

GOATS AND GOAT PRODUCTS MARKETS
IN WESTERN KENYA

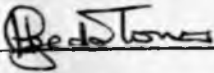
BY

HENRY TOMS KOLA OGADA

A Thesis submitted in partial fulfillment for the degree of
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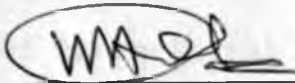
DECLARATION

This thesis is my original work and has not been presented for a degree in any other University.



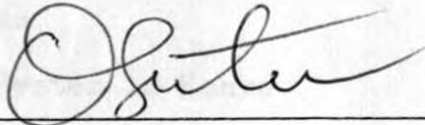
HENRY TOMS KOLA OGADA
(Candidate)

This Thesis has been Submitted for examination with our approval as University supervisors.



5th Sept. 1987.

Dr. W. Oluoch-Kosura
(Supervisor)



Dr. A.C. Ackello-Ogutu
(Supervisor)

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ABSTRACT

This research was undertaken to contribute to the understanding of goats and goat products markets in Western Kenya . The survey was carried out in Kakamega district which is one of the areas where dual purpose goats are being bred for milk production. The objectives of the study were: to identify and describe current markets for goats and goat products, assess the possibility of grade establishment and to examine market linkages and price changes in the marketing system .

Both primary and secondary data were used . Primary data were generated from livestock markets through interviews by enumerators using structured questionnaire. Secondary data were obtained from divisional annual reports .

Analytical techniques included, descriptive statistics, regression and bivariate correlation analysis . The survey results showed that goat markets were unevenly distributed in the region and was mainly influenced by volume of livestock that can be supplied to the market from that region . It also showed that livestock exchanges at the market favoured goats of weights between 16-30kg .

The cold dress weight of goats were estimated at 40 percent of the liveweight . This proportion was mainly constituted by " bone in bone out meat". The other parts were the bowels commonly known as " matumbo" which constituted 21 percent of the animals' liveweight . The price for meat and

"matumbo" were controlled by the government. The price controls were therefore only effective on up to 61 percent of the total liveweight of goats .

Regression results indicated that only liveweight attribute had significant influence on goat prices . It was therefore desired by buyers and could be used in grading scheme . The contribution of other attributes like age and sex had no significant influence on prices of goats and were regarded as less suitable as part of any grading scheme that can be established for goats

Weak linkages existed between markets . The highest coefficient calculated was 0.65 which was close to 0.7 which is considered satisfactory (schmidt, 1979). Price formation at various market levels were also not efficient . The margins were not independent from selling prices. This indicated that traders were setting prices which deviated significantly from perfect competitive conditions . This is illustrated by regression result between price margin and selling price .

The study recommended the establishment of pricing of goats based on liveweight as a means of improving price efficiency . Formation of various institution like co-operatives and other specialised agencies to perform some market functions was suggested as part of measures designed to improve market performance .

CHAPTER 1

INTRODUCTION

Kenya's agricultural potential varies widely and is classified on the basis of average rainfall received into high , medium ,and low potential zones .Of the 52 million hectares of land available , only about 6.8 million hectares can be considered high potential ,3.2 million hectares medium potential and the remaining 42 million hectares fall under low potential areas (Senga et al 1976).

This indicates a relatively small proportion of productive land available for food production to feed the population in the country. The current population of Kenya is close to 20 million with annual growth rate of about 4 percent This fast rate of population growth will require the agricultural sector to play an important role of increasing food supply both in quantity and quality in order to cope with the requirement of the rapidly expanding population .

In livestock industry to which this study was directed, demand projections of animal products like meat and milk indicated the need to intensify production for the country to cope with the estimated demand.For example,projections by the ministry of Agriculture and Livestock Development have shown that high grade cattle will increase from 1.2 million heads

to 2.13 million heads from 1977 to 1988 . This number is expected to give an output of 2200 million litres of milk, enabling consumption per capita of 100 litres .

Beef production on the other hand was projected to reach the level of 288,000 tons per year . This represents an increase of 120 percent in the same period (Kenya, 1981; Kenya, 1977) .

It is also reported that other human food requirements will cause a decrease of up to 3.2 percent of grazing land in future ^{by what time} . In an effort to compromise such conflicting issues regarding future production of meat and milk from cattle given the available land , the government has adopted a policy that would encourage the development of goats capable of providing enough milk for kids and surplus for human consumption (Kenya, 1974).

It was envisaged that because goats are small compared to cattle and consume relatively less feed , their potentiality for easing the resource constraint was high particularly in small scale farming sector where goats are being kept already .

1.1 THE BACKGROUND

Development of dual purpose goats (DPG) which are capable of providing enough milk for kids and surplus for human consumption and meat has received a great interest including government and other collaborating international

institutions . The small Ruminant Collaborative Research Support Programme (SR-CRSP) ,in particular has concentrated its resources on DPG development .

This research was proposed as part of SR-CRSP project seeking to evaluate goats and goat product markets in Western Kenya . The programme has been operating in Kenya since 1980. It is a joint venture between United States Agency for International Development (USAID) and American Universities collaborating with the government of Kenya .

The main objective of SR-CRSP is to develop and introduce DPG in small scale farming systems in Western Kenya . The goal for developing and introducing DPG in small scale farms in Western Kenya is to improve nutritional status of the people in terms of provision of meat and milk ,as well as increasing the farmers' income .The above goal is in line with the government objective in the national food policy sessional paper No.4 of 1981 of ensuring that every citizen is well fed .

1.2 THE PROBLEM

The breeding work to develop dual purpose goats by SR CRSP is on going .Marketing stage of developed DPG is yet to be reached.As a prerequisite activity towards development and introduction of DPG the study sought to provide an understanding of the current goats and goat product market in western Kenya .

The current lack of information about goat markets in the region holds a great uncertainty over the future development of goat production in the area. The question as to whether the current marketing system would be able to sustain and accelerate the development of DPG needs an answer. As part of general concern, the study sought to describe the goat and goat products markets in the region. In doing so, other options which would offer improvement in the system also required attention.

Assuming the success of DPG project, increased commercialization on trade of goats and goat products is expected. This might require structural changes in the present system in order to cope with the demand of services required by the improved goat and its' products. The current system if not well developed will need to be improved in order to provide services conducive for high commercial activities.

The study held grade establishment in goat markets as an important aspect for such marketing system. It would contribute significantly towards improvement on price efficiency. This is essentially attainable through its ability in creating reduction to price uncertainty between buyers and sellers.

However, establishment of grades may not be as simple as stated. It requires both the identification of right product attributes upon which grades are to be defined and consistency with which individual attribute appeal to a wide cross section of consumers.

Previous studies have tended to depict liveweight, age, and sex of goats as important attributes which seem to have influence on goat prices. This would suggest their appropriateness for grade definition. However, these were results observed from a different environment and probably with different economic set up. As such their applicability in the region may not provide reliable information upon which grading scheme may be set. As a result the study sought to establish the significance of price and attribute relationship as a criteria for identifying the right attribute for defining grades.

The attention was also focused on interregional trade on goats. It is an important market activity that contributes to a greater extent towards the improvement of price efficiency. Resources should be moved from surplus areas to deficit areas. Through interregional trade, equitable redistribution of resources can be achieved. This is primarily achieved through "homeostatic" balance of prices between regions. Thus, when price differences between regions that trade exceed transfer cost then arbitrage activities is expected to occur raising prices in low price region until price differences between the corresponding regions just equal transfer cost. At this point, the market is considered efficient as excess margins over transfer cost ceases to exist. However, at times the activity may fail to occur in a region either due to market controls or other market

imperfections . Weak market linkages may occur as a result. Weak market linkages have been associated with unfair margins or lack of information . Determination of the extent of goat market linkages was therefore seen as important objective of the study .

1.3 OBJECTIVES OF THE STUDY

The objectives of the study were :

- (i) to identify and describe current markets and marketing channels for goats and goat products markets including breeding stock ,slaughter stock milk and skins .
- (ii) to examine the possibility of using liveweight ,age and sex attributes for establishing grades in goat markets .
- (iii) to assess the extent to which goat markets are linked by arbitrage activities .

1.4 HYPOTHESES

The following hypotheses which relate to the objectives of the study were posed .

- (i) Liveweight ,age ,and sex of goats have an influence on market prices and therefore can be used as attributes for setting up grades .
- (ii) Differences in prices of goats between markets exceed transfer cost. Therefore, there is low price efficiency.

1.5 AREA OF STUDY

This study was carried out in Kakamega district in Western part of Kenya (fig1.1).Kakamega district forms one of the sites where the project was implemented . The district was chosen for the study to evaluate marketing aspects of goats since the other alternative site like Siaya and Busia were under quarantine for stocks at the time of the research.

The district covers an area of about 3520 km² and by 1980 approximately 82 percent of land holdings were registered as small holders (Kenya,1980) . The total average holding ranges between 2-2.5 hectares (Sands et al.1982) . From 1979 census, the population of the area was approximated at 1,033,000 with varying density between 274-880 people per km² (Kenya,1981;Sands et. al. 1982) .

Kakamega district lies between the longitudes of 34-35 East and latitude 0-1 North in Western Kenya . A large proportion of the district forms part of high potential land in western Kenya . The altitude range is between 1400-1500 meters above the sea level .The daily maximum temperature range between 22-27 C ,while daily minimum temperature is between 10-14 C (Sands et al. 1982) .The soils are derived from volcanic basement complex rocks and classified as ultisols (Nyandat quoted by Sands et al.1982) .

The district can be differentiated into zones on the basis of principal cash crop produced . The major cash crops Produced are sugar cane ,coffee ,tea and maize . Maize is

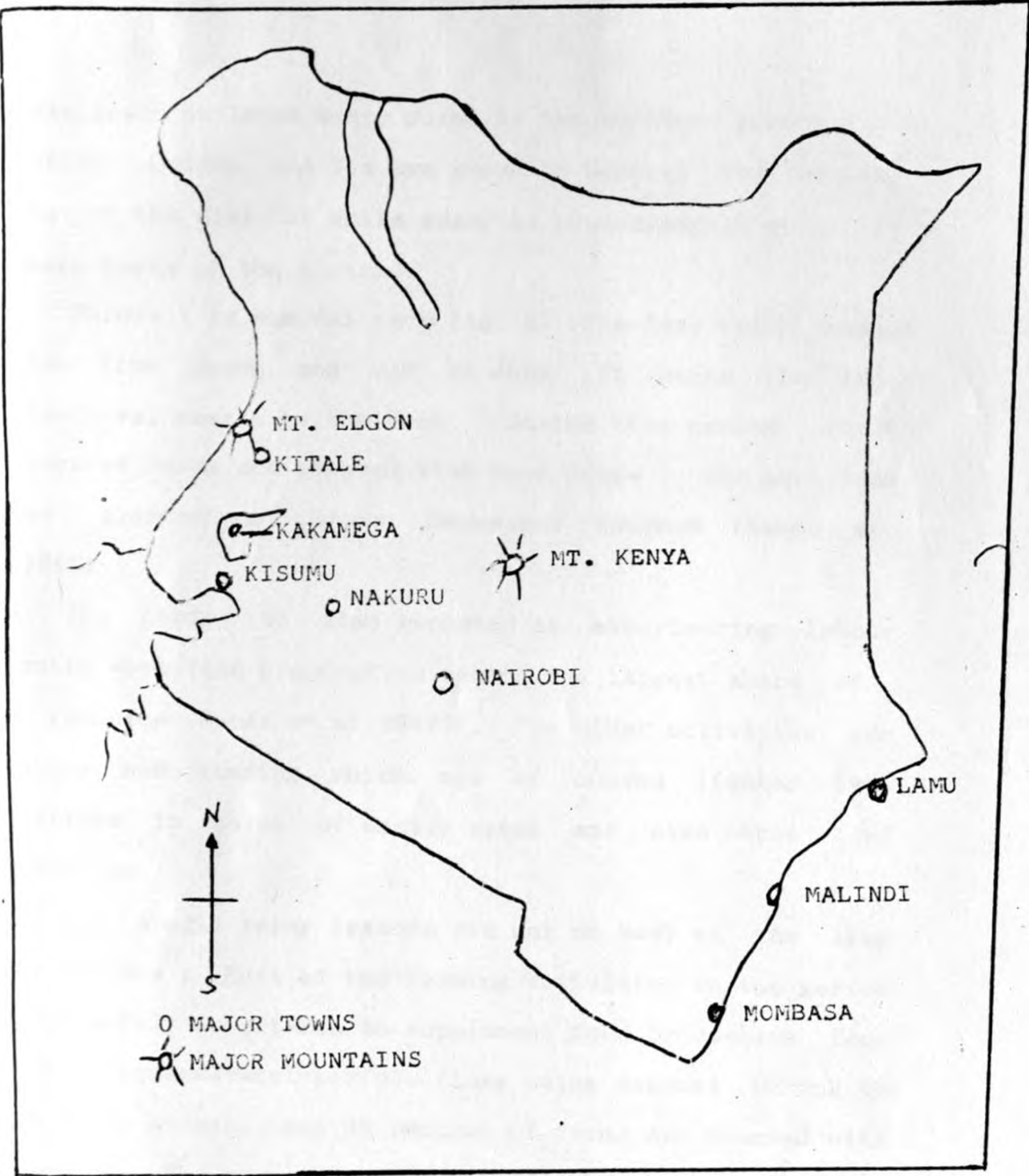


FIG 1.1 MAP OF KENYA SHOWING THE RELATIVE POSITION OF KAKAMEGA

mainly grown on large scale farms in the Northern parts of the district .Coffee and Tea are grown in Central and Eastern parts of the district while sugar is predominantly grown in Western Parts of the district .

Rainfall is bimodal (see fig1.2) .The long rainy season begins from March and end in June .It marks the major agricultural season in the area . During this period ,60-70 percent of farms are planted with food crops . The main food crops planted are Maize ,Beans,and Sorghum (Sands et. al.1982) .

The period is also reported as experiencing labour scarcity with land preparation taking the largest share of the resource (Sands et al.1982) . The other activities are planting and weeding which are of course lighter farm operations in terms of energy spent and time than land preparation .

The short rainy seasons are not as busy as the long rainy seasons . Most of the farming activities in the period are primarily undertaken to supplement food production from the main agricultural periods (long rainy season) .During the short rainy season, only 33 percent of farms are planted with food crops . The rest of the farms lie fallow waiting for the main season or used in production of other crops like vegetables .

Livestock population in the district is estimated at 440,705 heads (Sands et al.1982) .

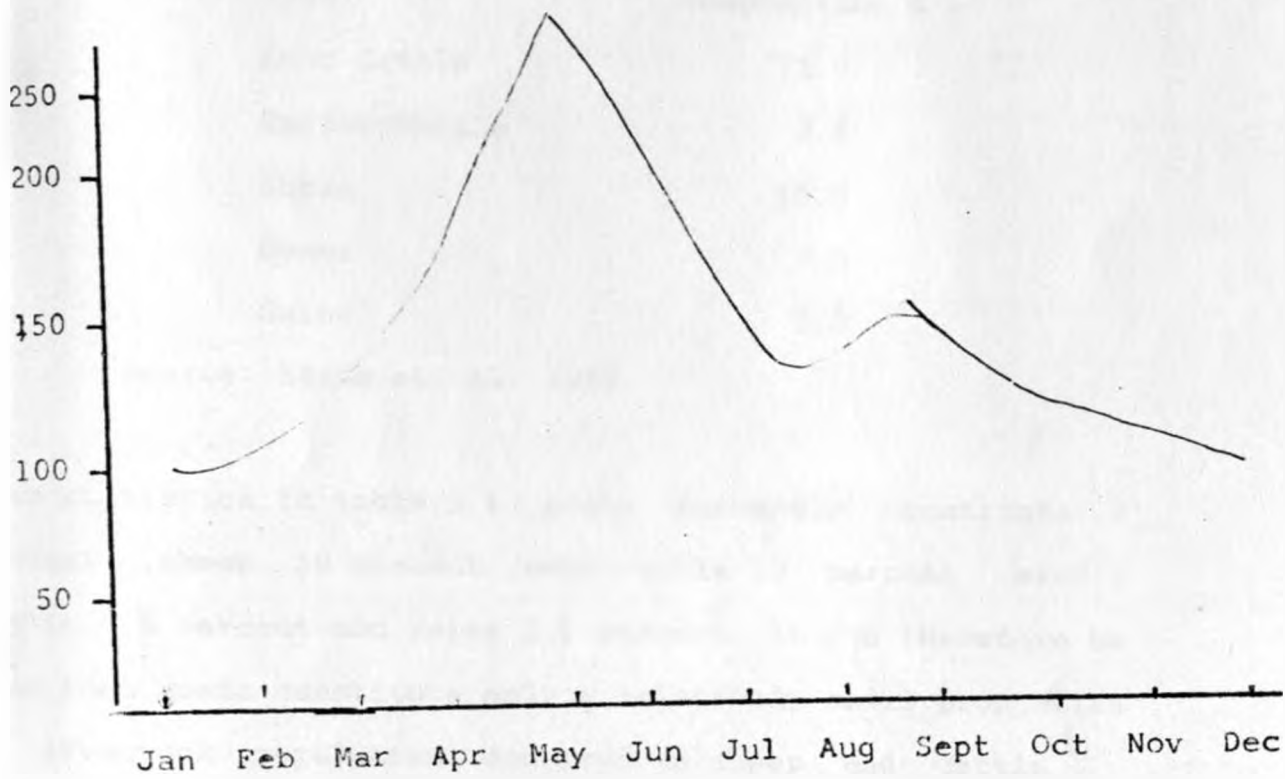


Fig. 1.2 Mean monthly rainfall of Kakamega town 1982.

Table 1.1 Composition of Livestock Population in Kakamega District

Type	Composition %
Zebu Cattle	72.0
Exotic Cattle	6.5
Sheep	10.0
Goats	9.0
Swine	2.5

source: Sands et. al. 1982.

From statistics in table 1.1 ,goats currently constitute 9 percent ,sheep 10 percent ,zebu cattle 72 percent ,exotic cattle 6.5 percent and swine 2.5 percent. It can therefore be seen that goats constitute only a relatively small proportion of livestock population compared to sheep and cattle . Partly this may be explained by lack of competitive position of goats at the farm level .

The production of goats is mainly kept at subsistence level and no large scale goat production takes place in the district . While these unfavourable conditions hold for goat production at the present ,projections of future efficient allocation of resources identify goats as future livestock resource for alternative production of meat and milk in small scale farms (sands et al. 1982;Kenya,1974;Kenya,1977) .

The main issue or task for SR CRSP at the moment is to make goats acceptable in the existing farming systems as an insurance against anticipated shortages of milk and meat in

the future .

1.6 ORGANISATION OF THE THESIS

Chapter one has provided information about Kenya's requirements for livestock products ,outlined basic facts underlying the farming systems in the research area ,discussed problem setting ,objectives and hypotheses posed in the study . In chapter two ,the review of existing literature on the subject and theoretical basis of the study are given. Chapter three discusses the methodology and analytical techniques employed in the study .The results are provided in chapter four ,while summary ,conclusion and policy implication are presented in chapter five .

CHAPTER 2

THEORETICAL BASIS OF THE STUDY AND LITERATURE REVIEW2.0.0 THEORETICAL BASIS OF THE STUDY

The purpose of this section is to present relevant concepts on economic theory upon which the analysis was based. The issues covered are : organization of agricultural marketing systems , determination of attributes of goats for defining grades , spatial price relations and price margins behaviour in perfectly competitive markets .

2.0.1 ORGANISATION OF AGRICULTURAL MARKETS

In agricultural marketing system ,producers need not come into direct contact with consumers . Instead ,middlemen provide the necessary services in the process of product transfer from producers to consumers . Therefore , between producers and consumers ,a chain of different types of middlemen may exist . Some are only involved in title transfer . Others are concerned with changes in product forms and others storage . All these types can be found in goat and goat product marketing system but the most important issue is how their activities conform with proper functioning of the marketing system .

In the entire process of product transfer,the producers' main objective is to maximize profit , middlemen aim at

maximizing profit from services rendered and consumers aim at maximizing their satisfaction from the goods purchased . It can therefore be seen that each one of these economic units in the marketing system has an objective to achieve . Depending on individuals' objective and conducts adopted for achieving such objectives , the market may either be efficient or not .

The most fundamental issue in the interaction of producers , middlemen and consumers is price discovery . This refers to the process by which buyers and sellers arrive at a specific price . There are several alternatives . These are :

- (i) individual negotiations .
- (ii) organized exchanges like market auctions .
- (iii) formula pricing .
- (iv) group bargaining conducted by producer cooperatives.
- (v) administrative decisions .

These alternative price discovery procedures prevail in different market conditions . The transaction that takes place between buyers and sellers involve title transfer or product exchange . The location from which exchange transaction occur are termed markets .

These markets are spatially located over a given geographical area . Trade occur in between these markets in hierachical order . Generally , it takes place from primary markets through intermediate up to terminal markets .

Primary markets are those in which the majority of sellers are producers. Intermediate markets are those in which the composition of producers and middlemen are almost similar in number. Terminal markets are characterised by high proportion of sellers as middlemen.

The path through which a product passes to consumers is termed a marketing channel. For any marketing system, one or more channels may exist. These channels are composed of different arrangements of producers, middlemen and consumers. The arrangement along the channels may be diffused or clearly defined. A clearly defined channel has a specific and definite chains of economic units. Diffused channels have no clear cut chains.

The economic importance of these channels lies in the length of the chain. The longer the marketing chain the higher the price spread. This proposition holds because from one level to another along the chain there is price increase or margin. This implies that long chains are harmful to consumers. Therefore, from theoretical point of view, the negative effects (i.e excessive cost to consumers) which arises from long marketing chains can be reduced by integrating some market functions to be performed by individual or groups of individuals. It is clear that marketing channels which is the path through which the product passes from producers to consumers constitute an important aspect of market organisation as far price efficiency is concerned.

2.0.2 THEORETICAL DETERMINATION OF ATTRIBUTES FOR GRADE DEFINITION

There are three important questions asked while assessing product grading system . These are :

- (i) How to identify the attributes of a product for defining grades ? .
- (ii) Given the information on attributes how should the grades be defined ? .
- (iii) How should boundaries between grades be established ?

The main task of this study was based on answering the first question rather than the second and the third questions . The first question is primarily concerned with methodologies adopted in establishing important attribute of product for defining grades . The second and third questions act as guides towards selection of appropriate grading system .

It is generally known that agricultural products are highly heterogeneous . The differences are of course expressed in product attributes . The variations along a product's attributes results in quality differences . Since the definition of grades is in terms of certain quality characteristics or attributes , the relationship between product quality and consumer behavior is central to any theory of grading (Zusman,1967) .

It is conceivable that for any product , there is an individual quality valuation function based on attributes . The nature of these functions depend on consumer attitude .

Consumers are perceived to evaluate quality through indices or measurements of a particular characteristic (Zusman, 1967).

In the analysis, Zusman assumed that these quality characteristics have continuous functions but are bounded after some time. For instance, given $a_1, a_2, a_3, \dots, a_n$ as certain measures or indices of quality characteristics then the intervals are defined as $L_i \leq a_i \leq L_i$

where L_i is the lower bound and L_i is the upper bound

Since a given commodity is defined by its quality characteristics any differences in these characteristics implies different commodities. Therefore at the market

$q(a_1, a_n)$ is the amount of the commodity with quality characteristics a_1, \dots, a_n purchased by a consumer.

Following Zusman (1967), if the commodities with all possible quality characteristics are offered for sale, it can be argued that the commodity space has infinite dimensions and the utility function can be represented as in

$$U = u[q, m] \tag{1}$$

The budget constraint as in 2 becomes

$$\int_{L_n}^{L_n} \dots \int_{L_1}^{L_1} P[a_1, \dots, a_n] q[a_1, \dots, a_n] da_1 da_n \tag{2}$$

where $p[a_1, \dots, a_n]$ is the market price of $q[a_1, \dots, a_n]$.

Providing analogy with the finite commodity space, the first order condition of consumers equilibrium is given as

$$U [a_1 \dots a_n] \leq U [p[a_1 \dots a_n]] \quad L_1 \leq a_i \leq L_n \quad i=[1..n] \quad (3)$$

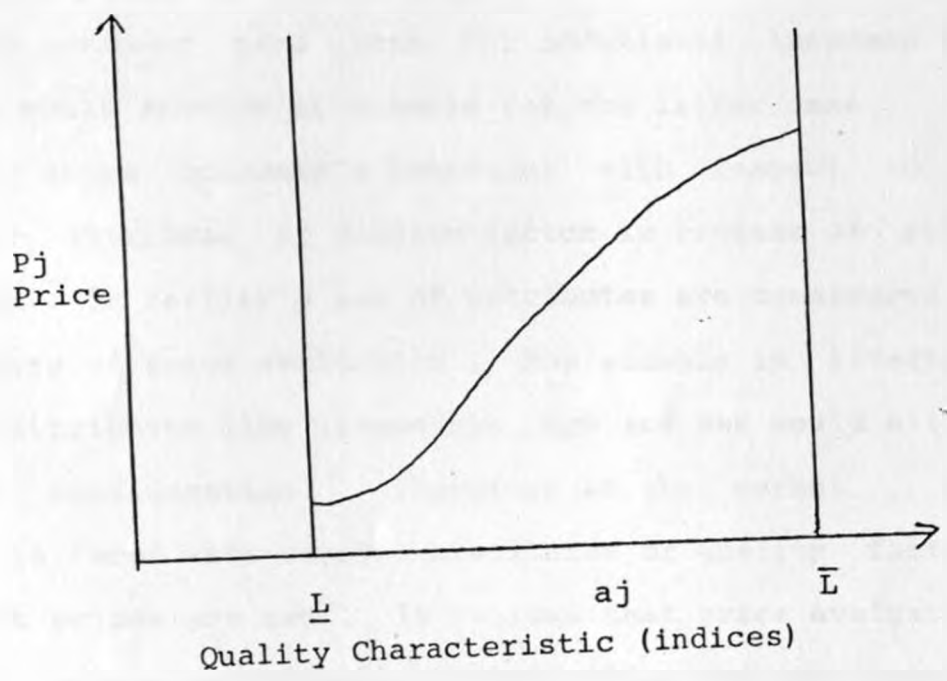
The strict equality in 3 is said to hold whenever any positive amount of $q[a_1 \dots a_n]$ is purchased. Zusman stated that for any consumer to be in equilibrium, the marginal rate of substitution between commodities with equal characteristics $a_1 \dots a_n$ and the composite commodity m is a function of $a_1 \dots a_n$ and of the equilibrium bundle of purchased goods B_i which consist of some or all the q 's as well as some m .

This function is denoted by $R[a_1 \dots a_n, B]$ and is termed Individual Quality Valuation Function (IQVF). The function is assumed to be continuous over the range $a_1 \dots a_n$. This is illustrated in figure 2.0. This function assumes that there are some levels of quality characteristics which the consumer prefers. As stated in the preceding section, consumers main objective is to maximise satisfaction based on utility function. This utility function is maximised when certain axioms are satisfied. These axioms are:

- (i) Complete ordering : given indices a_1, \dots, a_n the consumer is capable of comparing the indices.
- (ii) Transitivity : if $a_3 > a_1$ and $a_2 > a_1$ then $a_3 > a_2$
- (iii) Rationality : The consumer is rational in his purchase of products given attributes.

If the above axioms are satisfied, then utility

Fig.20: Illustration of individual quality valuation function



function is monotonically increasing . This implies that IQVF is also monotonically increasing . However ,Zusman recognised that IQVF is sometimes monotonically decreasing . For instance ,attributes like back fat thickness in pigs where the consumer pays less for additional increase in thickness would provide an example for the latter case .

IQVF shows consumer's behaviour with respect to a particular attribute or quality factor in process of price evaluation . In reality a set of attributes are considered in the process of price evaluation . For example in livestock market , attributes like liveweight ,age and sex would all be put into consideration . Therefore at the market , the consumer is faced with several attributes or quality factors upon which prices are set . It follows that price evaluation is a multivariate relationship between price and attributes .

Quality valuation function is estimated through direct market experiments .The price of lots with different quality characteristics sold in the market are correlated by means of regression analysis with relevant quality characteristics . The resulting estimate provide market quality valuation function (MQVF) (Zusman ,1967).

Generally a set of attributes are used for grade definition but not all attributes of a product are necessarily used in grade definition . The question of how to identify attributes of a product to use in defining grades needs an answer. From theoretical point of view, only attributes

which are desired are used . The assessment of these attributes can be done through market valuation function .

Mathematically , this function can be specified as

$$P = f[x_1, x_2, x_3, \dots, x_n] \quad (4)$$

P = price of the product .

x_1 = set of attributes under investigation

Since the main aim is to identify the attributes desired by buyers , their significant influence on price would show their desirability . In this case , multiple regression technique can be used to identify desired attributes of a product in the market .

Using multiple regression technique , the structural form of MQVF can be stated as in 5

$$P = B_0 + B_1 X_1 + B_2 X_2 + B_3 X_3 + \dots + B_n X_n + e \quad (5)$$

P = price at the market

$B_0, B_1, B_2, \dots, B_n$ = regression coefficients on attribute

e = error term

The null hypothesis to be tested presumes that $B_i = 0$

If the hypothesis is not rejected then it has no significant influence on price . This would show that the attribute involved is not desired by buyers . On the other hand , if the null hypothesis is rejected then it is desired by buyers . It can as well be used for defining grades .

In this study , liveweight is expected to have positive relationship with price . Thus , the buyer is willing to pay more for higher liveweight indices . In otherwords ,higher liveweight are preferred to lower liveweight . Similar relationship is expected for age since liveweight and age are expected to have direct relationship. However, this relationship may not always hold because in any population some are stunted while others are fast growing. Therefore, the inclusion of both attribute into the scheme might pay as a way of checking growth factor.

Sex attribute is given a bivariate comparison . Preferences for males is set to be indicated by positive price response . This is because of a higher index for male than females . Conversely , a negative response would show preference for females .

Age and sex indices are instituted on scores . The selection of scores on age and sex are made purely in accordance to market conditions which has tended to differentiate livestock along age and sex categories .

2.1.3 SPATIAL PRICE RELATIONSHIP

Theoretically ,spatial price relationship are determined by transfer cost between regions .Under competitive market conditions , a set of basic principles are applicable in determining the existence and extent of trade on a product through spatial price relationship .These conditions are :

- (i) price differences between two regions that trade with each other just equal transfer cost .
- (ii) price differences between two regions that do not engage in trade with each other will be less than or equal transfer cost .
- (iii) prices between two regions that trade with each other are perfectly elastic .

The first two principles detect whether trade occurs between two regions . The third principle establishes the existence of trade . It is argued that price differences between regions involved in trade cannot exceed transfer cost. If however , the proposition holds then traders are motivated to buy products from low price region and sell in high price region . This action known as arbitrage activity continues and cause price to rise in low price region until price differences no longer exceed transfer cost.

Price relationship between two regions that engage in trade are expected to be perfectly correlated as stated in next section . Low price correlation would imply low arbitrage activities between markets as a result of factors that create imperfect conditions . These factors as highlighted in section 2.1.0 are imperfect price information, mobility ,and product heterogeneity .

From the study , if differences in price of goats between the sampled markets exceed or equal transfer cost then there is a possibility of goat trade between these

markets . However , for the trade to occur perfectly , the correlation coefficient of prices is expected to be 1.0 . If the coefficient is less than 1.0 , then trade between markets is not perfect . The factors mentioned in the forgone section therefore holds for restriction in trade .

In terms of price movement along the marketing chain, separate demand curves for various market levels exist. These curves are separated by a schedule of marketing margins . A simple but somewhat common proposition about demand curves at different market levels is that price margins are constant absolute amounts in competitive markets (Tomek and Robinson ,1976) . Assuming that the proposition holds then price elasticities of demand are similar at all market levels . In other words , price changes in the marketing system are efficiently passed along the marketing chain . Price margins between separate market levels therefore remain independent of selling and buying prices . Under this state , the market is considered price efficient .

In real life , such perfect conditions rarely exist . At times departure from perfect market condition is considerably great leading the market into a state of imperfection . For instance in the entire system only a group of market participants gains at the expense of the others . Such exploitative tendencies often arise from structural inefficiencies . Elimination of these structural inefficiencies would therefore contribute to the improvement

of the marketing system . The question is how to establish the fact that price changes in the system are efficiently passed along the marketing system . In order to answer this question ,the behaviour between margins and selling prices was investigated .

Tomek and Robinson (1976) provide the following structural equation :

$$M = a_0 + a_1 P \quad (6)$$

$M =$ margin

$P =$ selling price

$a_0, a_1 =$ coefficient of margin price relationship

$$a_0 > 0 \quad 0 \leq a_1 < 1$$

In this study , a_0 represent constant absolute amount of margin . It is the margin traders obtain independent of selling price . This signifies the minimum margin traders can accept . A constant percentage of margin on selling price is given by a_1 . If it is zero , the margin remains constant absolute amounts . This would show that for any goat traded, there is a constant margin accruing to the middlemen . From statistical tests , a_1 is expected to be significantly greater than zero .

2.0.0 LITERATURE REVIEW

The relative importance of goats as an alternative source of meat and milk in Kenya was realized as early as 1974, when it was first incorporated into the national Livestock production policy. However, it was up to late 1970s' that active research was launched to determine the possibility of its success. This research work was part of the activities of research programme aiming at developing a goat that could provide both milk and meat to the people. As has been outlined in section 1.4, market evaluation was part of this research.

The study was on general aspects of goats and goat products markets and focused on grading system, spatial market integration, and price formation between separate market levels.

Information available on livestock markets in Kenya indicated that the Ministry of Agriculture and livestock Development in collaboration with Local County Councils initiated the establishment of livestock market centers through-out the entire country as early as 1950s' (Kivunja, 1976).

In non-pastoral areas the establishment of these centers were intended to improve livestock marketing system. This was one way of providing assured markets for farmers. It was also a policy intended to raise production of livestock in these areas. Thus, the establishment of these centers were to parallel the function of Livestock Marketing

Division (LMD) in pastoral areas . The activity was however never carried to a greater extent in non-pastoral areas owing to lack of veterinary staff required for effective administration of these centers . As an administrative requirement ,these centers can either be closed or opened for trade depending on the disease incidence in the area . This responsibility to open and close these markets is bestowed on veterinary staff by law . Lack of veterinary staff therefore caused some areas not to be adequately covered in terms of these markets .It followed that the areas which were not adequately covered remained at a disadvantage .

The advantages of having these market centers are two-fold to producers . On one hand, these market centers provide reliable and assured markets for livestock producers. While on the other hand , they also provide competitive conditions for buying and selling of the animals . These advantages provide better production condition to farmers in as far as market performance is concerned .

Empirical results obtained by Sandford (1982) while carrying out research on goat markets in Ethiopia support the above preposition . Sandford (1982) reported that livestock prices (goats) at market centers were higher than the prices obtained outside these centers . The differences were found anywhere up to 20 percent . This showed that lack of these centers may cause the producers to lose a substantial amount of income since under such circumstances they have to contend

with low prices causing the supply of livestock to lag behind the demand . This research therefore intended to provide a general description of the distribution and state of these market centers in western Kenya to find out the adequacy of these markets .

Grading plays an important role in the market, especially if products are to be standardized. The importance of grades in goat markets may need to be emphasized particularly in the anticipated specialized marketing system assuming the success of DPG development .The establishment of grades in goat markets may enhance improvement on price efficiency in the market . This would primarily be achieved through reduction of price uncertainty between buyers and sellers and right payment for right product. For instance, when grades exist ,producers can tell with accuracy what the animal can fetch in the market . In this case ,there would be little chance for unfair margins to exist in the market .

Zusman (1967) stated that unless products are sorted into grades , buyers stay ignorant of the product composition and each transaction is beset with uncertainty. According to Rhodes (1956) ,where grading system exist ,it serves the end of equity for the individual producers and consumers (i.e better payment for better quality products) . It is therefore clear that besides the reduction of uncertainty by having grades, they also help buyers and sellers to strike a balance without one being unfair to the other.

Generally , grades are either established or enforced by private institutions , formal interaction or institutions and public institutions . In whichever situation the grades are established or enforced , their demand should exist for the grading scheme to work effectively (Tomek and Robinson, 1976) . Inconsistencies often arise from grading schemes which are not properly determined . To avoid such inconsistencies , thorough assessment of the product attributes as far as they affect prices are necessary . Such assessment can simply be done by finding the relationship between these attributes and price . This study therefore examined the relationships between proposed goat attributes and price.

Zusman (1967) stressed that determination of market evaluation function ; which is price presented as a function of attributes is a pre-requisite exercise for grade management . Unless this is done , default may arise from the established grading scheme . To this end , methodologies developed for the establishment of grades have tended to depend on theories which are consumer oriented . They assume product heterogeneity with a number of attributes upon which the buyer ranks his preferences . Thus, for every market there exists a market evaluation function consisting of price as dependent variable and attributes as explanatory variables.

In empirical research relating to Africa , Sandford (1982) investigated the effects of liveweight , age and sex on

goat prices .Sandford applied regression analyses in assessing the effects of these attribute on price . The results showed that 80-90 percent of the deviations in actual goat prices could be explained by liveweight, age and sex of goats . It was argued that the high proportion of deviations explained by the above attributes was thought to be due to lack of bargaining ability in the markets .

The above results depicted a case where uncertainty in the market was not high . In this case ,the attributes could reliably be used to define grades . However , Sandford only discussed the results of the R^2 without giving individual coefficients of each attribute on price .In this respect ,it is not clear whether all the attributes were significantly related to price or one explained a larger proportion in deviation in price than the rest . It is therefore difficult to discuss optional grade definition in the marketing system owing to lack of information on each attribute . This study examined the individual effect of these attributes to find their individual contribution as the basis for their suitability in grade definition .

The importance of assessing the effect of livestock attributes on price is also underscored by Bekure and Tilahum (1982).They suggested that stepwise regression analyses is an appropriate technique for determining the effect of attribute such as liveweight,age sex and breed on prices .Distance as a factor could also be included in the model. However, in this study the inclusion of distance within the analysis

could not bear much relevance since it was not an attribute which could be used in a grading scheme. On the other hand it is usually included in the model under the assumption that there is direct relation between distance and transfer cost. In this case, the seller would price the animal relative to the distance covered. However, where the markets have traditional outlook and mode of transport is predominantly trekking, inclusion of distance in the regression model may not reveal much about the relationship between transfer cost and livestock prices. The general practice is to base the cost on the number of animals trekked. The main reason would be based on the large extent to which the trade is localized and transfer cost not necessarily based on distance. However, part of the analysis in this study was to consider distance as a factor influencing the prices.

Stepwise regression method was however preferred due to its ability in quantifying the relationship between price and respective variables. In this case the individual influence of each attribute is easily depicted and detected and limits to which it can be used is also identified.

Shapiro (1979) also used regression analysis to investigate the influence of age and sex on price of livestock. The results obtained showed that price of females increase at an increasing rate up to 5.7 years. They increase at a decreasing rate up to the age of 11.4 years. After this age the prices begin to fall. However, no age

price relations was found for males .

Josserand et al. (1982) obtained similar results to Shapiro .The price behaviour between males and females were found to be different . Price increase on males was reported to start diminishing at the age of four or so .In contrast female prices started at higher prices than males but remained constant after the age of two .

It is therefore clear that the relationship between price and attributes namely age and sex as well as insights about price boundaries upon which price behaviour changes can be determined . However , from the above studies ,it may be difficult to decide as to whether grades can be established on the basis of the above attributes alone . This is because of the fact that no indication of the extent to which they affect prices was given .

The above studies also never took into consideration liveweight attribute which bears direct relationship with input factors . Thus , if one purchases commercial feed to feed to animals, the effect is best seen through liveweight gain . It follows that price per unit of liveweight is at least crucial in animal production and the market should also be responsive to it .Despite the rationale,it should be noted that age and liveweight are expected to be correlated. In view of the findings of Shapiro and Josserand ,it is desirable to determine the right attributes for grade definition .

The other issue which was also to be covered was spatial market integration . It is an issue which has been widely investigated as revealed by available literature e.g Jones, (1968), Goldman, (1974), Schmidt, (1979) .

Jones (1968) applied bivariate correlation analysis on price of several grain crops collected from various markets in Nigeria . This was undertaken to determine the extent of market integration for these grain crops . The survey covered several towns in different parts of the country . The grain crops investigated were :Gari ,Cowpeas,Rice,Sorghum,Yams and millet . The correlation was only done for each grain crop .

From 483 coefficients observed only 19 were as great as 0.9 . The other 424 had values of zero or negative . Given the above outcome ,interregional trade on these crops appeared very low ,except for Gari which showed better performance . The negative or small correlation coefficients were attributed to aberrations in data system like gaps and in accuracies in data recording . The alternative possibility was lack of trade between markets either due to lack of price information or no significant price differences between the markets to warrant trade .

Goldman (1974) undertook similar analysis on rice trade in Indonesia . The towns covered were Bandung,Semurang,and Serubaya . Using correlation analysis , the coefficients obtained were ranging between -0.7 to 0.99 . Since most of the coefficients were positive and above 0.7 ,the results

indicated high integration interspersed with periods of extreme disintegration as shown by low and negative coefficients . These periods of extreme disintegration were attributed to deterioration in political conditions and internal security in the country .

. Using similar approach to Goldman (1974) ,Schmidt (1979) assessed the extent of trade in maize and beans between a number of markets in Kenya. In the study , several issues relating to the levels of correlation coefficient were discussed . For instance ,it was stated that if the trade between two markets is perfect then the correlation coefficient is 1.0 . Effective market integration was stated to be achieved when the coefficient is greater than 0.9 . Correlation with values of 0.7 and above were considered to show satisfactory integration . It was further stated that coefficients with values less than 1.0 was associated with imperfect price margins ,mobility , market transparency ,and homogeneity of the product . Ruttan (1968) , also discussed similar issues in his study . They were emphasized as yardsticks in aid of assessing the extent of interregional trade in spatial markets .

Schmidt (1979) , surveyed a total of 67 markets . From the entire coefficients observed , only 0.5 percent were greater than 0.7 in Western Kenya . About 6 percent of the coefficients in Central Kenya were greater than the above value (0.7) . The outcome therefore indicated weak market integration for maize and beans for all the areas covered .

Whether interregional trade on goats are also limited remains to be determined through the same procedure as no documented evidence exist to provide an insight on the issue .

The concept of interphase price efficiency has also received a lot of attention in previous research . The issue has been investigated to determine the extent of exploitation in markets . Schmidt (1979) , discussed a set of conditions for interphase pricing . Interphase pricing in this context refers to prices obtained at different market levels . For example , a product is bought by the first buyer who then sells the same product to another buyer . This process continues up to the ultimate consumer of the product . Along this line, there are different price levels and they are obtained at different interphases . The magnitude of differences depends on the level of price efficiency in the market .

The conditions Schmidt (1979) set were as follows : the correlation coefficient between selling and buying prices is 1.0 in perfectly competitive markets . Slope coefficient between buying and selling prices is not significantly different from 1.0 for similar markets . Also the slope coefficient between the margins and selling prices is not significantly different from zero . Further more , the correlation coefficient between margins and selling prices are extremely low or near zero .

Schmidt (1979) working on maize and beans marketing in

Kenya found the results closely approximating perfect market conditions . Schmidt applied regression analysis in the assessment of interphase price efficiency . The results revealed that about 70 percent of the variation in selling prices were explained by buying prices . The correlation between price margin and buying prices were found to be -0.137 . This showed that prices were to a large extent passed along the marketing system and there was little or no unfair margins in the marketing system .

Ruttan (1968) presented results obtained by Aide Recto (1965) when working with corn markets in South East Asia . The results showed that supply of market services between farms and wholesale levels in corn markets were perfectly elastic . Statistical results indicated that 82 percent of the deviation in whole sale prices were explained by farm prices . The regression coefficient obtained was not significantly different from zero . As a whole the results also indicated that price changes in corn marketing system were efficiently passed along the marketing chain .

This study assessed interphase price efficiency in goat marketing system . The study examined the relationship between price margins and selling prices to find out whether price changes were efficiently passed a long the goat marketing system with no unfair margins .

2.0.1 MILK MARKETING SYSTEM IN KENYA

Since goat milk was at the time of the study a non-commercially traded product ,it was worthwhile to assess the existing dairy milk marketing system as a way of evaluating the structure of the anticipated goat milk marketing . In principle ,there could be little changes particularly if goat milk is to be developed as a substitute for dairy milk .

Since Kenya's independence in 1963 ,fundamental changes have taken place within dairy milk marketing system . The changes have taken place both in the production and distribution of milk throughout the country .

On the aspect of production , there has been a clear shift in emphasis from large scale farm milk production to small scale farm milk production . For instance ,the small scale farms are now estimated to produce 80 percent of milk consumed in the country leaving 20 percent for the large scale producers (Mbogo,1981) . It is also important to add at this point that subdivision of large scale farms has greatly played a major role in causing such changes .

Changes have also occurred in the distribution of milk in the country . Initially , the distribution of commercially processed milk (i.e brands like KCC and UHT) were mainly confined to large towns . So far changes have taken place such that these commercial brands can now be found in rural areas . Thus , the distribution has been extended to cover deficits in rural areas . These changes have been attributed

to (i) growing income per capita both in rural and urban areas (ii) rapidly expanding population and its composition (iii) improvement in physical infrastructure and transportation facilities (Heyer et.al.1976) .

The entire process of dairy milk marketing development has been partly or wholly influenced by institutional involvement . To give a brief historical background , the Kenya Dairy Board (KDB) was initially set up and solely entrusted with functions geared towards improving milk marketing system . For example , the general function of KDB were to :

(i) secure reasonable and stable price to producers of dairy milk .

(ii) organize , regulate and develop efficient production, marketing distribution and supply of dairy produce required by different classes of consumers .

(iii) improve the quality of dairy production .

(iv) promote market research in relation to dairy produce .

(v) permit greatest possible degree of private enterprise in production , processing and sale of dairy produce , consistent with efficiency of producers and interest of other producers and consumers .

(vi) generally to ensure by itself or in association with any government department or local authority , the adoption of measures and practices designed to promote greater efficiency in the dairy industry .

In 1972 owing to problems in their operations , the

powers of KDB were suspended by the government and functions reduced to inspectorate and licensing (Mbogo, 1981). The action left Kenya Cooperative Creameries (KCC) the monopoly of handling dairy produce. KCC was first established as a private company in 1925. Later on in 1932 it became a cooperative society. Since then it has functioned as neither a true private company nor cooperative.

So far most of the structural problems in milk marketing system has been attributed to monopoly that KCC possesses over the handling of dairy produce (Heyer et al. 1976). As a monopolist, KCC has remained the sole determinant of the number and location of milk processing plants in the country. To this end, some areas are poorly catered for in terms commercially assured markets for dairy milk.

For instance if such places like Kakamega are taken into consideration, it can be seen that the nearest milk processing plant is situated at Kapsabet. This then implies that small scale farmers in Western region of the district are left with only two alternatives. The first one and which is generally encouraged is selling milk to dairy cooperative societies. The second alternative is selling milk in the neighbourhood. These are some of the conditions goat milk would face. However, the main concern of this study was to describe the general market situation in Kakamega district and possibly come up with suggestions which would allow a breakthrough for goat milk.

CHAPTER 3

DATA SOURCES AND METHODS OF ANALYSIS3.0.0 DATA SOURCES

Data were collected from both primary and secondary sources. Types of primary data included price and liveweight of goats, purpose of selling and buying, source and destination of the animals and supply and demand levels of goats. Secondary data included, sales of sheep, cattle and goats as well as prices of goat skin.

3.0.1 PRIMARY DATA

Primary data were gathered by enumerators using structured questionnaire. Two enumerators from each sampled market were appointed with the assistance of county council market staff of their respective markets. The appointment criteria was based on the proximity of the enumerators residence to sample markets as well as enumerators attaining four years of secondary education. This was advantageous on two ways. Firstly, the enumerators were expected to be conversant with social set up of the environment. In addition, they would be capable of understanding the structure of the questionnaire. Secondly, enumerators were also expected to be familiar with local market staff and most of the respondents to allow information generation without suspicion.

The selected enumerators were trained together on what

to do for a period of two weeks before they were dispatched to their respective markets . Training session included going over the questionnaire and filling out questionnaire . The questionnaire was adjusted after training and pretesting to obtain the final questionnaire to be used for collecting data.

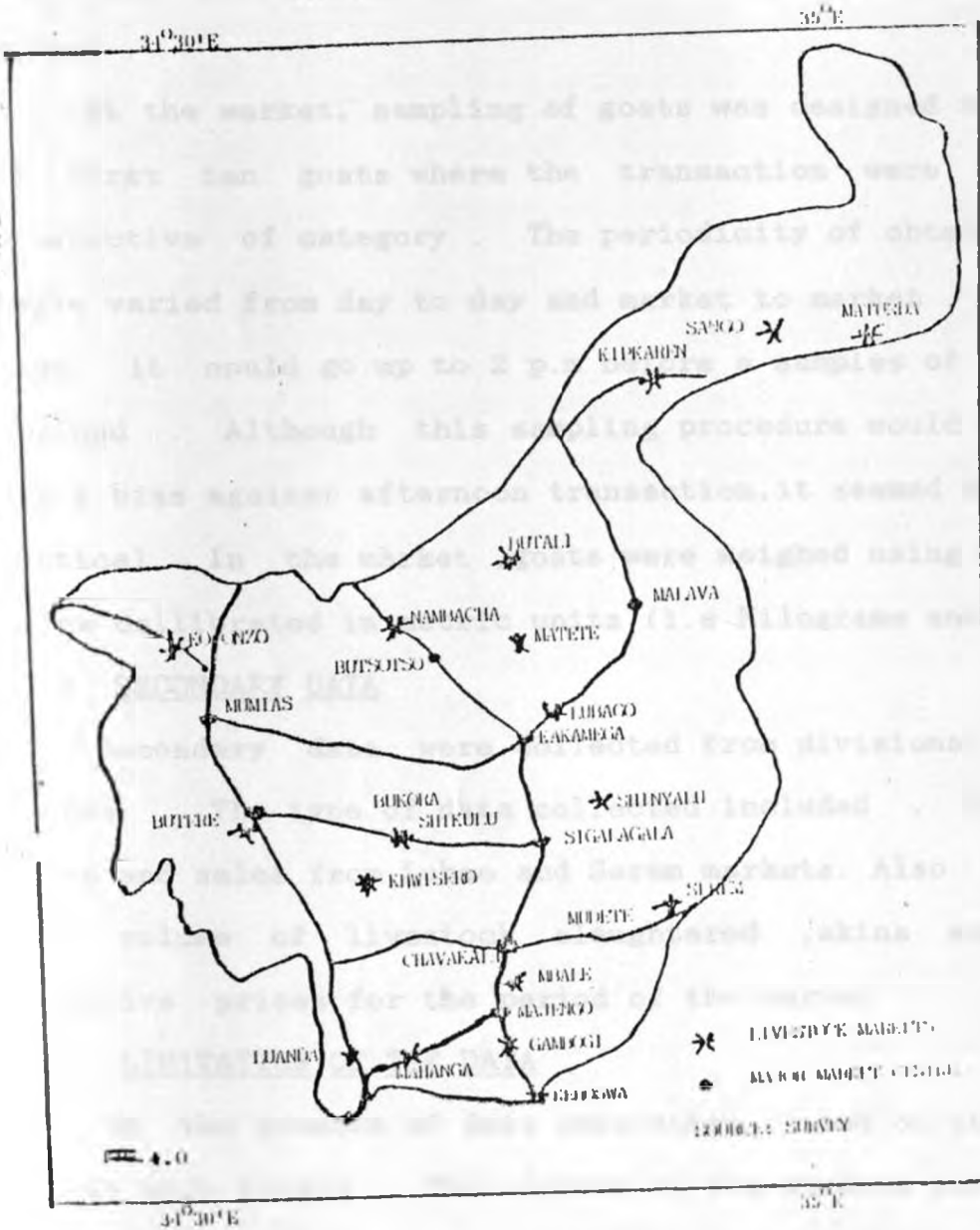
3.0.2 SAMPLING PROCEDURE

Sampling was done at two levels . First , there was sampling for markets where data were to be collected . The second level of sampling was for goats at the market .

As regards markets , a preliminary survey for all livestock markets was undertaken with the assistance of District Agricultural Office . A total of 19 livestock market centres were identified . All these centres were located near or within local trading centers . This was followed by a selection of 5 markets through purposive sampling. Intensive data collection was then undertaken in the selected markets. The method was adopted to allow for fair regional representation . Partly , the locations were also intended to show the pattern of livestock trade in the district .

The five sample markets selected were Nambacha , Serem Mahanga , Lubao , and Shikulu shown in figure 3 . Out of the five sample markets , two were chosen for the purpose of identifying and describing seasonal fluctuations in livestock prices and sales . These markets were observed to be the main markets in both the northern and southern parts . Besides ,

Fig. 3. DISTRIBUTION OF LIVESTOCK MARKETS



they were also typical of livestock markets in those regions .

At the market, sampling of goats was designed to cover the first ten goats where the transaction were complete irrespective of category . The periodicity of obtaining the sample varied from day to day and market to market . In some cases, it could go up to 2 p.m before a samples of 10 was obtained . Although this sampling procedure would tend to have a bias against afternoon transaction, it seemed the most practical. In the market ,goats were weighed using weighing scales callibrated in metric units (i.e Kilograms and grams)

3.0.3 SECONDARY DATA

Secondary data were collected from divisional annual reports . The type of data collected included , livestock prices and sales from Lubao and Serem markets. Also collected were volume of livestock slaughtered ,skins and their respective prices for the period of the survey .

3.0.4 LIMITATION OF THE DATA

In the process of data generation , two of the sample markets were closed . The closure of the markets were caused by circumstances beyond control . As a result , in some cases relatively few observations were used in the analysis.

3.1.0 METHODS OF DATA ANALYSIS

This section presents methods adopted for data analysis. One of the methods was descriptive analysis . It included the calculation of averages , frequencies ,and

percentages . This was mainly undertaken to provide insights to various activities in goat marketing system .

There were three other methods of analysis . The first one was multiple regression analysis . This method was adopted for the valuation of various quality factors or attributes of goats for grade definition . The second model was bivariate correlation analysis for determining the extent of interregional trade on goats in Western Kenya . The last technique was simple regression analysis adopted for investigating the extent to which prices at one level of the market depends on the other (i.e interphase price efficiency) . The analysis involved price margins and selling prices .

3.1.1 MULTIPLE REGRESSION MODEL

Multiple regression analysis was used to evaluate the contribution of selected goat attribute to price . The attributes as already mentioned were liveweight ,age and sex. It was appropriate to apply stepwise regression technique as a way of isolating specific effects of these attributes on price . In this method ,independent variables (Liveweight ,age and sex) are entered one by one into the model depending on the magnitude of their correlation coefficient and how they explain variation in dependent variable (price) . This method by way of discrimination excludes variables which do not have significant contribution to the model . In the end

it provide variables to be included in the equation .

The most important parameters in this technique are F-statistics and R^2 . The F ratio in the analysis provide a test of the significance of the regression coefficients . Thus , it shows the usefulness of the estimated equation . Multiple correlation coefficient R^2 on the other hand provide a measure of the proportion of the dependent variable which is explained by independent variables .

The model has several advantages which makes it suitable for this particular analysis . First , the relation between price and attributes provide demand equation (Bekure and Tilahun ,1982) . It is argued in the above context that the model is useful in quantifying relationship between these attributes and price and not for predicting future price . It is therefore appropriate for this study, since the aim is to quantify the relationship between the attributes and price to enable the identification of right attributes for grade definition .

The second advantage lies in the procedure of the analysis . By way of discrimination , irrelevant variables are left out of the model . However, this is done through a statistical selection procedure.

The procedure involves the inclusion of the variable with the largest acceptable selection criterion. The value of the criterion is then re-evaluated for other variables after the first variable is entered and the one with largest acceptable criterion is entered next. At this moment, the first variable is re-evaluated to find if it meets the removal criterion. If that condition is met then it is removed from the model. There are two sets of evaluation condition. There is the evaluation of the already included variables for removal and evaluation of other variables for entry.

Like in ordinary least square estimation, if some independent variables are linearly related, a unique solution might not be possible. To avoid this problem, the tolerance value of a variable is checked before it is entered into the model. The tolerance value is a measure of the degree of linear association between the independent variables. For instance, it is given by $1 - R^2$ for any entry stage. Small values would indicate linear relationship with other included variables. If the entry of a variable would cause the tolerance of a variable already included in the model to fall below an acceptable levels then the variable is not entered.

The equation to be estimated is therefore stated as

$$P = B_0 + B_1 X_1 + B_2 X_2 + B_3 X_3 + e \quad (7)$$

P = price of goats in (Ksh)

X₁ = liveweight of goats in Kg

1

X_2 = Age of goats in score

2

1 = immature

2 = weaners

3 = mature

X_3 = sex 1 = females 2 = males

3

B_0, B_1, \dots, B_3 = regression coefficients.

0

1

3

e = error term

3.1.2 BIVARIATE CORRELATION ANALYSIS

Bivariate correlation analysis was used to determine the degree to which prices between markets were related. This was expected to indicate the extent of arbitrage activities in goat markets in Western Kenya.

Price of goats in one market were correlated with prices in another market on pairwise basis. This was performed for the five selected markets. Although some markets had relatively fewer observation than others due to closure of the two markets, the minimum number of observation was large enough to give useful results.

3.1.3 SIMPLE REGRESSION ANALYSIS

Simple regression analysis was applied to determine structural relationship between price margins and selling price. The general linear model was selected for the purpose of obtaining ordinary least square estimates (OLS) in the equation.

The structural equation estimated as in 8 was

$$M = a_0 + a_1 P_s + e_i \quad (8)$$

M = price margin between buying and selling price

P_s = selling price

a_0, a_1 = coefficient of regression

e_i = error term

* The use of OLS implied that the distribution of dependent variable is normal with a constant variance for a fixed value of independent variable. The mean values therefore lie on a straight line constituting the regression line. Thus, the error term is normally distributed with independent, random variable with a mean of zero and variance of σ^2 .

CHAPTER 4

THE RESULTS4.0.0 INTRODUCTION

In this section , description of organisational structure of goat and goat products markets is provided . The results from data analysis are also presented .

The scope of description covers aspects of market structure and marketing channels for goats and goat products markets in Kakamega district . The products considered were goat meat , goat skin , and live goats . However , dairy milk marketing was described to provide an overview of what goat milk would face in terms of market practices . This was done because of the fact that goat milk has not been marketed in any form .

The influence of goat attributes namely liveweight , age category and sex on market prices was also investigated through stepwise regression technique . From this analysis , the suitability of these attributes for defining grades is discussed . This is followed by presentation of results from correlation analysis between market prices . In this section, intermarket linkages in goat markets are discussed . The last part of the chapter discusses the extent to which price changes are efficiently passed in goat marketing system.

4.1.0 NUMBER ,SIZE AND DISTRIBUTION OF LIVESTOCK MARKETS

A total of 19 livestock market centres were identified. These centres were found to be unevenly distributed over the entire district . This is shown in table 4.0 . The distribution of these markets could be explained both in terms of regional basis and administrative boundaries or divisions. Both were important since all of them were closely linked with the actual operation of these markets in the region .

On regional basis , the distribution of the markets were associated with supply of livestock . For example in the Western part of the district , there were fewer livestock markets than towards The Eastern side . Large livestock catchment area was required to provide adequate daily supply to the markets to warrant the establishment of a centre .

The low volume of livestock in Western part is assumed to have been prompted by substituting sugar cane production for other agricultural activities . As a result , the level of production of other commodities have declined since the establishment of cane factories in these areas .

The Eastern side of the district had relatively more market centres than the Western side . Livestock volume in this area was also very high compared to Western side . This was partly due to lack of any dominant crop like sugar cane in the area . Farming in this area was also diversified to a greater extent than it was in the Western side .

Table 4.0 Number of Livestock market Centres in Kakamega district in 1985.

Division	Number of market centres
Hamisi	4
Vihiga	3
Ikolomani	3
Kabras	3
Lugari	3
Butere	1
Mumias	1
Lurambi	1

source : survey

In terms of administrative boundaries , Hamisi division had four centers . Ikolomani ,Kabras ,and Lugari had three market centres each . Butere , Mumias and Lurambi had only one market centre each.

Administratively , the establishment of market centers rest in the hands of divisional livestock office and local authority in the district . The criteria upon which these centers are established depend on regular market supply potential . New markets centers which fail to attain adequate supply volume in terms of livestock population are abandoned. Such cases were reported by county council staff in the process of survey . An example was a rural market in Butso in Lurambi division

and another one to the south of Mumias division .

The local authority in the district are responsible for the operations and control of the markets . They collect cess from the sales . The entry fee for cattle was Ksh 10.00, while that for sheep and goats was Ksh 5.00 . The fee collected for exit after the animal was sold was also the same. As already mentioned these market centers were located near or within local trading centers . This was partly to allow the ease of coordinating administration of trading centers and livestock markets by local authority and partly due to the relatively better infrastructure in these centres.

A part from these regular livestock markets , parallel livestock markets were also reported to exist . These were markets where transaction took place in the villages in informal manner . These markets were illegal and these transaction took place without the knowledge of the authority concerned . These activities were reported to be prevalent when markets were closed . However , no further investigation was made about their activities .

In terms of livestock population handled by regular market centers , about 1040 to 8880 heads were estimated for each market per year . These figures only reflected the official livestock number registered by market clerks . The real numbers could be slightly higher since some transaction took place outside the markets and never appeared in the register . In the process of the survey , such irregular

transactions would rise up to 5 percent of daily registered sales .

From the preceding description of goat markets ,it would seem as if the available livestock market centres were inadequate and would not be conducive for the intended increase in goat production . This argument may not hold when population of goats supplied to market is considered . However , it is valid when distance factor is considered . For instance, the results from the survey indicated that producer operational activities were concentrated within a distance of 3 km to the markets . Therefore ,even divisions with up to 4 markets are inadequately covered . Infact ,it can be argued that the majority of goat producers living beyond a distance of 3 km from the markets also have limited access to markets . It is even most likely that they sell their goats in parallel markets where prices are not competitive .

The prices of goats in these markets as shown in chapter 2 could be lower than prices in established centers by up to 20 percent . This shows that the producers could be losing a substantial amount of income by selling goats in such markets. The current distribution of market centres in the region may therefore hinder the development of DPG.

4.1.1 LIVESTOCK EXCHANGE AND STRUCTURE OF SELLING

Livestock market activities were organised to occur once every week except in a few places where they occurred

more than once in a week . Livestock exchange transaction took place within rings or yards . The yards were partitioned by fences usually constructed by wires . In every partition, there is transaction for a group of animals either differentiated by type or sex (i.e goats ,sheep, bulls, heifers ,calves) .

From the survey conducted on these markets , goats were found to be traded for different purposes. For instance ,it was found that a high percentage of goats offered for sale in the markets were mainly sold for meeting basic household needs like purchase of food-stuff and some farm inputs (i.e seeds and other household items) .

As shown in table 4.1 , the percentage sales for meeting household needs was higher than those calculated for other purposes in all markets .

Table 4.1 Purposes of selling goats in different markets in Kakamega District

Location	Purpose (in percent				No. of animals in the sample
	Debt Payment	School Fees	Basic House Needs	Harambee	
Mahanga	13	13	71	3	145
Nambacha	24	29	43	4	173
Lubao	6	36	50	8	103
Serem	30	30	35	5	35
Shikulu	36	26	36	2	73

Source: survey

This observation underscores the important role played by goats in farm households . In spite of the low value placed on goats as reported by Sandford (1982) , it can be seen that they still occupy a central position in farm households especially as regards supplementing their financial resources . The development of goat production activity as an alternative agricultural enterprise is therefore an important venture .

Next in the rank was selling goats for payment of debts. The percentage composition was varying . The highest percentage recorded was 36 percent for Lubao market . The lowest percentage was 13 percent recorded in Mahanga . This information further reinforces the economic importance of goats especially as far as the need for keeping goats as part of livestock wealth is concerned .

In places like Serem and Shikulu selling for repayment of debts was equally as high as for meeting basic household needs . Therefore , one can argue that goats also contribute towards the improvement of household liquidity position .

The number of goats sold for the purpose of harambee contribution was generally lower than the others . Harambee contributions are funds voluntarily donated by individuals in a community or society for financing communal projects like schools, health dispenseries etc. The fact that goats were sold for harambee payments indicated that the levels of

contributions could be up to over Ksh.100.

As regards buyers , different responses about purchases were observed . For example in table 4.2 , the percentage of stock bought for slaughter were considerably high in market centers next to large consumption centres than those away . Mumias and Kakamega towns were the major consumption centres in the district . Next to these centres were Nambacha and Lubao markets respectively . The percentage of goats purchased for slaughter in these markets were fairly high as compared to other markets . However , the proportion recorded for Mahanga and Serem is not very low considering the levels for Lubao and Nambacha . The exception was Shikulu with only 8 percent purchase for slaughter . This unusual case can be explained by lack of popularity of goats as alternative source of meat in the area . Infact ,goats were rarely slaughtered in butcheries found in this market centre .

Although goats were not popularly purchased for slaughter in Shikulu , the lots that were offered for sale by inspection through body conformation and the hair, had good body condition . This probably explains why the percentage purchased for breeding purposes was the highest (50%) . Otherwise , the demand for goats for breeding was almost uniformly high . This information is shown in table 4.2

The proportion of goats purchased for social functions was very low . The percentage of goats purchased for social function was low because the survey period did not coincide

with seasons when social events were predominant (August and December). Otherwise, from the results in table 4.2, it

Table 4.2: Purpose of purchasing goats in different markets in Kakamega District (1985)

Location	Purpose (in percentage)				
	Slaughter	Breeding	Reselling	Social Function	No. of animals in sample
Mahanga	20	33	36	11	145
Nambacha	44	38	10	8	173
Lubao	48	33	13	6	103
Serem	17	34	49	0	35
Shikulu	8	51	30	12	73

source: survey

is clear that goats were popularly purchased for breeding purposes.

The organisation of livestock exchange were arranged such that the buyer pays in cash the agreed price. Price discovery method varied from individual negotiation to group bargaining between buyers and seller.

Buyers selected suitable stock in terms of price and various attributes. These attributes could be used to classify buyers stock requirement at the markets. Given as an illustration is the percentage purchase of a group of animals by weight. This is shown in table 4.3

Table 4.3: The size of goats purchased in different markets in Kakamega District (1985) .

Weight group (kg)	The Proportion in percentage in different markets					
	Mahanga	Lubao	Nambacha	Serem	Shikulu	Total
1-5	0	0	2.8	0	0	0.5
6-10	1.3	1.9	8.6	0	0	2.3
11-15	8.9	1.9	17.9	5.7	4.1	7.7
16-20	28.3	14.5	17.3	40.0	8.2	21.6
21-25	22.7	33.9	15.0	28.5	32.8	26.9
26-30	22.7	27.2	12.1	21.1	35.6	23.7
31-35	12.4	13.5	11.5	0	17.9	11.0
>35	3.7	5.9	14.4	2.8	1.4	5.6
N	145	103	173	35	73	

source: survey

By inspection , it can be seen that goats weighing between 1-5 kg were not popular in markets . It is only in Nambacha where they constituted 2.8 percent of the 173 goats sampled . This information showed that kids were usually raised beyond the weight of 5 kilograms before they were sold . However , beyond the weight of 5 kilograms the proportion purchased in the market increased up to a certain level and then begin to fall . This pattern prevails in most markets as shown in table 4.3 . To illustrate further , if Mahanga market is considered for instance , out of the 145 goats sampled , none was between 1-5 kg . The level rises to 1.3

percent for the 6-10 kg group . In this particular market the group that was demanded most was 16-20 kg . It constituted about 28 percent of the goats sampled in this market . After this group the proportion falls up to 3.7 percent for the group beyond 35 kg.

From table 4.3 , a general trend can be seen . For example , goats of weight group 21-25 kg were highly preferred . This was followed by 26-30 kg and 15-20 kg weight groups respectively .

The weight groups 16-20 kg were mainly purchased as breeding stock . The weight group 21-25 kg were purchased as both breeding and slaughter stock . The weight group 26-30 were mainly purchased as slaughter stock particularly more so in large towns such as Kakamega and Mumias . However , there were other markets where even heavy goats were purchased for breeding purposes .

The purchase of weight group exceeding 35 kg were very low as already shown . This weight group was mainly purchased for slaughter. In small markets or trading centers, the carcass from these size of goats took longer time before salable portion was completed. Sometimes a considerable portion got spoilt due to lack of proper storage facilities .

From the result shown in table 4.3 , it is therefore advisable to dispose of goats between the weight of 16-20 kg. However , the group 21-25 kg and 26-30 kg were also popularly

purchased. However, the group between 16-20 kg would still be preferable since they would only be raised for a short period of time to reach average market weight (23kg) .

4.1.2 CHANNELS IN GOAT MARKETS

Different channels could be identified in goat marketing system . The channels were as follows

1. producer ---producer
2. producer ---trader---butcher
3. producer----butcher
4. producer ---trader----producer

A part from the first channel and to some extent the second one , the rest of the channels were mainly concerned with interregional goat trade . In some cases the animals passed several markets before reaching their final destination . The transaction range was between one to two weeks . Under long transaction period , traders tended to hold animals and graze them in their holding grounds before taking them to markets . This was done to offset weight loss that is incurred during transaction period .

These channels have no particular established line as outlined above . In the entire system , a group of individuals may perform more than one function . For example , some butcher operators were also livestock traders . Thus , they tend to integrate both functions and one can not easily identify which particular channel they belong .

The lack of clear cut lines in channels makes it difficult to assess the performance of these channels . In such situations , it would be difficult to impute specific price spread for each channel . Because of this fact , the performance of channels in goat marketing system is assessed in totality by analysing the efficiency of price flow through interphases . This is given in section 4.8.0 . However , only descriptive features are given here .

The channels identified and described lead to a number of market outlets . The markets outlets available for goat producers in Kakamega district were home and urban consumption centers . Little was known about home consumption of goat meat but data compiled from hides and skin barns indicated that a considerable portion of the total goat consumption were consumed at home .

As far as urban consumption was concerned , there were only a few large markets where goats were slaughtered in butchereries . Because of this , goat meat markets were not as widely distributed as livestock markets . This issue is discussed more fully under goat meat markets in section 4.4

A number of available outlets were still not yet accessible to goat producers in Kakamega . These market outlets were Kenya Meat Commission (KMC) and other abattoirs in major towns . Perhaps , it is due to under-utilised market outlets that made goat supply exceed goat sales by a considerable margin . This is illustrated with data presented

in the appendices 2a, 2b, and 2c. The inaccessability of these markets constitute a major constraint to goat development in the region and unless some improvement are undertaken, the development of goat production will continue to be hindered. It will therefore be necessary to revitalize the underutilised market outlets if an increase in market throughput is to be achieved.

4.1.3 AGGREGATE SUPPLY PATTERN OF GOATS

The general livestock movement in the district follow supply and demand pattern. There were two distinct major demand points. These were Mumias and Kakamega regions. They represent principal foci for livestock movement in the district. Kakamega town is a major town in the district as well as in the headquarters for the province. Mumias is a major consumption point due to high cash inflow in the area (possibly from sugar cane).

The main source of supply of livestock is the Eastern part of the district. A part from having a relatively high volume of stock, there was also an additional supply across the district borders. As an illustration, the pattern is given in figure 4.1. The most distinct pattern is East - West movement.

Livestock were mainly transported on hooves. Only on a few occasions were vehicles used for transport. There was a characteristic behaviour on the movement of producers and

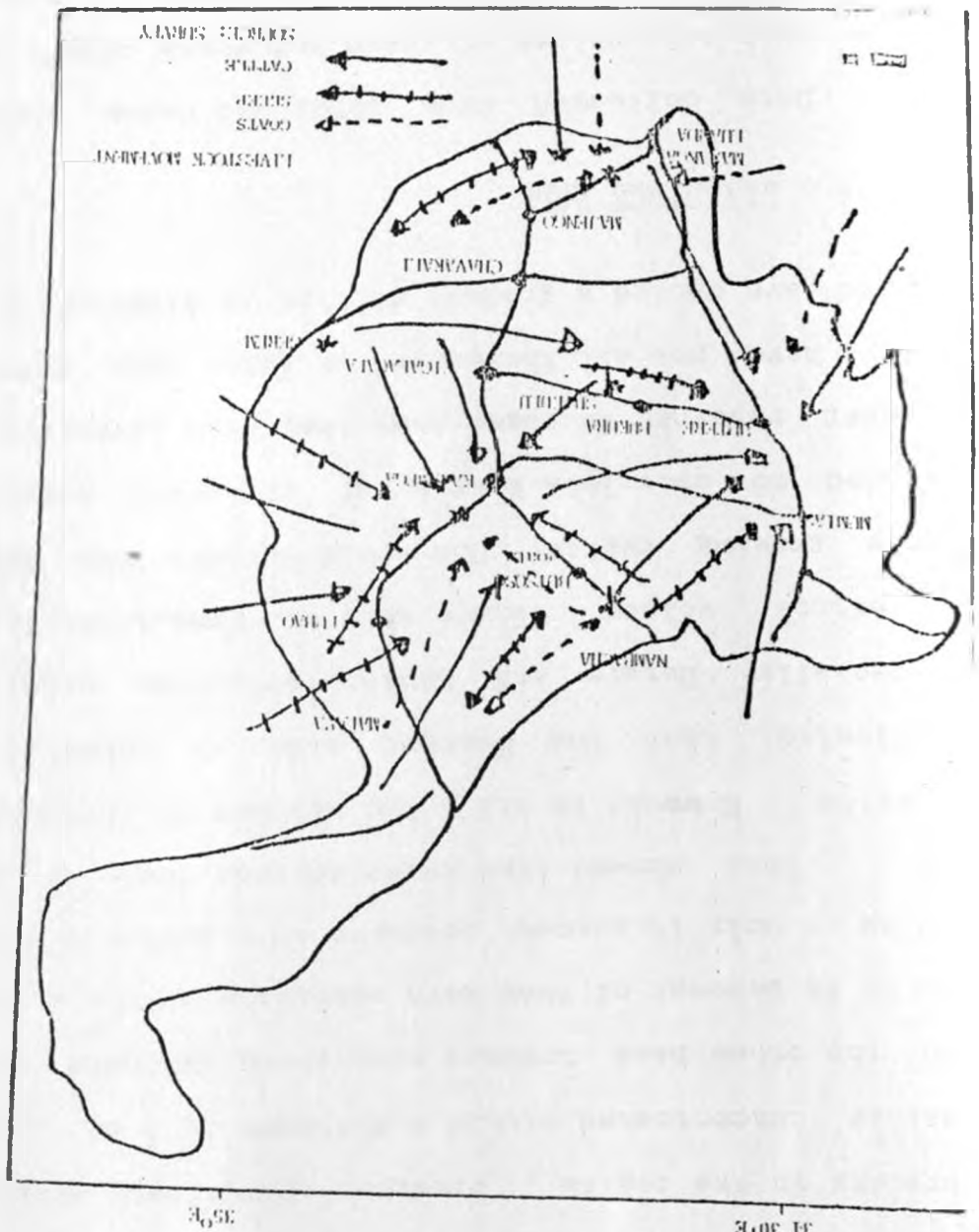


FIG. 4.1. SCHEMATIC PRESENTATION OF LHASAN MOVEMENT

35°E

31°30'E

traders in the region . Producer operational activities were mainly concentrated within a distance of 3 km to markets . On the other hand traders activities extended to 40 km but up to 84 percent of them were operating within a distance of 12 km . Only 16 percent operated in a distance exceeding 12 km . This showed that interregional trade on goats were limited . However in all , the pattern of livestock movement indicated that the Eastern side of Kakamega district especially Butere and Mumias divisions experienced low livestock volume . Since this is predominantly a sugar cane growing region, One would believe that farmers have tended to over-look keeping of livestock especially with higher returns in sugar cane than from livestock . Instead, they have put all the effort in sugar cane growing which might have caused a gradual decline in livestock population.

4.1.4 LIVESTOCK SALE

Data collected from Lubao and Serem markets showed that peak sale volume of sheep and goats occurs in march in the Northern parts of the district(Lubao) . The lowest sale volume occurs in August for these stocks in the same region . Peak sales tend to coincide with opening sessions of schools.

This is understandable since it marks the period when cash for school fee is in great demand . Farmers who are also parents of school going children therefore offer their stocks for school fees .However, the lowest sale period falls

a month before opening period for schools (August) . It can be argued that lowest sales occur due to withholding of stocks in anticipation for payment of school fees .

In the Southern part of the district the pattern was quite different from the type observed in the Northern parts. The peak sale period for goat occurs in March and for sheep in September . The opposite for the species is true for lowest sales. Thus, lowest sales for goats occur in September and March for sheep . The sale pattern was partly associated with social factors and destocking of the herd .

A comparatively remarkable difference in seasonal livestock sales and mean price fluctuation existed between the Southern and the Northern regions of the district . This information is shown in appendix 3 and 4 . In both regions , it is evident that sheep and goats only constitute a small proportion of market supply . The largest proportion is occupied by cattle . At least this observation indicated that cattle were valued more than goats .

Seasonal sale fluctuation in cattle supply were higher in the Northern than in the Southern parts of the district . The differences in sales fluctuation were attributed to relative composition of source of supply . Most of the animals supplied to the Northern markets came from Nandi district . When this external source suffers shortages , the effect is directly reflected in Northern markets . This reason explained the pattern of fluctuation observed in the Northern parts of the district .

The same reason was valid for goats . Except for goats the fluctuation was higher in the Southern than in the Northern part . Sheep did not exhibit major differences in sales as shown in appendix 4 . Sheep was said to have even supply throughout the district .

4.2.0 GOAT MEAT MARKET

Goat meat markets have similar standard specification just as beef markets in rural areas(DeBoer,1982). Thus ,the strong product standardization in terms of gazetted grades as in large towns does not prevail . In a rural set up , goat meat were sold in three distinct parts . These parts consisted of "bone in bone out meat" . This refers to goat carcass sold with bones . It does not include the offals . The other part was "matumbo" which refers to bowels . The remaining parts were the offals which constituted the legs, head,blood, etc .

The bone in bone out meat was selling at Ksh 20.60 per kilogram . Matumbo was also being sold at Ksh 10.00 per kilogram . The two parts had controlled prices . The remaining offals were sold at varying prices depending on their availability .

The price of bone in bone out meat was higher than price of beef by 3-9 percent depending on the location of the butchery (i.e town or rural areas) . The "bone in bone out meat" constituted 40 percent of liveweight . It constituted the calculated dressing out percentage . This proportion

compares well with what Airey (1982) calculated for goats in Baringo district (43-44%) . " Matumbo" constituted 21 percent of liveweight. The price uncontrolled parts like leg heads, blood and other waste materials made up to 31 percent of the liveweight . About 8 percent was completely lost as waste as they could not be accounted for in the final weight break down .

As stated in section 4.1.1 , goat meat market is not as widely distributed as livestock markets . In some parts of the district , social bottlenecks still hinder profitability of the business . For example , slaughtering a goat or its consumption is associated with certain social ceremonies . It was therefore not unusual to find several markets with butchereries selling no goat meat . As a result , one of the tasks facing the programme developing DPG is how to address this socio cultural constraint . Some efforts on educating the rural population about nutritive value of goat meat and milk may perhaps offer some help.

4.3.0 GOAT SKIN MARKET

The supply of goat skin is a function of goat meat (DeBoer,1982) . At primary supply level goat skin is sold or traded as by-product of goat slaughter . At this level , the product is not graded and the price is uniform . In subsequent stages , the skin is graded and each grade fetch a different price at the market . The prices of different grades are presented in table 4.4 .

Table 4.4; Prices of Goat Skin in 1984 . Ksh/kg

Grades	Minimum	Maximum
1	8.00	14.00
2	6.00	12.00
3	4.00	10.00
4	3.00	6.00

source: Divisional Annual Report 1984 .

Goat skin were mainly purchased for trade . The trade was organised such that the semi processed skins were sold in two large terminal markets (i.e tanneries) at Kisumu and Eldoret .A number of middlemen operated along the marketing chain . These were producers , butcher owners ,barn owners private traders , main agents and tanneries . These individual units along the chains were arranged as in figure 4.2 to form a network of channels.

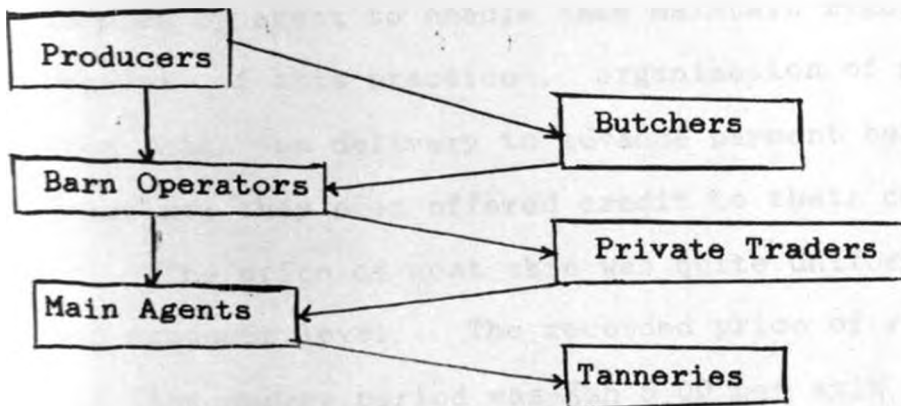


Figure 4.2 : Network of Skin Transfers .

As can be seen in figure 4.2 there were no clearly defined channels . The product flow could take a number of alternative paths as shown by arrows . However , at the lower levels of the chains , the trade was quite competitive . There were a considerable number of butcheries , barn operators as well as private traders enabling the market to have competitive outlook . This condition does not prevail at the main agent level . Main agents of the tanneries were few and because of that private traders , barn operators , and butcher operators faced limited number of buyers . Main agents were appointed by Tanneries . They were few and their number were determined by Management of the tanneries . Because of the number of agents available , there was a high level of collusion between main agents and those who sell the skins to them .

The nature of collusion ranged from financial to material support to sellers by main agents . This conduct was adopted by agent to enable them maintain regular customers . Because of this practice , organisation of purchase varied from cash on delivery to advance payment before delivery . Sometimes they even offered credit to their customers .

The price of goat skin was quite uniform at the butcher and producer level . The recorded price of raw skin throughout the survey period was Ksh 5.00 per skin . The recorded weight of the skin at delivery varied from 4 kg to 7 kg per skin . This observed weight at reception of raw skin ,

decreased by about 40 percent on average at the time of dispatch from the barns . The figures were based on interviews with barn operators and may be subject to precision errors . At the intermediate level , the prices were based on grades as shown in table 4.4 .

The price margin for semi processed skins were quite high . For example , if raw skin of 4 kg reduces to 2.5 kg at the time of dispatch and if grade 2 is assumed then the following margin would accrue to the barn operators .

	Minimum	Maximum
Price at dispatch Ksh	15.00	30.00
Purchase price Ksh	5.00	5.00
Gross price spread Ksh	10.00	25.00

From the above calculations the minimum gross price spread of Ksh. 10.00 would give gross profit of 200 percent. The presence of this high margins probably explains the rampant illegal trade in hides and skins business . However , the trade on goat skin may have little influence on goat production at the farm level . Considering all the processes in semi processing in barns , it is easier for the farmer to dispose raw skin rather than the semi processed form . Besides , they might not have the right skills to give good grades . Therefore a part from Ksh 5.00 farmers get from raw skin ,there was no other impact the trade on skin could have on goat production at the farm level .

4.4.0 STRUCTURE OF DAIRY MILK MARKETING IN WESTERN KENYA

The study investigated the nature of supply and demand of three dairy products commonly found in commercial market centres . The first product was processed milk with the brand name "KCC" . This milk product is manufactured by Kenya Cooperative Creameries (KCC) . The second product was raw milk sold as fresh milk either through vending or dairy cooperative societies . The third product was sour milk . This refers to milk which has undergone fermentation with cream separated . It is usually marketed through private vendors .

KCC milk accounted for the largest proportion of milk supplied to the retail markets . In some parts of Kakamega district the supply was intermittent or restricted . The restriction was imposed in some areas to encourage the development of private dairies or cooperative societies by farmers . For example at Lubao no KCC milk was recorded in the course of survey .

Raw or fresh milk from the farms was found in most parts of the district being sold by dairy cooperative societies and to a limited extent by private vendors . Private vending of raw milk was very rare since KDB regulations makes it illegal . One is required to secure a license from dairy board before running the business .

However , KDB in most cases give priorities to cooperatives and not individuals . As a result private vendors were few in the business .

The supply of raw milk in certain periods was higher than for sour milk . This was particularly so during periods when milk supply in general was very low . Most of raw milk produced were sold and little was left to go sour. Therefore , at the market little volume of sour milk would be found .

Unlike raw (fresh milk marketed directly by farmers) and KCC milk , sour milk marketing was not controlled. It was sold in cups by private vendors . Almost in all the markets , one could see that women tended to dominate the business .

As has been noted elsewhere in the country and especially as reported in the study by Heyer et al(1976), there exist a remarkable variation in milk supply through out the year . This was also true for Kakamega district . One feature was apparently noticeable in the district . As supply of raw milk to dairy cooperative societies exceeded 30 litres, supply of KCC and sour milk to markets declines . This can be seen in graphs in appendix 5 . An explanation to the above observation was partly related to price and consumption of fresh milk from the farms and consumed locally without passing to KCC. Thus , as volume of fresh milk increases beyond 30 litres , the price becomes comparatively cheaper to KCC . Since fresh milk was whole milk and of better quality than KCC , consumers tended

Table 4.5 shows price of milk as recorded both at wholesale and retail levels . From the results , KCC milk was more expensive than any other form of milk . The wholesale price for KCC was Ksh. 5.25 per litre . The retail price was Ksh.5.50 per litre . Both the retail and wholesale prices for KCC were fixed . Fresh and sour milk had varying prices . Minimum wholesale price for fresh milk was Ksh 2.20 per litre with the maximum of Ksh.4.60 per litre . The retail prices were Ksh.3.80 and Ksh.8.00 per litre for minimum and maximum respectively . For sour milk , minimum wholesale price was Ksh.2.50 per litre with maximum price of Ksh.5.20 per litre . The retail price was Ksh.3.30 and Ksh.7.00 per litre for minimum and maximum prices respectively . The prevailing milk marketing system does not augur well for goat milk . It would imply that they will have do with unorganised selling of milk through local milk vending or limited number of milk co-operative societies if DPGs are successfully introduced for milk production .

4.5.0 MULTIPLE REGRESSION RESULTS

Multiple regression was applied to estimate the influence of liveweight , age and sex on goat prices . The outcome was intended to help in identifying the attributes which were suitable for defining grades in goat marketing system . The estimated equation as already discussed in section 2.0.2 represents price- attribute function (MQVF).

Data from different markets were pooled to enable the determination of the nature of aggregate demand . However, when dealing with cross sectional data ,precaution has to be

taken to avoid the problem of heteroscedasticity . The problem arises due to changes in population variances for different samples . The consequences are many fold . For example , the regression coefficients may remain linear but biased . The t and F ratios may no longer be valid due the changes in population variances . As a result the judgement on the level of significance also become unreliable .

To avoid the problem of heteroscedasticity , Chows test was undertaken to indicate the severity in changes in variances of different market data . In other words , it was a way of finding out whether data collected from different markets came from population with similar normal distribution pattern . The following results were obtained :

Lubao F-Cal = 2.033 F-Crit = 4.020

Mahanga F-Cal = 3.205 F-Crit = 4.020

Shikulu F-Cal = 3.220 F-Crit = 4.670

Nambacha F-Cal= 0.445 F-Crit = 4.020

Cal = Calculated Crit = Critical

The results revealed low calculated F values than critical F values provided in statistical tables . This indicated that there was no significant differences in these population samples from different markets . Heteroscedasticity was therefore not a severe problem which could stop the data from being pooled .

In order to obtain appropriate market quality valuation function , stepwise regression procedure was adopted .The results showed that all the variables had positive

correlation coefficient . These coefficients are shown in table 4.6 . The highest coefficient observed was between price and liveweight (0.89) . For age and sex , the coefficients were 0.77 and 0.32 respectively . The results indicated that there was positive linear relationship between price and all the attributes .

Looking at the relationship between attributes , liveweight and age have high positive linear relationships . This indicated that they could form colinear set in the specified equation for estimation (see method of analysis in section 3.2.1) . This was further confirmed when age was left out in the final estimated equation . It indicated that the addition of age into the equation does not contribute

Table 4.6. Correlation Matrix of Price of Goats on Liveweight , Age and Sex in Livestock Markets in Kakamega 1985.

Attributes	Price of goats	Liveweight	Age	Sex
Price of goats	1.00	0.89	0.77	0.32
Liveweight		1.00	0.86	0.34
Age			1.00	0.26
Sex				1.00

source: author

significantly towards explaining the variation in price of goats . Thus, liveweight can suitably be used instead of using the two attributes in grading scheme . The equation obtained was ,

$$P = -2.806 + 5.545 X_1 + 6.451 X_3 + e_2 \quad (9)$$

s.e	0.349	5.232	R = 0.66
(t)	15.874	1.233	n = 165

Regression coefficient obtained for liveweight (X_1) was significantly different from zero at 5 percent level. The positive regression coefficient observed on liveweight indicated that goats of higher liveweight were preferred to those of lower liveweight. In other words, buyers were willing to pay more for goats of higher liveweight than those of lower liveweight.

Regression coefficient on sex (X_3) was not significantly different from zero. This indicated the lack of influence on price by sex. In which case, the distinction between sex may have little or no impact as far as grades are concerned.

The other implication was related to perception of individual attributes by buyers at the market. As indicated by varying coefficients on each attribute, it was evident that liveweight had greater influence on price than sex. Moreover, sex was found to have no significant influence on goat prices. Therefore, it is realistic to suggest that more emphasis be laid on liveweight in the process of price setting. Since regression coefficient on liveweight was significantly different from zero, it can also be argued that liveweight as an attribute was desired by buyers.

Basing the argument on the results, age and sex were found not to be suitable for grade definition. Age was

excluded from the final equation because its contribution in explaining variation in prices of goats were not significant particularly when liveweight was included . In other words , instead of using the two variables only one can be used and from the results, liveweight was chosen .

Sex was not suitable because it had no significant influence on price .This observation verified the fact that buyers simply saw no significant differences in value when purchasing male or female goat . This indicated that sex was not desired by buyers and including it within grading scheme would cause inconsistencies .

The other variable which could have been included in the regression analysis but had no relevance to grading scheme was distance. The idea of including distance in the analysis as a proxy of transfer cost could not explain much about price as the cost was predominantly fixed irrespective of distance covered. This is explained in the next section. Moreover, as explained in section 4.1.3 ,the trade was highly localized.

4.6.0 INTER-REGIONAL TRADE ON GOATS

The nature of transfer cost observed was a function of livestock numbers .It showed that transferring or trekking up to 5 heads of goats cost Ksh.10.00 . In other words , the cost function encountered was a step function of livestock numbers . On average , the cost of transferring a goat to a market was Ksh.2.00 . This number is simply calculated from

the cost of trekking five animals . This transfer cost was in most cases fixed irrespective of distance covered.

Table 4.7 shows calculated differences in selling prices of goats between markets . Given in brackets are distance between the two markets . Using the above average figure of Ksh.2.00, it can be seen that price differences between markets exceeded transfer cost by high magnitude . The results also showed that transfer cost would still be less than price differences between corresponding markets even if one goat was traded .Since transfer cost was less than the observed differences in prices between markets ,it followed that spatial price relations were not in equilibrium position.

Price difference between Serem and Mahanga was the highest with the value of Ksh.81 . Serem had higher price than the rest of the markets . This is shown in table 4.10

By inspection, price differences between markets seem to correspond with distance between markets. This argument

Table 4.7. Calculated Price Differences Between Markets For Live Goats Ksh. Feb.--Jun.1985

Markets	Lubao	Nambacha	Mahanga	Serem	Shikulu
Lubao	0	13 (17)	62 (50)	19 (45)	36 (28)
Nambacha		0	49 (45)	32 (70)	23 (35)
Mahanga			0	81 (35)	26 (20)
Serem				0	55 (30)
Shikulu					0

source: author Note: Numbers in parenthesis are distance in Kilometers between the two markets .

however fails in the case of Serem Vs Mahanga and Shikulu Vs Serem . If the distance between the two cases are compared with distance in other cases then it will be found that the differences between the above two cases were excessively high . In these two cases , it can be seen that prices of goats depend more on other factors rather than distance alone . The analysis then proceeded to assess the intermarket linkages .

4.6.1 BIVARIATE CORRELATION RESULTS

Bivariate correlation analysis was used to assess interregional trade on goats. The aim was to look at how prices between markets were related . The results in table 4.8 showed that intermarket linkages were very low as indicated by low value of coefficients obtained .

Out of the 10 coefficients obtained , 4 had negative values . This indicated lack of congruence in price movement between markets . The positive coefficients indicated the existence of arbitrage activities .

The highest correlation coefficient obtained was 0.65 . This was almost equal to but lower than 0.70 which was stated as satisfactory level (Schmidt,1979). The level of intermarket linkages could therefore be described as low but almost satisfactory in one case . Although price differences between markets were found to exceed transfer cost , price relationship between markets were low . This could be

Table 4.8. Correlation Matrix Showing Correlation Coefficients of Prices Between Markets 1985

Markets	Lubao	Nambacha	Mahanga	Serem	Shikulu
Lubao	1.00	0.09	-0.56	0.65	-0.54
Nambacha		1.00	0.13	0.42	-0.28
Mahanga			1.00	-0.28	0.48
Serem				1.00	0.01
Shikulu					1.00

source: author

explained by limitation on traders activities as shown in section 4.1.3 . Because of vast distance between these markets, only few traders may have trade connections between these markets .

4.7.0 PRICE ANALYSIS

Price analysis provided an overview of price structure in the entire goat marketing system .It sought to answer questions like : what would one pay for purchasing a goat from the market ? how do the butcher operators benefit from price controls ? What is the nature of price movement between buyers and sellers of goats .

Table 4.9 presents selling prices of live goats on per kilogram basis . Two important issues can be deduced from table 4.9. Firstly, the price one would pay for one goat vary from place to place . The highest price was Ksh.8.35 per kilogram observed at Serem . The lowest price was Ksh.5.50

per kilogram at Mahanga . Secondly ,from the calculated standard deviation , the variation in prices were not large . Therefore , the expected price of goats in the district during the time of survey was between Ksh.5.50 to Ksh.8.35 per kilogram .

Table 4.9 Price Outlook for Live Goats as Estimated from different Markets Ksh./kg(1985) .

Markets	Lubao	Mahanga	Nambacha	Serem	Shikulu
Minimum	4.88	3.76	5.27	5.22	5.15
Maximum	7.54	7.45	6.99	10.07	6.49
Mean	6.30	5.50	6.20	8.35	5.96
SD	0.61	0.89	0.29	2.17	0.14
N	17	17	17	10	10

source survey

SD = standard deviation

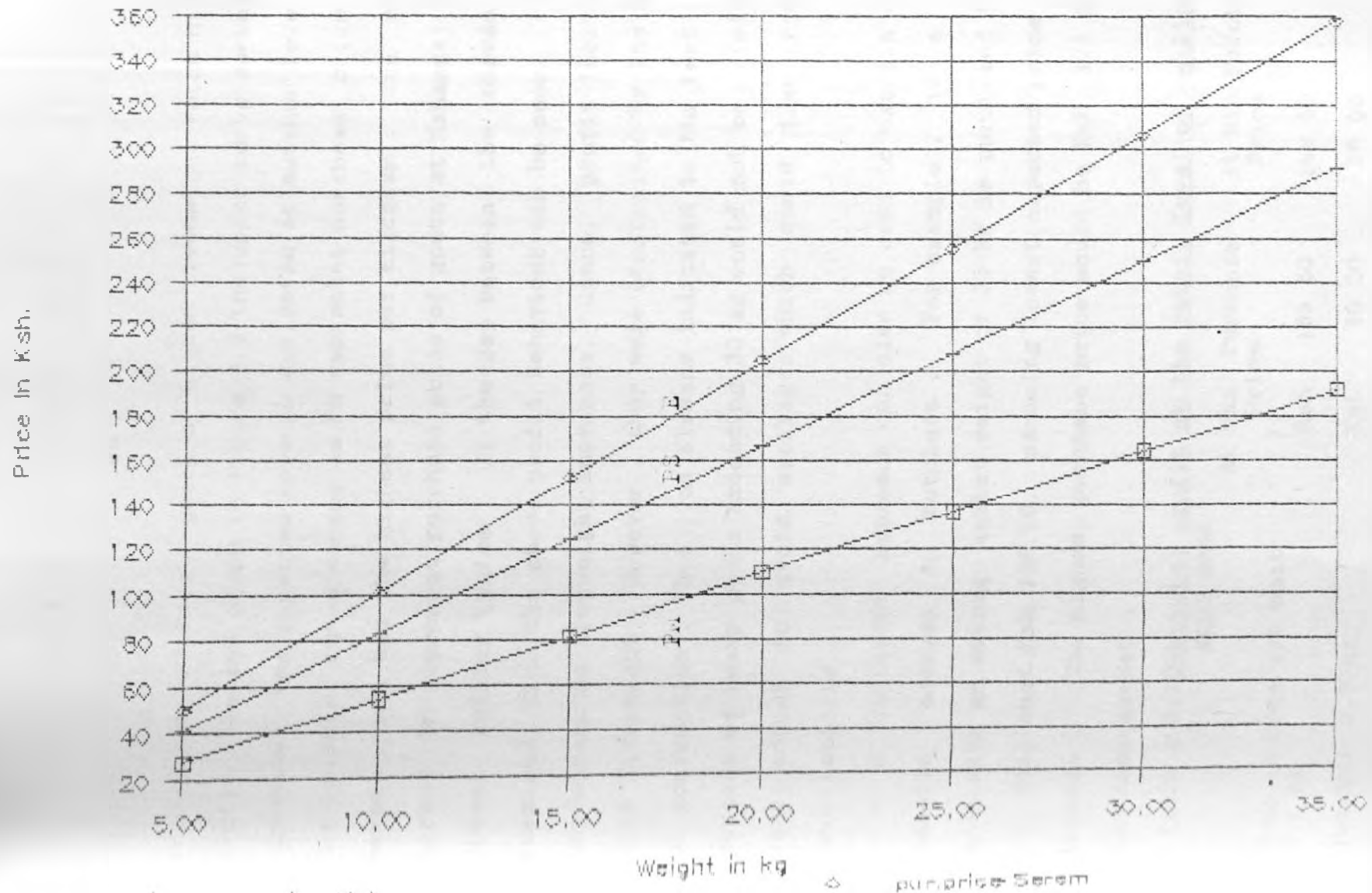
N = number of animals in the sample

From the butcheries , price of bone in bone out meat and matumbo was given as Ksh.20.60 and Ksh.10.00 per kilogram respectively . If the proportion of the two parts with controlled prices is calculated and multiplied by their respective prices then the revenue accruing to butcher operator cover 61 percent of the original liveweight . The 31 percent from uncontrolled parts are to the benefit of butcher operator .

Since purchase of goats varied from place to place , it can be argued that the magnitude of profit also varied in a similar manner. However , results displayed in figure 4.3 showed that profit increases with the size of goat

FIGURE 4.3

The Weight/Price Behaviour



slaughtered . Thus , goats of higher liveweight fetch higher profit . In the graph in figure 4.3 the upper curve marked E represent the expected revenue collected at butcher level . The middle curve marked as PS represent purchase price at Serem which had the highest price per kilogram . The curve marked PM represent purchase price of goats at Mahanga with lowest selling price . If the gap between the curves is examined then the above profit behaviour can be seen . The gap widens as liveweight increases. Hence, profit increases with liveweight . However , they were constrained by the rate of consumption . Thus , as already indicated in the text ,the carcass of heavy goats exceeding 30 kg could not be finished fast enough to avoid spoilages which could then reduce profitability .

A different approach can also be used to explain how benefit accrues to butchers . For example , if a goat with an average market weight of 23 kg is purchased then it will cost Ksh.126.50, assuming lowest expected price at Mahanga . The highest purchase price would be Ksh. 171.35 in the same market.

Table 4.9.1 Estimated profit at the retail level of selling goat meat

	At Max. Purchase Price	At Min. Purchase Price
Bone in bone out meat 9.2 kg	Ksh 189.50	189.50
Matumbo 5.0 kg	Ksh 50.00	50.00
Total revenue	Ksh 239.50	239.50
Purchase price of live goat	Ksh 171.35	126.50
Expected Profit	Ksh 68.15	113.00

Using the purchase price as the basis for calculation , the butcher operator makes a gross profit of about 40 percent without including the sale of uncontrolled parts(table 4.9.1). The butchers therefore get a large profit despite the existence of price controls .

With regards to price movement between buyers and sellers of live goats, the analysis was undertaken with absolute amounts . The results are presented in tables 4.10,4.11 and 4.12. Beginning with buying price in table 4.9, it is clear that they varied from market to market . The average buying price was recorded at Serem (ksh.152.60) . The minimum was Ksh.102 recorded at Mahanga . Similar behaviour was also noticeable with selling price . The highest selling price was ksh.197.50 and was recorded at Serem . The lowest was ksh.116.72 recorded at Mahanga . Price margins between selling price and buying prices also displayed similar behaviour . The highest price margin was recorded at Serem . It was Ksh.45.50 . The lowest margin was Ksh.14.55 recorded at Mahanga .

These observed prices showed that goats were more expensive at Serem than in other market centres . Looking at the prices in table 4.10 ,goats would fetch as much as ksh.350.00 on resale . Table 4.11 on the other hand showed that traders were getting a minimum of Ksh.14.55 and a maximum of ksh.45.55 of profit . Looking at the margins and transfer cost of trekking goats to markets , It is quite clear that goat trade is profitable even if only one goat is

traded .

Table 4.10. Recorded buying prices from different markets in Kakamega District in 1985 (ksh).

Market	Min.	Max.	Mean	SD.	N
Lubao	50.00	275.00	145.17	59.88	35
Nambacha	60.00	310.00	146.14	90.08	35
Mahanga	45.00	190.00	102.12	41.98	35
Serem	90.00	220.00	152.66	36.92	30
Shikulu	100.00	140.00	121.47	15.51	23

source: survey.

Table 4.11. Recorded selling prices from different Markets in Kakamega District in 1985 (ksh).

Market	Min.	Max.	Mean	SD	N
Lubao	75.00	300.00	178.45	59.88	35
Nambacha	70.00	350.00	165.00	100.73	35
Mahanga	65.00	200.00	116.72	49.56	35
Serem	100.00	260.00	197.50	36.92	30
Shikulu	110.00	190.00	142.64	19.93	23

source: survey.

Table 4.12. Recorded margins as calculated for different Markets in Kakamega District in 1985. (ksh.)

Market	Min.	Max.	Mean	SD	N
Lubao	11.00	40.00	24.57	5.54	35
Nambacha	5.00	45.00	21.12	12.23	35
Mahanga	11.00	32.00	21.45	6.45	35
Serem	13.00	43.00	20.30	10.10	30
Shikulu	10.00	30.00	19.82	5.61	23

source : survey.

Basing the judgement on the above outcome, it can be argued that the trade on goats is profitable in Kakamega district except lack of price information and institutional constraints hinders its popularity.

4.8.0 RESULTS FROM SIMPLE REGRESSION ANALYSIS

Simple regression analysis was applied to quantify structural relationship between price margins and selling prices. The relationship was expected to show the behaviour of price formation along separate market levels. The correlation coefficient between price margin and selling price was 0.58. If this outcome is compared to those provided by Schmidt (1979), then prices changes are not efficiently passed along the goat marketing system. The above outcome was expected to be low and near zero. In which case the traders have no exploitative tendency. With the observed outcome, price margins are not independent of selling prices as expected. The traders therefore tended to price above the desired margin.

To provide further evidence on the above finding, regression results between price margin and selling prices were provided as in 1 below.

$$M = -2.314 + 0.189P + e \quad (10)$$

s.e

0.0203

t

8.897

n = 157

2

R = 0.33

The results showed that regression coefficient was significantly greater than zero discounting the existence of efficient interphase price efficiency .Ruttan (1968), argued that when regression coefficient obtained between prices and margins are significantly greater than zero then price elasticities of demand are not similar at all market levels. Therefore it can also be argued that price elasticities in goat markets were not similar at all levels.

About 33 percent of variation in the margin was explained by selling price . This indicated that traders always set prices with the aim of getting high margin . Under competitive market conditions, the margin is fixed between market interphases(levels) or constant percentage amount of selling prices . In that case the regression coefficient between margin and selling price is expected not to be significantly different from zero as found in this study .

4.9.0 DISCUSSION OF THE RESULTS

The results have touched on various hypothesis postulated for testing in the study . Firstly, the hypothesis which stated that liveweight of goats have significant influence on prices and can be used for defining grades was not rejected. However, age was not suitable because its effects in explaining variation in prices of goats when liveweight was included was not significant. Either of the two could be used but weight was preferred to age because its contribution in explaining the variation prices was greater than for age .

On the other hand, sex had no significant influence on prices of goats at the markets. Because of lack of influence on prices, it was not worthwhile for sex to be included in any grading scheme as this would create inconsistencies in grade structure. If this is done and sellers grade their animals on the basis of sex where buyers see no advantage then the standard specification defining that particular grade may collapse. Some buyers might violate the rule on sex thereby causing default in the scheme. As a result, establishment of grading scheme which would require a set of attributes was not feasible. However, an alternative measure was pricing of goats on the basis of liveweight since the attribute had significant influence on prices and also desired by buyers.

The hypothesis which stated that differences in price of live goats between markets exceed transfer cost was not rejected. This implied that the current goat markets are not price efficient. Although the current trade on goats was found below satisfactory level, there is a possibility of increasing trade basing the argument on calculated price differences. Probably lack of information would explain the low levels of market linkages as shown by low levels of price movements between markets. Only one case showed the likelihood of satisfactory market integration because the level of coefficient obtained (0.65) was close to 0.70 shown by Schmidt (1979) as satisfactory.

The institutional restriction on livestock movement could explain low levels of market integration . From regulations pertaining to livestock movement , one is required to obtain a permit from veterinary officer to legally move livestock between divisions . Where this is not possible or easy, particularly regions far off from the headquarters , it becomes a real bottleneck for traders or those willing to move animals to do so . Because of the above procedure , livestock movements get restricted causing constraint on arbitrage activities .

Furthermore , in all the markets surveyed , goats offered for sale were not all purchased . A considerable portion always remained unsold . This spelt the risk of incurring losses in terms of transfer cost when the animal remained unsold. Due to such risks ,not many traders would be willing to bear the consequences of trade on goats from one region to another .

Lack of arbitrage activities could also be due to the inability of small stock to cover long distances on hooves . It would therefore , imply that improvement on mode of transportation would offer some options for improvement . However , unless there are sufficient number of goats available to justify motor vehicle transport , improvement on transportation may be a problem .

Investigation on price margin behaviour revealed lack of interphase price efficiency . The regression coefficient

obtained on selling price was significantly different from zero . The outcome indicated that price changes are not efficiently passed along the marketing channel . Therefore , price margins were exploitative . The value of R^2 (0.33) provided further support to the argument . It showed that up to 33 percent of variation margin could be explained by selling price . This indicated that there are other external influences on price margins . These factor can be attributed to imperfections in the marketing system (i.e imperfect information, mobility ,transparency and heterogeneity in goat marketing system .

As it stands limited options exist for the improvement on price margin behaviour . Perhaps what may turn out to be appropriate strategy for further improvement would be establishment of goat pricing based on liveweight and improved information system .

CHAPTER 5

SUMMARY ,CONCLUSION AND POLICY IMPLICATION

This study was set to evaluate goat and goat products markets in Western Kenya. It has shown that the distribution of livestock market centres in Kakamega district is uneven. The distribution of these centers were found to be influenced by potential daily livestock supply to markets from the region . It was also found that because of uneven distribution of the markets and the long distance goats have to cover to markets, the present network of markets was therefore not conducive to increased goat production in the area .

At the markets , partial analysis of livestock exchanges indicated that goats of weight group between 16-30 kg were purchased in large numbers compared to other groups. This could suggests that goats should optimally be disposed to markets for sale between the above weights . Similar analysis also showed that a high proportion of goats were sold for funding basic household needs . Goats could therefore be seen as playing an important role in household economy .

A number of constraints relating to market functions were identified . On the exchange function , the markets were faced with conditions of excess supply of goats . Thus, for every market day , a considerable percentage of goats offered for sale remained unsold . This could be explained in two

ways . Either the sellers could be having higher initial prices than the market could offer which would later on fall with subsequent visits to the markets or the demand for goats in general was very low . Also identified was the under utilisation of existing market outlets in the country . This was exemplified by lack of access to other provincial markets and possible export market .

Goats of liveweight exceeding 35 kg were not popularly sold at the market . The reason why this could be so was due to the purpose for which they were purchased . Most of them were purchased as slaughter stock . Because the carcass from these stock took longer to dispose of at the butcher level , they never appeared to be popular .

Lack of opportunity for large scale commercial production of goat milk was also pin pointed . This was indicated by the distance to which the nearest KCC processing plant to Kakamega was located . Infact , the plant which is situated at Kapsabet is too far to allow even commercial production of dairy milk in most parts of Western Kenya .

Liveweight of goats was found as the most suitable attribute upon which price can be instituted . The attribute had significant influence on price and hence was desired by buyers . However , the possibility of grade establishment was not feasible . It was not possible because two of the attributes under investigation could not be included in grading scheme as explained in section 4.5.0 . According to Zusman (1967) , the establishment of grades require a set of

above condition or requirement , it would not be appropriate to institute grading scheme on liveweight alone . However , there is further alternative of using other attributes which are not set for investigation like breed, and quality provided they are desired by buyers . Although as a first step , it would be worthwhile to institute price of goats from liveweight score pending investigation on these other excluded attributes .

As regards market integration , formidable constraints that explained low intermarket linkages were provided , The constraints were controls over livestock movement ,lack of adequate demand and poor transportation mode .

Price formation at various market levels of goat marketing system ,were not highly dependent on each other. The magnitude of regression coefficient on selling price was low but significantly different from zero indicating that selling prices had direct influence on the margins. The margins between buying and selling prices were therefore not independent from selling price as supposed to be under competitive markets. Hence, price changes were not efficiently passed along the marketing system .

5.1 POLICY IMPLICATIONS

One of the major observations from the study is unorganised goat marketing system characterised by underutilised existing market outlets and poor information system . An option open to SR-CRSP as the implimenting institution behind DPG development is to initiate the formation of an organised marketing system that will ensure that the present underuti-

lised outlets are exploited to capacity . A possible way of initiating the development of such marketing system is by liaising with the ministry of livestock development to look into the possibility of forming a specialised agency to undertake the marketing of DPG and its products. If the formation of such a specialised agency is found feasible then its mandate should include :

- provision of improved transportation services and exploitation of underutilised market outlets .
- provision of market and price information through common media as radio ,newspapers and farmers magazines .
- undertake active training of farmers in collaboration with Ministry of Livestock Development for improved goat production on the farms .

As regards price policy , a number of strategies could be adopted to improve on price efficiency . The first strategy was establishment of pricing of goats from liveweight score .This would provide a good option particularly if modern capital intensive inputs were to be required for DPG production . Liveweight constitute an output parameter in goat production . Generally, the performance of most inputs are mainly measured through liveweight gain . Therefore , if better response to these inputs are to be achieved then liveweight price response should be looked into or otherwise increased .

Strategies relating to income policy are those intending to make goat milk a commercially viable enterprise as well as those aimed at improving competitive position of

goats enterprise at the farm level . In this respect , there is a need for SRCRSP as a responsible research institution behind DPG development to build up research in collaboration with KDB and KCC on feasibility of marketing goat milk and its' products particularly ghee in the country . This provision is even outlined among the functions of KDB.

Another alternative policy implication arises from the fact that there seem to be lack of awareness on the usefulness of raising goats on small farms and using them for milk production . An alternative way that can possibly resolve this constraint is the carrying out of mass awareness activities. For a higher degree of success ,it might be necessary to carry out such activities on sub-location basis.

In these sub-locations , SR-CRSP should organise seminars for opinion leaders ,church leaders ,administrative authority in the area and political leadership .The purpose of the seminars should be to educate the leaders on the importance of raising goats on small farms and the nutritive value of goat milk. The seminar should be organised such a way that the discussion on the awareness issue is conducted on a two way front. Thus, leaders should be asked questions. Similarly, they should also be allowed to raise questions and comments on the subject . This is expected to enable all the leaders to feel that they have contributed towards solving such constraints. They will then help to facilitate the acceptance of such ideas in their respective communities. These seminars should be followed by large public rallies organised through the divisional office to educate the public on the same issue .

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Enumerator
 Market
 Type of Animal

Date

Animal Identification

Animal No.	Price	Weight	Seller or Trader Producer	IF SELLER IS TRADER			Seller Purposes 1 Debt payment 2 School fees 3 Income 4 Harambee	Buyer Purposes 1 Slaughter 2 Rearing 3 Selling 4 Social function	Source	Destination Distance	Mode of Transport
				Original Price	Original Place	From Local Market or Farm					
1.											
2.											
3.											
4.											
5.											

- Animal Identification:
- 1) Mature Male
 - 2) Mature Female
 - 3) Weaned Male
 - 4) Weaned Female
 - 5) Unweaned Male
 - 6) Unweaned Female

1B For Seller

Date

Market

- a) Seller's Name Enumerator
- b) When did you sell livestock last?
- c) What type of livestock did you sell?
 - (i) Sheep () (ii) Goats () (iii) Cattle ()
 - (iv) Others ()
- d) Where did you sell?
- e) Do you always sell there? Yes/No
- f) If no, which alternative place do you sell?
- g) Are you livestock trader or producer?
- h) If seller is producer, for what purpose do you sell the animals?
 - (i) For school fees ()
 - (ii) For debt repayment ()
 - (iii) For general cash income ()
 - (iv) For Harambee contribution ()
- i) How do you acquire information about prevailing price?
 - (i) Neighbours ()
 - (ii) Visiting the market ()
 - (iii) Market Official ()
- j) Where do you come from?

Distance

(i) For school fees ()		
(ii) For debt repayment ()		
(iii) For general cash income ()		
(iv) For Harambee contribution ()		

1C For Buyer Date

Market

a) Buyer's Name Enumerator

b) Where do you live? Distance

c) For what purpose do you buy the animals?

(i) Slaughtering ()

(ii) Rearing ()

(iii) Selling ()

(iv) Social function () Name

d) Are you a livestock trader? Yes/No

e) If yes, how many years have you been in livestock trade?

f) Indicate the number of the following stock purchased per time period?

Type of Stock	Week	Month	Year
Cattle			
Goats			
Sheep			

g) Do you usually get all the livestock you require in this market? Yes/No

h) If no, where else do you get other livestock?

.....

i) Indicate the places you sell your livestock 1 (v)

Place	Cattle	Goats	Sheep
Local Market			
To farmers			
To traders			
To butchers			
To others			

2 Cost of Transporting Livestock to or From Market
(for Both Sellers and Buyers)

Enumerator Date

Market

Item	Livestock Type		
	Cattle	Goats	Sheep

a) Trekking (v)

Destination

No. of hired persons

Cost of hired labour per day

Cost of food for hired labour (KShs)

No. of stock

No. of days of trekking

b) Motor Transport (v)

Destination

Hire charges per herd

No. of stock

No. of days

Death losses

Weight losses

Total losses (KShs)

c) How do you travel to this market?

d) How much do you spend on personal transport and meals per day/ (KShs)

e) How many days do you take per transaction?

f) What problems do you encounter on trading?

Cattle

Goats

Sheep

MEAT CONSUMPTION

Enumerator

Date

Market

Day

Butcher No.

Month

Type of Animal	No Purchased	No. Slaughtered	Date of Purchase	Live-weight	Date of Slaughter	Date Finished	Purchase Price	Car-cass in kg	G.I.T contents (kg)	Hides or skins	Head and Legs (KShs)	Labour cost Fees	Source Trader Farmer
----------------	--------------	-----------------	------------------	-------------	-------------------	---------------	----------------	----------------	---------------------	----------------	----------------------	------------------	----------------------

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4. WEEKLY SUPPLY OF HIDES AND SKINS

Enumerators

Date

Market

Day

Month

Week Ending

Type	Total Supply	By Producer	Trader	Butchers	Price/kg	No Cured	Cost of Airing	No Dispatched	Sale Price Kg	Destination	Mode of Transport	Cost
Hides												
Goat Skins												
Sheep Skins												

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5. MILK SUPPLY AND DEMAND IN A MARKET

Enumerator

Date

Market

Seller No.	Type of Seller Hawker or Retailer	K C C			Fresh Milk			Sour Milk			Remarks				
		Purchase	Price/ kg	Sold/ kg	Price/ kg	Purchase	Price/ kg	Sold/ kg	Price/ kg	Purchase		Price/ kg	Sold/ kg	Price/ kg	
1.															
2.															
3.															
4.															
5.															
6.															

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Appendix 2a

Weekly mean livestock prices, supply and Sales at Lubao in 1985

Month	Week	Price of Goats	Goat Supply	Goat Sales	Sheep Supply	Sheep Sales	Cattle Supply	Cattle Sales
Jan	4	6.73	25	15	28	20	286	171
Feb	1	7.17	12	11	37	36	197	129
	2	7.20	34	26	17	16	243	184
	3	5.56	12	9	31	30	276	158
	4	5.85	23	21	46	45	303	150
Mar	1	4.88	23	5	25	21	270	130
	2	5.82	26	14	42	26	356	266
	3	6.20	41	35	45	36	225	131
	4	6.36	45	40	35	22	305	155
April	1	5.27	71	61	33	25	287	171
	2	7.57	53	34	50	30	213	131
	3	5.86	30	19	40	29	272	148
	4	7.72	23	17	35	23	250	130
May	1	6.32	43	35	46	33	297	180
	2	4.35	41	33	63	53	256	164
	3	6.26	44	36	65	41	296	165
	4							

Appendix 2b

Weekly mean livestock prices, supply and sales at Nambacha
in 1985

Month	Week	Price of Goats	Goat Supply	Goat Sales	Sheep Supply	Sheep Sales	Cattle Supply	Cattle Sales
Jan	4	6.99	46	40	58	45	110	93
Feb	1	6.02	32	28	69	52	121	113
	2	6.64	45	37	37	30	219	198
	3	5.48	30	30	33	29	236	212
	4	5.27	40	29	70	58	240	210
Mar	1	5.61	17	13	35	29	218	195
	2	5.75	45	25	32	31	252	96
	3	5.89	39	38	55	51	213	183
	4	6.29	60	48	110	86	336	317
April	1	6.22	39	34	35	31	225	206
	2	6.48	42	32	35	30	189	167
	3	6.98	32	28	68	63	211	205
	4	6.90	35	22	55	29	278	213
May	1	6.29	25	24	50	45	289	150
	2	8.03	45	40	37	33	330	304
	3	7.35	31	30	75	75	296	270
	4	6.29	80	50	109	90	304	269
June	1	6.37	70	66	86	85	271	256

Appendix 2c

Weekly mean livestock prices, supply and sales at Mahanga in 1985

Month	Week	Price of Goats	Goat Supply	Goat Sales	Sheep Supply	Sheep Sales	Cattle Supply	Cattle Sales
Jan	4	4.60	80	20	50	30	200	30
Feb	1	-	-	-	-	-	-	-
	2	5.62	60	32	20	19	200	38
	3	4.56	70	18	60	20	150	50
	4	3.76	66	17	62	4	221	11
Mar	1	6.17	60	13	30	7	70	10
	2	5.83	63	20	20	7	170	14
	3	5.76	61	10	49	4	210	10
	4	4.76	70	11	55	5	109	11
April	1	5.57	42	19	25	10	150	20
	2	5.22	60	10	34	5	125	19
	3	7.45	60	17	40	8	275	42
	4	6.50	90	41	38	10	180	26
May	1	6.07	59	14	31	7	180	20
	2	5.24	49	37	64	10	300	22
	3	6.06	51	15	35	11	195	45
	4	6.01	96	33	49	11	300	34
June	1	5.42	44	21	32	7	160	44

Appendix 3

Monthly and Annual Mean Livestock Prices At Lubao and Serem Markets for 1981 and 1982

Market	Livestock Type	Jan	Feb	March	April	May	June	July	Aug.	Sept	Oct.	Nov.	Dec.	Annual Total	Mean Month	S.D*
Lubao	Cattle	690	1090	1682	563	711	1824	1368	1193	1091	1276	1200	1201	13,882	1157.0	378.0
	Goats	80	102	117	58	89	134	113	133	108	120	117	122	1,293	108.0	22.4
	Sheep	75	81	111	53	62	109	123	108	136	134	128	167	1,287	107.0	16.2
Serem	Cattle	868	857	985	950	895	1050	897	897	888	912	980	1021	11,172	931.0	64.6
	Goats	150	150	135	150	126	164	107	115	150	171	295	258	1,971	164.0	56.0
	Sheep	120	110	150	115	132	130	155	170	130	201	205	198	1,816	151.0	34.6

* S.D - Standard Deviation

Source: Divisional Annual Reports 1981 - 1982

APPENDIX 4: MONTHLY AND ANNUAL MEAN NUMBER OF LIVESTOCK SALES AT LUBAO AND SEREM MARKETS FOR 1981 AND 1982

Market	Livestock Type	Jan	Feb	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Annual Total	Monthly Mean	S.D*
Lubao	Cattle	460	270	473	331	455	423	430	109	593	522	401	339	4806	400.0	126.0
	Goats	48	31	55	26	46	40	32	9	49	43	33	27	439	37.0	12.7
	Sheep	85	39	79	75	105	86	88	36	76	84	65	52	869	72.0	21.0
Serem	Cattle	108	117	126	110	74	126	155	133	115	140	161	128	1495	124.6	23.0
	Goats	59	25	101	50	11	37	34	48	72	52	43	18	550	45.8	25.0
	Sheep	34	26	61	41	30	36	31	48	89	32	31	22	481	40.8	18.0

* S.D - Standard Deviation

Source: Divisional Annual Reports 1981 - 1982

SEARCH COVERS CASES 1 TO 157
No conditions in effect.

VARIABLES USED IN REGRESSION

(Based on 157 Observations)

	FIELD NUMBER	FIELD NAME	MEAN	VARIANCE	STANDARD DEVIATION	STANDARD ERROR
DEPENDENT VARIABLE	4	MARGIN	26.677484	161.9513310	21.1930530	1.7153323
INDEPENDENT VARIABLES		PRICE				
	3	SELLING	159.6178343	4768.4171157	69.0537262	5.6110873

CORRELATION MATRIX

	4	3
MARGIN	1.00	0.88
SELLING PRICE		1.00

REGRESSION PARAMETER ESTIMATES

	ESTIMATED VALUE	STANDARD ERROR	't' STATISTIC	95% CONFIDENCE LIMITS	P
Regression Constant	-2.3140110				
Coefficient, for variable 3 SELLING PRICE	.1909776	2.03307570-02	8.8977293 with 155 df	.1107985 .2211567	0.0000

ANALYSIS OF VARIANCE

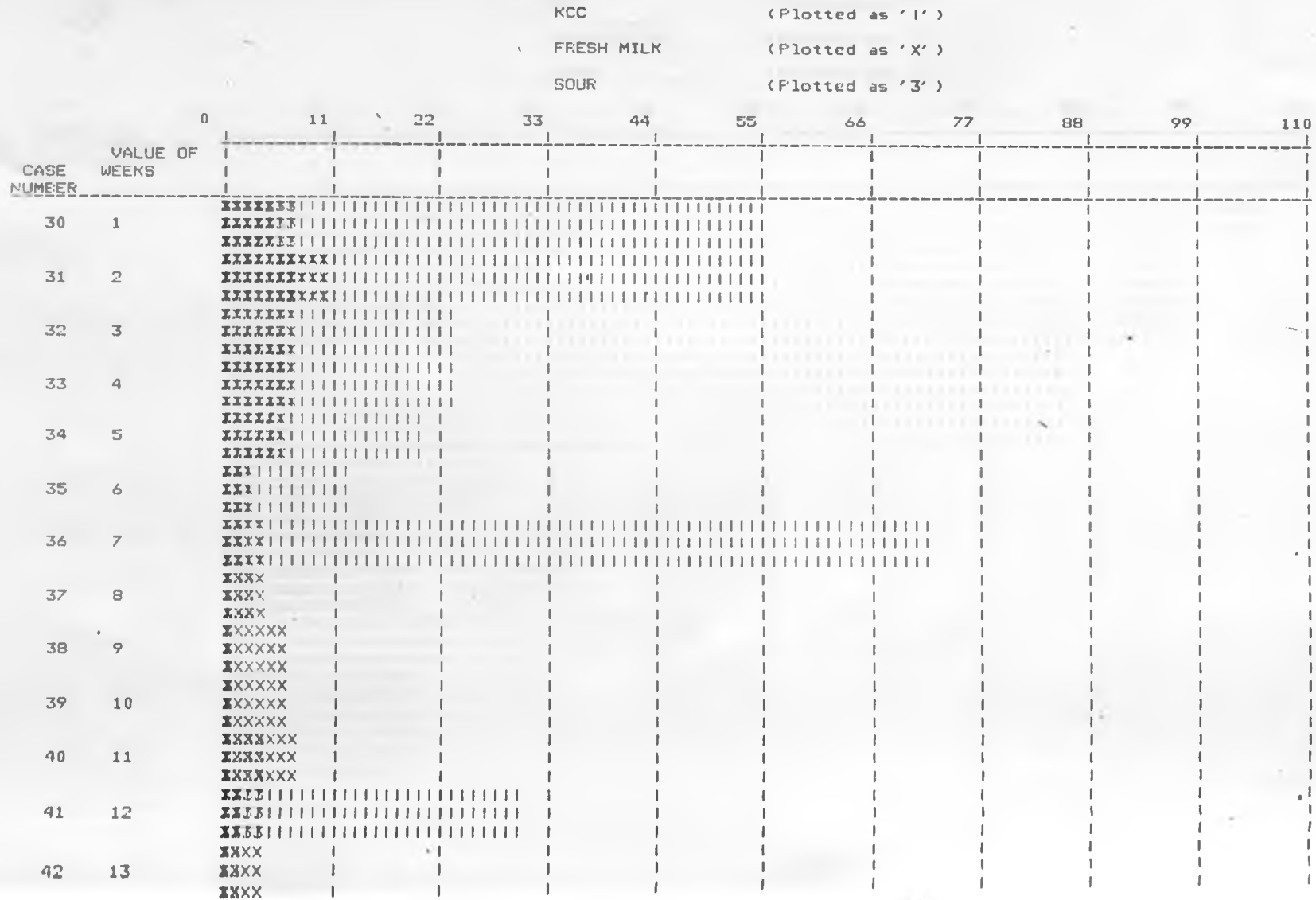
	DF	SUM-OF-SQUARES	MEAN SQUARE	F-RATIO	P
REGRESSION	1	31364.0056788	24364.0056788	79.1595819	0.0000
RESIDUAL	155	87780.4819844	307.7445288		
TOTAL	156	72044.4876632			

Standard Deviation of Errors = 17.3426488306864
Multiple Coefficient of Determination = .33806532517041

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TIME-SERIES CHART
 DATASET : MILK--

Appendix 5a: Milk Supply, Nambacha



TIME-SERIES CHART
 DATASET : MILK

Appendix 5b: Milk Supply, Luanda

KCC (Plotted as '1')
 FRESH MILK (Plotted as 'X')
 SOUR (Plotted as '3')

CASE NUMBER	0	11	22	33	44	55	66	77	88	99	110
1	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX
2	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX
3	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX
4	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX
5	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX
6	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX
7	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX
8	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX
9	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX
10	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX
11	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX
12	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX
13	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX
14	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX

TIME-SERIES CHART

DATASET : MILK--

Appendix 5c: Milk Supply, Lubao

KCC (Plotted as 'I')

FRESH MILK (Plotted as 'X')

SOUR (Plotted as '3')

