 1293 are goats. Animals traded in Ethiopian markets as elsewhere in the developing countries are not standard products to allow collection of price data on a per unit output, e.g. per kg live weight basis. Actually weighting animals is not practiced in the sample markets. Traders targeting animals for purchase usually make good guesses about weight and the ability to guess the weight helps them in making a good bargain (Jabbar, 1998). Agreement on price is reached through a long bargaining process between the buyer and the seller either directly or through a broker, who may charge a fee from both parties. Attempts were made to use weighing scale but it turned out to be difficult in the crowded market place. Since prices are negotiated for an animal, it was hypothesized that different attributes of the animal will contribute to the price ultimately negotiated. Therefore data were collected on the agreed price and the following attributes of the animal, the buyer and the seller: species, sex, age (months), body condition, skin condition, breed, origin, color, animal type, tail type, height of the animal (cm), heart girth (cm), expected price of skin, seller type and seller sex, buyer type and buyer sex, purpose of selling and buying.

Age was approximately estimated by examining the number and type of teeth. Information on body and skin conditions were graded into three categories (good, average and poor) based on the assessment of certain observable physical characteristics. Height and heart girth were used as proxies for weight. Sometimes, weight in cattle is extrapolated from heart girth by using some standard tape or by using a conversion formula suggested by Payne (1990) but no such suitable tape is available for small ruminants, and suitable conversion formula using heart girth as the base is also not available.

**The Theoretical and Empirical Model for Price Determination**

It is generally hypothesized that products have attributes that confer utility and that the values of those attributes contribute to the price of the product. Therefore, a composite of the implicit prices of the product's attributes is reflected in the observed price of a product. An implicit price of a product in a competitive market will be a function of the product attributes alone. This implies that only products are differentiated, while their markets, buyers and sellers are not (Rosen, 1974; Lucas, 1975; Ockowski, 1994). However, in most empirical studies, price has been found to be related to the product attributes as well as attributes of the buyers and sellers, implying some non-competitiveness in the market (e.g. Brorsen et al., 1984; Francis, 1990; Andargachew and Brokken, 1993; Parker, 1993; Parker and Zilberman, 1993; Williams et al., 1993; Oczkowski, 1994; Rodriguez et al., 1995; Jabbar, 1998; Jabbar and Diedhoudu, 2003).

In this study, an implicit or hedonic price function was estimated to relate the price per animal to its various attributes, and the attributes of markets, buyers and sellers. The general form of the implicit price function is as follows: $\mathbf{P} = \mathbf{F}(\mathbf{Q},\mathbf{C}) + \mathbf{e}$ , where P is the observed price of the product, **Q** is a set of qualitative (discrete) variables or factors each with more than one category, **C** is a set of quantitative variables (covariates), and **e** is an error term. Interaction variables may also be incorporated. The partial derivative of the estimated function with respect to a quantitative variable is the implicit marginal value of the attribute. Qualitative attributes are represented by dummy variables so the estimated parameters measure the impact of the presence or absence of the attribute. Therefore, the predicted price cannot be directly obtained from the partial derivatives, and hence additional manipulation would be required (Gujarati, 1988).

Since data on weight of animals could not be collected, the price model was estimated with price per animal as the dependent variable and the following explanatory variables: species (sheep, goats), characteristics of the animals (age, heart girth, height, sex, tail type, breed and origin, body and skin conditions, and color), market locations, time (week or month) of transaction in the year (representing season and presence or absence of a major festival), sex and types of sellers (traders vs producers), reasons for selling the animals, sex and type of buyer of the animal and purpose of buying. The SPSS Analysis of Covariance procedure (SPSS, 2004) was used to estimate the model parameters. The model estimated the price differences between categories within a factor, e.g. between male and female animals, after adjusting for the effects of all other factors and covariates. Bonferroni confidence intervals were used in the hypothesis tests in order to reduce the likelihood of false rejection of null hypotheses.

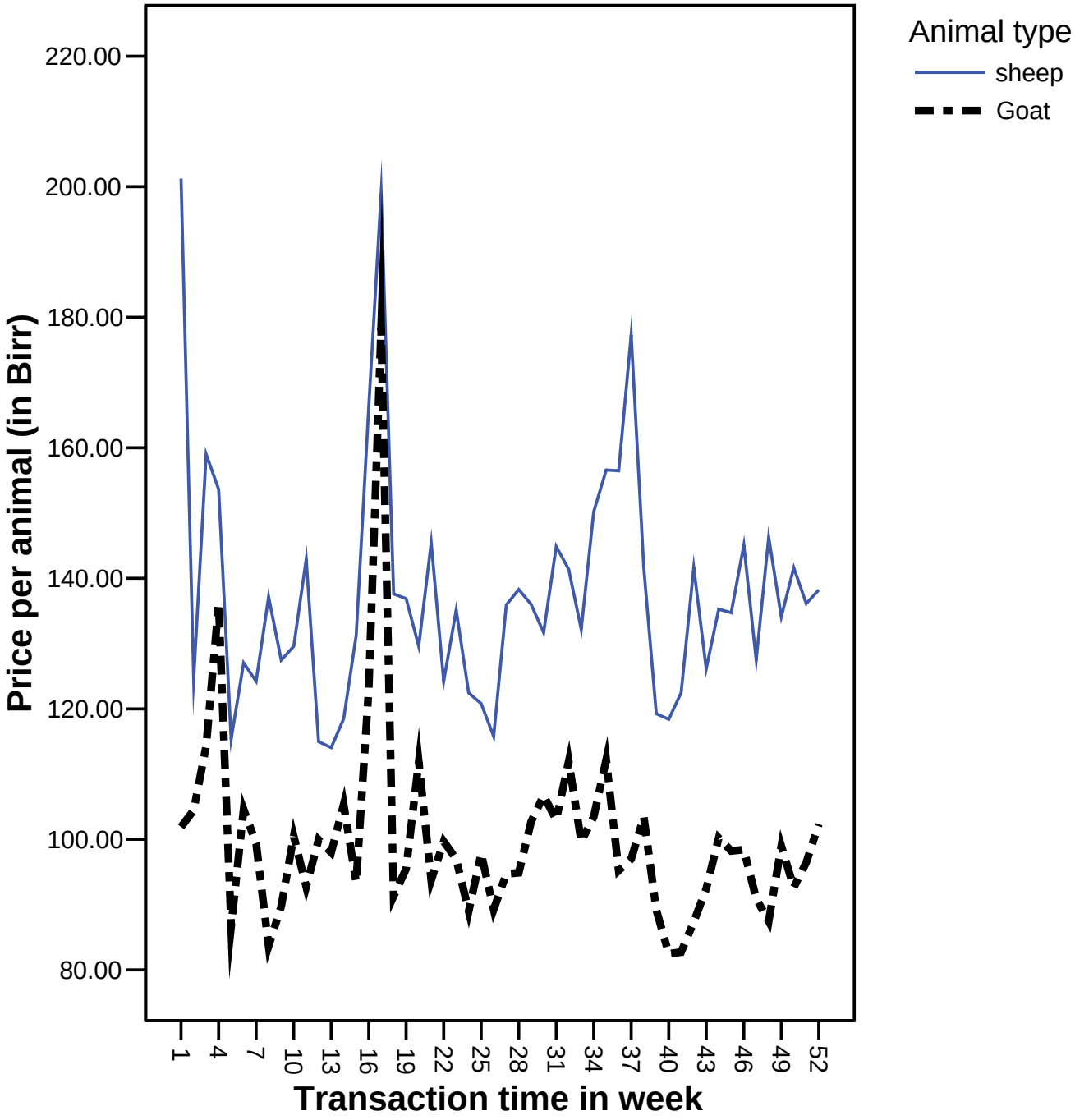
Of the total sample animals, 53% were sheep and 47% goats. Plot of average weekly nominal price data for sheep and goats show that prices of sheep were generally higher than those of goats throughout the year (Figure 2). Initially, the entire sample of sheep and goats was analyzed together using species as a factor, and significant price differences were found between sheep and goats. However, certain physical attributes of the two species are quite different, and the effects of those factors could not be properly captured in the aggregate analysis. Therefore, separate functions were fitted for sheep and goats, which gave better fit.

The weekly nominal price data plot in figure 2 shows that during the year there were about five different peaks and troughs, some large and some small, in price movement. Two approaches were tested to define time in the equation to see which fits these cycles better. First, transaction data were recorded each week so week was defined as a covariate and a fifth degree polynomial form for this variable was specified. Second, prices usually build up over several weeks toward a peak surrounding a major festival or religious occasion, e.g. new year, Christmas, haj, and then falls sharply after the occasion. These occasions also fall in some calendar month though the build up period may overlap with another month. Assuming that average for a month might capture these significant occasions, month was defined as a factor with individual months as categories. Of these two options, the month option gave the better fit.

Another problem was with respect to the use of reason for selling as a factor. Although every sale generates cash, farmers sold animals due to some specific underlying reasons other than cash generation, e.g. dispose of fattened animals for profit, to meet problems arising from draught, due to feed and water shortage, while traders sold only for profit. It was hypothesized that, other things being equal, price received for an animal might differ significantly according to the reason for sale. However, traders sold only for one reason so the data matrix had empty cells for other reasons for selling, which made accurate estimation of parameters for those variables difficult.

Therefore, for each species two equations were estimated: one for the total sample using all factors and covariates excluding reason for selling as a factor, the other for only animals sold by farmers using all factors and covariates including reason for selling as a factor. For sheep, $R^2$ for the overall and farmer seller equations was respectively 0.66 and 0.67, while for goats this was respectively 0.68 and 0.65. The significance of different parameters also remained largely similar in the two equations except in a few cases. Therefore, detailed discussion is focused only on the results of the overall equations, and any significant result from the farmer seller equations are highlighted at the end.

**Figure 2. Average weekly nominal prices of sheep and goats per animal, September 2002 – August 2003**



## Results and discussion

### Overall equations for sheep and goats

The results of best fit equations for sheep and goats are shown in Table 1. The specified variables explain 66% and 68% of price variation in case of sheep and goats respectively. Among the covariates, square terms were introduced for age, heart girth and height in order to capture the price premium or penalty for over aged, larger heart girth and taller animals. Other things being equal, age, heart girth and height of the animals had significant influence on the prices but with some difference between sheep and goats. Price per animal increased with age but declined for older or over mature animals for both sheep and goats. Height and heart girth are proxies for overall size of an animal and some breeds have larger height but narrow heart girth, so likelihood of correlation between these two parameters is low. In case of sheep, price per animal was very low or there was price penalty for animals with very small heart girth or dwarf size as indicated by the negative sign of the coefficient but price increased significantly as heart girth became larger and height increased. In case of goats, the influence of heart girth had the same pattern as in the case of sheep but coefficients of height and height square were not significant. This may indicate that marketed goat breeds were of more uniform height or that differences in height of did not affect price of goats. Expected average price of sheep and goat skins was Birr 22.8 and 10.8 respectively with standard error of 0.16 and 0.07 respectively. Expected price of goat skin significantly increased price of a goat but not so in case of a sheep.

Among the sample animals, the proportion of male was 76% in sheep and 66% in goats. Other things being equal, price per animal was significantly higher for males compared to females in case of both sheep and goats. One possible reason is that most marketed females are old culled animals which passed their productive age. Also some consumers don't want to buy female animals for slaughtering due to the possibility of pregnancy, as it is ethically unacceptable in Ethiopian society to slaughter pregnant animals.

Among the sample sheep, 56.8, 38.7 and 4.5% had good, average and poor body conditions respectively compared to 54.9, 35.8 and 9.3% in case of goats. In case of both sheep and goats, there was significant price penalty as body condition became poorer compared to the good condition.[1]

[1] Data on skin condition were also collected for each animal and this was used as a factor in the equation. However, because of high correlation between body and skin condition, this variable did not improve model fit, so was left out.

Several sheep breeds in Ethiopia are fat tailed but goats are generally thin tailed though some may have slight fat tail. Apart from inherent breed characteristics, the degree of fatness of the tail may also indicate general health condition of the animal: a more fatty tail indicates a better body condition and better health of the animal. Among sample sheep, 58.1, 38.2 and 3.7% were respectively thin tailed, fat tailed and fat ramped (very fat) tailed. Among goats, 88.2% were thin tailed and 11.8% were slightly fat tailed. Other things being equal, compared to fat ramped sheep, those with thin or fat tail commanded significantly lower prices. In case of goats, tail type did not significantly affect price.

Some breeds have inherent exclusive or dominant color while in other cases, this may not be so, especially when crossing among breeds is very common. Among sheep dalacha (28%), white (20.5%) red (21%) and black (18%) were major colors while among goats the same colors represented respectively 21.3, 20.6, 18.7 and 26.1%. Some times, buyers prefer a particular color while buying an animal either because of cultural reasons, e.g. animals bought for sacrifice may require to be of certain color, or because of one's personal liking for a particular color. In this study, other things being, equal, no significant price difference between color of goats was observed but black colored sheep commanded significantly lower price compared to red and other colors.

Among sample sheep, 97.8% were various local breeds but exact breed names could not be ascertained and 2.2% were crosses between some local and imported exotic breeds. Among goats 99.5% were local breeds. Crossbred sheep commanded significantly higher prices than local breeds, but prices did not differ significantly between breeds of goats.

No scientifically based breed classification is available yet so all the breeds are generally considered local nondescript. However, based on the origin or location of their habitat, various names are used by producers, traders and consumers to identify a particular type of animal. Each of these types has specific phenotypic characteristics as well as other quality attributes for differentiation, e.g. meat of animals from certain locations may be more tasteful than others due to differences in ecological conditions including feeds. Among the sample sheep, Arsi (45%) and Adal (15.6%) were major know origins and 19.9% came from unspecified places, while Arsi (37.7%), *Simit Sheleko* (14.2%) and Somali (12.3%) were major origins of goats and 27.8% of the goats came from unspecified places.. Other things being equal, in the markets surveyed, Somali lowland sheep commanded significantly lower

prices than Arsi another highland sheep but sheep of unknown origin commanded significantly higher prices than Arsi and other highland sheep. This may be because the highland markets prefer sheep of highland origin compared to those from pastoral lowland in the Somali region of Ethiopia and Somalia. On the other hand, goats originating in Somali and Jimma commanded significantly higher prices than Arsi and other highland origin goats.

Among the buyers of sheep 44.3% were consumers, 33.2% were traders, 16.4% were producers and 6.1% were butchers and restaurants; for goats buyers, the percentages were respectively 45.3, 27.2, 20 and 7.4. Among different types of buyers of sheep, other things being equal, farmers paid significantly lower prices compared to traders, consumers, and butchers and restaurants. One possible reason is that farmers as buyers are more prevalent in local markets while traders operate in all markets and dominate the secondary markets. In addition, farmers usually purchase animals for breeding, rearing and fattening and not for resale and consumption like traders and other consumers do. Thus they may prefer small animals with lower prices. Farmers supplied only 5.2% animals in Addis Ababa market but 99.6% and 97.3% of animals in Dire and Shashemene markets and 83% and 89% in Arerti and Meki markets. In case of goats, consumers paid significantly higher prices compared to other types of buyers. Farmers paid lower prices but the difference was not significant.

Fifty four percent of the sellers of sheep were farmers and 46% were traders while 67% of sellers of goats were farmers and 33% were traders. Other things being equal, there was no significant difference between prices received by farmers and traders as sellers of sheep. In case of goats, farmers received significantly lower prices than traders, which could be partly because farmers operate at the bottom end of the market chain and traders being profit motivated, may try to pay the lowest price possible in any bargain or negotiation. Farmers are often forced to sell their animals for reasons other than profit motives in situations of dire cash needs, so may accept lower prices than traders.

About 89% of buyers of both sheep and goats were male, the remainder was females. On the other hand, about 92% of the sellers of both sheep and goats were male. Buyer sex or seller sex had no significant influence on price in either species.

Among the nine markets, Methara is the farthest from Addis Ababa, the domestic terminal market. Nazareth and Shashemene are also semi-terminal markets in the sense that exporters

of live animals and export slaughterhouses operate in these markets and these markets get supplies from other primary/secondary markets around them. Therefore, Addis Ababa was used as the base for comparison of prices in other markets as, other things being equal, prices would be expected to be lower in other markets at least to the tune of marketing and transaction costs between Addis Ababa and each of the other markets.

Other things being equal, sheep prices were equally and significantly higher in Akakai and Nazareth, and significantly lower in Debre Zeit and Methara compared to prices in Addis Ababa. Methara had the lowest price of all. Prices in other markets were not significantly different compared to prices in Addis Ababa. In general, there was no clear progression in price along the primary to terminal market chain as would be normally expected except that the farthest market, Methara, had the lowest price. The reason for higher prices in Akaki and Nazareth could be partly explained by the fact that exporters and processors buy animals in these markets and they pay premium prices for best quality animals, and left over second or third grade animals may end up in Addis Ababa market, which then virtually becomes a sink market. Also animals from all over the country are supplied to Addis Ababa, so supply and prices in markets in a particular transect of the country may not significantly determine prices in Addis Ababa.

In case of goats, prices in Debre Zeit, Nazareth and Methara were significantly and equally lower compared to prices in Addis Ababa, but prices in Meki were significantly higher. Prices in Dire and shashamene were higher but statistically significant. Thus price differences between markets followed to some extent the expected differences between primary, secondary and terminal markets. One possible reason is that in general highland is not a major production or consumption area for goats, so supplies come mainly from the lowlands, of which the markets studied are one of major sources of supplies for Addis Ababa.

In the forgoing comparison of prices between markets, the comparison is for the same time point or period. In reality, a major source of price variation across markets would be the lag in price transmission between interlinked markets. If market A supplies animals to market B and the price in market B on a particular day depends on the price in market A x number of days earlier due to the time required to move animals from A to B, then price comparison between these two markets need to take this lagged relationship into account. In the present anlaysis, the process of transmission and degree of market integration was not tested.

Other things being equal, prices showed variation between months during the survey year. Assuming inflationary effect during the periods was minimal, the monthly price differences could be largely explained by occurrence of festivals. In case of sheep, compared to prices in August 2003, which coincided with the Ethiopian new year, prices in most previous months were lower, and they were significantly lower in October- December 2002 and in February and June of 2003. Prices in April (coinciding with Ethiopian Easter) were higher than in August but the difference was not statistically significant. A possible reason is that the month captured both the build up to the peak at the time of Easter but also the drastic fall following the Easter festival (Figure 2), thereby canceling the higher price segment of the month. In case of goats, compared to August 2003 prices were significantly lower during previous October-November but were significantly higher in January (coinciding the Ethiopian Christmas) and April (Ethiopian Easter).

**Farmer seller equations for sheep and goats**

Although in the overall equation, prices differed significantly for sheep and goats of certain origin, in the farmer seller equations for sheep similar differences were observed but in the farmer seller equation for goats, prices did not significantly differ between goats of different origin, indicating that farmers pay equal prices for all kinds of goats for rearing.

In the farmer seller equation, prices did not significantly differ between markets either for sheep or for goats though there were significant differences between certain markets in the overall equations. Price differences between months and between markets had fairly similar pattern as in the overall equations.

Producers sold more than 66% of the animals due to cash shortage, 10% as a result of drought and 4% due to feed and water shortage and 20% due to various other reasons including targeting a festival for profit. Other things being equal, prices received by farmers for sheep sales were significantly higher when they were sold for ‘other reasons including festival time market targeting’ compared to sales for cash shortage as well as drought and feed/water shortage. In case of goats, prices received were significantly lower when sold due to drought compared to sales for cash shortage and other reasons.

Central highlands (Menz and Arsi areas) are the main sheep producing areas in the market transect studied. In this zone, about 40% cash income from sales of animals was attributed to

sales of sheep (Gryseels, 1988). Before harvest time, producers usually sell animals as a result of cash shortage to maintain livelihood. For instance, most of the farmers who mentioned cash shortage as a reason for sale came from Arsi and Menz areas, where the main crop harvest season '*meher*' is from November to January and short harvest season 'belg' is from April and May. Usually cash needs are higher before the harvest season (Andargachew, 1993). In the markets surveyed, there were no animals originating from Menz during Meher in November, December, January and during 'Belg' in April and May due to the availability of cash from crop sales (Table 2). Farmers in these locations faced serious cash shortage in June, July and October and as a result they increased sales of animals in these months.

Input constraints like feed and water shortage could significantly affect the supply and sales of animals. The occurrence of feed and water shortage often overlap and occur at the same time. In the transect studied, feed shortage occurs during February to June in dry season. Feed shortage was significant in Arsi from March to August during the survey year and sales of animals increased and reached peak in May and June (Table 2). In Simit Sheleko, feed shortage peaked in September and October when most animals were sold. Sales of animals in this zone was also affected by situations in the adjacent pastoral regions such as in Afar and Somali regions due to feed and water shortage. Sales of animals from Adal and Somali (Shinile zone which is close to Methara through Bike) pastoral origins are significant in number because of high potential for small ruminant production. In Afar and Somali, the feed shortage period stretches longer than in the neighboring highlands. Feed shortage was severe during February to July so sales peaked in June (Table 2).

Natural factors such as drought also affected the supply of sheep and goat, especially from Afar or Adal and Somali pastoralist areas. In bad years, pastoralists adopt coping strategies, increased livestock sales, increased slaughtering of own animals (SC-UK, 2001). Gryseels (1988) noted that small animals were the first to be considered for sale when food is depleted. Pastoralist in the highland markets sell goats in order to cope up with the drought. Sales from Afar origin during August to November was highest (Table 2).

**Summary**

Small ruminants play a major role in the livelihood of smallholder farmers in the highlands. Producers and traders of small ruminants generally consider seasonal and intermarket price differences as major problems constraining smallholder benefits from market participation. In

this paper, the results of a survey on seasonal and inter-market variation and other determinants of prices of small ruminants in selected highland and mid-altitude zonal markets are presented. Understanding the sources of price variation may be helpful for producers to understand buyer preferences for specific characteristics of animals and target breeding, fattening, time and place for sales to gain from important market opportunities.

Hedonic price models were fitted to a sample of 1397 sheep and 1293 goats respectively for which data were collected from nine markets in Ethiopia over a 12 month period. The objective was to determine seasonal and inter-market differences in prices after controlling for the effects different attributes of the animals, the buyers and the sellers. Results indicate that, controlling for attributes of the animals and of the buyers and sellers, there were significant differences in prices between seasons and markets. Seasons in which farmers faced severe cash shortages exhibited the lowest adjusted prices for animals they sold, indicating that although livestock may provide a fall back position for cash in times of crisis, terms of trade may be worst when farmers need cash the most. In general, there was no clear progression in price of sheep along the primary to terminal market chain ending in Addis Ababa as would be normally expected except that the farthest market had the lowest price. The reason for higher prices in some intermediate terminal markets could be partly explained by the fact that exporters and processors buy animals in these markets and they pay premium prices for best quality animals, and left over second or third grade animals may end up in Addis Ababa market, which then virtually becomes a sink market. In case of goats, price differences between markets followed to some extent the expected differences between primary, secondary and terminal markets. One possible reason is that in general highland is not a major production or consumption area for goats, so supplies come mainly from the lowlands, and the markets studied are one of the major sources of supplies for Addis Ababa, so the price movement followed the market chain.

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**Table 1: Determinants of sheep and goat prices in eastern highlands of Ethiopia**

| Covariates and factors | Sheep | | | Goats | | |
|---|---|---|---|---|---|---|
| | **Price margin** | **Standard error** | **t-values** | **Price margin** | **Standard error** | **t-values** |
| **Covariates** | | | | | | |
| Age (months) | 2.90 | 0.28 | 10.45*** | 1.28 | 0.24 | 5.37*** |
| $Age^2$ | -0.03 | 0.004 | -8.18*** | -0.01 | 0.004 | -3.02*** |
| Heart girth (cm) | -3.54 | 1.35 | -2.63*** | -12.93 | 1.325 | -9.760*** |
| $Heart\ girth^2$ | 0.04 | 0.01 | 4.62*** | 0.11 | 0.01 | 11.82*** |
| Height of animals (cm) | -2.35 | 1.58 | -1.49 | -1.30 | 1.38 | -0.94 |
| $Height^2$ | 0.02 | 0.01 | 1.88* | 0.02 | 0.01 | 1.51 |
| Expected skin price (birr) | 0.03 | 0.23 | 0.12 | 1.83 | 0.45 | 4.06*** |
| | | | | | | |
| **Sex** | | | | | | |
| Female | 0.0 | | | 0.0 | | |
| Male | 20.29 | 2.38 | 8.53*** | 13.69 | 2.06 | 6.64*** |
| **Body condition** | | | | | | |
| Good | 0.0 | | | 0.0 | | |
| Average | -20.33 | 2.27 | -8.95*** | -13.25 | 2.08 | -6.36*** |
| Poor | -34.29 | 5.18 | -6.62*** | -30.58 | 3.71 | -8.25*** |
| **Tail type** | | | | | | |
| Fat ramped | 0.0 | | | | | |
| Fat tailed | -14.58 | 5.08 | -2.87*** | 0.0 | | |
| Thin tailed | -12.25 | 5.23 | -2.34*** | -0.29 | 2.78 | -0.11 |
| **Color** | | | | | | |
| Red | 0.0 | | | 0.0 | | |
| Dalacha | -0.98 | 2.63 | -0.37 | -3.12 | 2.72 | 1.15 |
| White | -3.23 | 2.79 | -1.161 | -2.54 | 2.68 | 0.95 |
| Black | -9.62 | 2.84 | -3.39*** | -2.70 | 2.56 | 1.06 |
| Wessera | -4.75 | 3.48 | -1.37 | -3.96 | 3.69 | 1.07 |
| Brown | 4.66 | 6.25 | 0.75 | -5.50 | 4.68 | 1.17 |
| Bora | -0.50 | 8.39 | -0.06 | -2.16 | 5.93 | 0.36 |
| **Breed** | | | | | | |
| Local | 0.0 | | | 0.0 | | |
| Crossbreeds | 14.14 | 6.78 | 2.09*** | 5.45 | 12.22 | 0.45 |
| **Origin** | | | | | | |
| Arsi | 0.0 | | | 0.0 | | |
| Adal | -2.95 | 3.35 | -0.88 | -4.28 | 10.28 | -0.42 |
| Simit Sheleko | 6.96 | 5.14 | 1.36 | 3.81 | 4.64 | 0.82 |
| Menz | 4.92 | 4.46 | 1.10 | -3.19 | 5.32 | -0.60 |
| Somali | -17.58 | 6.88 | -2.56** | 6.53 | 3.744 | 1.75* |
| Others | 0.80 | 5.24 | 0.15 | -4.04 | 5.85 | -0.69 |
| Unknown | 7.30 | 3.11 | 2.35** | -1.22 | 2.96 | -0.41 |
| Jimma | 7.35 | 7.36 | 1.00 | 21.45 | 9.49 | 2.26** |

**Table 1 (continued)**

| Factors | Sheep | | | Goat | | |
|---|---|---|---|---|---|---|
| | **Price margin** | **Standard error** | **t-value** | **Price margin** | **Standard error** | **t-value** |
| **Buyers Type** | | | | | | |
| Trader | 0.0 | | | 0.0 | | |
| Consumer | -0.89 | 2.53 | -0.35 | 6.14 | 2.63 | 2.33** |
| Farmer | -14.85 | 3.20 | -4.65*** | -3.91 | 3.04 | -1.28 |
| Butcher and restaurants | 3.03 | 4.15 | 0.73 | 2.07 | 3.87 | 0.54 |
| **Buyers sex** | | | | | | |
| Female | 0.0 | | | 0.0 | | |
| Male | -5.57 | 2.99 | -1.86* | 0.83 | 2.87 | 0.77 |
| **Seller type** | | | | | | |
| Trader | 0.0 | | | 0.0 | | |
| Farmer | -1.93 | 2.41 | -0.80 | -9.40 | 2.42 | -3.89*** |
| **Seller sex** | | | | | | |
| Female | 0.0 | | | 0.0 | | |
| Male | 0.98 | 3.52 | 0.28 | -2.07 | 3.21 | -0.64 |
| **Market** | | | | | | |
| Addis Ababa | 0.0 | | | 0.0 | | |
| Akaki | 10.86 | 5.08 | 2.14** | 9.54 | 5.38 | 1.77 |
| Debreziet | -13.89 | 5.27 | -2.63*** | -15.43 | 5.69 | -2.71*** |
| Dire | 3.95 | 5.65 | 0.70 | 5.45 | 5.45 | 1.00 |
| Nazareth | 11.40 | 4.41 | 2.59** | -13.01 | 5.04 | -2.58** |
| Arerti | -6.38 | 5.50 | -1.16 | -3.201 | 6.19 | -0.52 |
| Meki | -5.67 | 6.68 | -.85 | 11.90 | 5.87 | 2.03** |
| Shashemene | 1.89 | 5.32 | 0.36 | 6.31 | 5.52 | 1.14 |
| Methara | -27.54 | 6.33 | -4.35*** | -16.20 | 5.26 | -3.08*** |
| **Month (occasions)** | | | | | | |
| August 2003 (new year) | 0.0 | | | 0.0 | | |
| July | -4.39 | 4.43 | -0.99 | -2.65 | 4.43 | -0.60 |
| June | -9.37 | 3.82 | -2.46** | 3.17 | 3.79 | 0.84 |
| May | -2.81 | 4.04 | -0.70 | -3.73 | 4.00 | -0.93 |
| April (Easter) | 3.68 | 4.14 | 0.89 | 8.18 | 4.10 | 1.99* |
| March (Christian fasting) | -4.68 | 3.964 | -1.18 | 1.82 | 3.87 | 0.47 |
| Feb (Christian fasting) | -11.86 | 3.83 | -3.10*** | -3.53 | 3.71 | -0.95 |
| January 2003 (Christmas) | -2.56 | 4.360 | -0.59 | 8.86 | 4.22 | 2.10** |
| December 2002 | -11.67 | 3.98 | -2.93*** | 0.48 | 4.01 | 0.12 |
| Nov (Ramadhan fasting) | -16.70 | 4.06 | -4.11*** | -6.87 | 3.94 | -1.74* |
| October | -11.01 | 3.77 | -2.92*** | -6.99 | 3.73 | -1.87* |
| September 2002 | -3.94 | 4.02 | -0.98 | 0.83 | 4.04 | 0.21 |
| $R^2$ | 0.66 | | | 0.68 | | |
| Adjusted $R^2$ | 0.65 | | | 0.66 | | |
| N | 1397 | | | 1293 | | |

*, ** and *** indicate significant at 10% , 5% and 1% level.

**Table 2: Percentage of sample animals sold by reason for sale, origin of animals and month of transaction in Eastern Shoa zone**

| Months | Cash Shortage | Drought | | Feed shortage | | | |
|---|---|---|---|---|---|---|---|
| | Arsi and Menz | Adal | Somali | Arsi | Simit Shelko | Adal | Somali |
| September | 0 | 13.3 | 0 | 0 | 33.3 | 7.1 | 0 |
| October | 42.9 | 13.3 | 0 | 0 | 33.3 | 0 | 0 |
| November | 0 | 21.7 | 16.7 | 0 | 0 | 0 | 0 |
| December | 0 | 0 | 16.7 | 0 | 0 | 7.1 | 0 |
| January | 0 | 4.3 | 0 | 0 | 0 | 0 | 0 |
| February | 14.3 | 4.3 | 0 | 0 | 0 | 7.1 | 16.7 |
| March | 0 | 4.3 | 0 | 11.1 | 16.7 | 7.1 | 16.7 |
| April | 14.3 | 4.3 | 0 | 11.1 | 0 | 7.1 | 8.2 |
| May | 0 | 4.3 | 8.3 | 22.3 | 0 | 14.3 | 16.7 |
| June | 14.3 | 8.7 | 8.3 | 33.3 | 0 | 21.6 | 25.0 |
| July | 14.2 | 0 | 33.3 | 11.1 | 16.7 | 14.3 | 16.7 |
| August | 0 | 21.5 | 16.7 | 11.1 | 0 | 14.3 | 0 |
| Total | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |

Source: Field survey

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