THE SPATIO - TEMPORAL STRUCTURE OF PERIODIC LIVESTOCK MARKETS AND THEIR ASSOCIATED ENVIRONMENTAL EFFECTS IN LAIKIPIA DISTRICT, KENYA.

BY

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A THESIS SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF MASTER OF ARTS IN ECONOMIC GEOGRAPHY IN THE FACULTY OF ARTS IN THE UNIVERSITY OF NAIROBI.
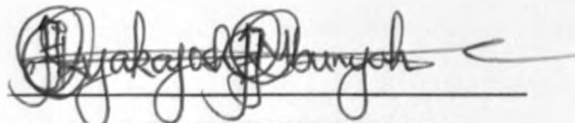
1998

DECLARATION

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

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KYAKA JOSHUA MBUNYA

This thesis has been submitted with my approval as the University Supervisor.

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DR. E.M IRANDU

DEDICATION

This thesis is dedicated to my parents, Mr and Mrs Benjamin .K. Mwei
who through their selfless sacrifice , concern , care and love have
ensured that my education becomes a success;
Parents, Thankyou and God bless you.

ACKNOWLEDGMENTS

ABSTRACT

Lack of access to the market and poor Spatio-Temporal integration of the marketing space present one of the most serious drawbacks in Kenya's economic development.. The rural market centres of this nation are fundamentally built on a periodic marketing system and hence hold the key to Local. Regional and National articulation of exchange processes The development of internal trading and marketing systems is therefore essential for a thriving market economy in Kenya in general and Laikipia district in particular Thus the Periodic Marketing System can not be ignored

The objectives of this study were to

(a)   Investigate ,describe and analyse the Spatial and Temporal elemental components of livestock periodic markets in Laikipia district.

(b)   To determine the degree of Spatio-temporal synchronization of livestock periodic markets in Laikipia district:

(c)   To determine the factors influencing the Spatio-temporal structure of livestock periodic marketing in Laikipia district and

(d)   To examine how these livestock periodic markets contribute towards environmental degradation/damage within the market areas.

The hypotheses tested in the study are-

(a)   "The spatio-temporal structure of livestock periodic markets in Laikipia district is not synchronized in space and time and as such proximity in space does not imply separation in time "

(b)   "There is no significant relationship between market provision and population density, accessibility and the degree of regional specialization".

(c)   "Livestock periodic markets are not responsible for any form of environmental damage/degradation   within   the enclosed market areas"

Geographic Information System (GIS) mapping techniques were used to present spatially geo-referenced data and also in determining spatial correlations of market provision densities and the market provision variables of population density, accessibility and degree of regional specialization. GIS overlaying technique was mainly used in this regard. Digital photo scanning was employed in presenting various forms of environmental damage in the enclosed market sites.

The distribution of livestock periodic markets was found to be random and presenting significant spatial disparities. A nearest neighbour statistic (Rn) of 1.0753 was computed hence suggesting an extremely random market distribution. The temporal distribution of marketing days is not uniform and some divisions have more or less than their fair share of the available marketing opportunities in the 14 day market calendar. An inverse relationship between spatial and temporal location of livestock periodic markets was found with an inverse correlation coefficient of -0.96057, which indicates that livestock periodic markets have a high degree of spatio-temporal synchronization.

The market provision variables examined namely population density, accessibility and degree of regional specialization significantly contribute towards the provision of market opportunities. Together these three variables explain 76.77% ($\equiv$ 77%) of the total variation in livestock market provision in the district. Regional specialization was found to be more strongly associated with livestock market provision than either accessibility or population density.

It was found that livestock periodic markets are responsible for a considerable deal of environmental damage. Excessive concentration of livestock at the market site leads to excessive pressure in the market enclosed area resulting to serious environmental damage/degradation.

It is the conclusion of this study that the overall functional efficiency of livestock marketing is depended upon a comprehensive national/local marketing policy framework which recognizes the production realities and potentiality of the local economy. Improvements in transport infrastructure, market information flows, and marketing institutional structures are a pre-requisite for successful livestock trade and marketing. Lastly in order to make livestock marketing environmentally sustainable, a well articulated institutional arrangement is also a pre-requisite. This will in turn depend upon the presence of a totally comprehensive and balanced policy framework that addresses the rather elusive and complex human-livestock - environment nexus of interactions.

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CHAPTER ONE

1.1 Introduction

Lack of access to the market is one of Kenya's most serious development drawbacks. The rural market centres of this nation which are fundamentally built on a periodic market system hold the key to the local, regional and national articulation of exchange processes. To develop a thriving market economy in Kenya in general and Laikipia district in particular, the periodic marketing or internal trading systems can not be ignored.

For Kenya to achieve the aspired industrialised state by the year 2020 as stipulated in the Sessional Paper Number 2 of 1996, the contribution of the *rural masses* is quite crucial. The fundamental question is how can the vast majority of the rural population participate in Kenya's development process in order to bring about maximum nation-wide benefit. With increasing commercialisation of the rural agricultural sector, large quantities of produce are being marketed locally as well as regionally over long distances , hence creating more vigorous interdistrict and interregional trading systems. The liberalisation of Kenya's economy over the past few years has far reaching effects on periodic marketing or internal trade systems of this nation.

Thus, although it is certainly true that these markets are important elemental components in the spatial-temporal articulation of economic exchanges and social activities, their changing role for both the rural and urban environments and for different strata of the population should be evaluated in the context of the general stage of development in any particular region.

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1.2   Statement of The Research Problem

The aim of this study is to identify the spatio-temporal structure of periodic livestock markets in Laikipia district . The study is also set to investigate how this structure comes about, what are its underlying constructs and the factors that interplay to produce the spatio-temporal structure of periodic livestock markets in the study area. Lastly the study also seeks to establish how these markets contribute towards environmental degradation within the enclosed market areas.

In more succinct terms the present study is set to examine certain aspects of periodic livestock marketing system in Laikipia district. Periodic markets considered in the context of an internal marketing system represent an organised framework for conducting economic exchange. Such an internal marketing system has spatial, temporal, institutional and behavioural elemental attributes which clearly distinguishes it from international trading systems . The distinctive components of internal marketing systems are its periodic calendar of market days and the spatial distribution over the geographic space of the market places.   The interactions of the temporal and the spatial dynamics of the internal marketing systems make it a complex *econo-geographic phenomenon*.

A study of the spatial structure of periodic marketing (and the spatial pattern of other economic activities) is quite important because of the fact that such patterns have serious ramifications for intra-regional as well as inter-regional exchange processes. Markets are important social cum economic institutions whose location in space and time (spatio-temporal structure) has far reaching influences on local, regional and

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national economies. An even distribution of periodic markets and central places in any given region is likely to bring about a broad spectrum of intra-regional and inter-regional development .

In any country the market place is an important place for commodity exchange . Market places are some of the most important and fundamental focal points of economic and social life. A considerably big proportion of the population living in a given region may be cut-off from the markets hence denying them the opportunity of participating in the market exchange process both locally and nationally (Ngau and Gaile, 1995).

The second aspect of livestock internal trade and marketing to be examined in this study is "market provision variables". It is approximated that over 60% of Kenya's population living on the best agricultural land are isolated from the market and hence from the fundamental economic activity of the country . The percentage for the Marginal lands / Arid and Semi Arid Lands (ASALs) should be expected to be higher than 60 per cent because of their relative poor accessibility and lower comparative productivity . Such people do not have an opportunity of participating in the marketing process . The development and growth prospects of these areas and their contribution towards total national development can be tapped and maximised by allowing them to have access to a ready marketing opportunity .

In order to increase access to the market by the rural population , the system of periodic markets which form the internal trade framework should be considered seriously . Spatial market distribution pattern over the geographic space is more important than their absolute number . It is this pattern of distribution which when

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clustered and concentrated in a few places produces unequal access opportunities for marketing within a region . To facilitate growth of the small market and trade centres and in order to equally benefit the agricultural sector and other productive activities, the government should see to it that it concentrates on providing the badly needed infrastructure.

This will in turn ensure the development of a thriving and prosperous agricultural-market economy. As long as the bulk of the rural population has no access to markets no meaningful development can be expected to take place . Areas where markets meet frequently and roads are passable, markets operate effectively for both producers and consumers . Periodic markets should be thoroughly understood because they are an important component of the total exchange mechanism in the rural areas of the less developed countries . The bulk of the rural economy in a majority of less developed countries is primarily dependent on periodic market exchange systems. These markets play a fundamental role of supplying inputs into the small-scale farming and informal manufacturing sectors and at the same time are an important location for sales of produce and purchase of low-order goods and services (Smith 1969) .

Periodic market places perform three basic function with respect to physical produce and manufactured commodities.These are as follows-:

(a) The importation of goods to the local region and their retail distribution

(b) The bulking and the export of goods from the local region and ,

(c) The exchange of goods within the local region especially between different agro-ecological zones producing different products.

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However , the relative importance of these functions may differ from one market to the other or one market system to the other . Gormsen (1985) , states that " the economic and social role of market places in developing countries is not straightforward or easily generalised ". Differences in this role are also very pronounced in the rural areas of developing countries . These differences depend to a great extent upon the general socio-economic and political pattern of the region , and they may alter considerably over time, with economic and technological development.

Oftenly ignored in market studies is the environmental effects that these markets have on their immediate surroundings .Livestock markets in particular can attract incredibly large numbers of herds and as a result creating environmental stress and resource degradation. Thus this study also examined how livestock periodic markets contribute towards environmental degradation at the market site ; notably those caused by concentrating large numbers of animals at the market sites.

The specific questions addressed in this study are :-

   (a) What is the Spatio-Temporal Structure of periodic Livestock markets and livestock trade in Laikipia district?.

   (b) What factors interplay to produce the Spatial and Temporal Structures of Livestock trade in Laikipia district ?,

   (c) In what ways do these periodic livestock markets contribute towards environmental degradation within the enclosed market areas ?.

The present study provides a practical approach of determining spatial interrelationships in spatial planning of marketing systems in regional

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development by use of computer based Geographic Information Systems (GIS). Secondly the study expands on the traditional approach of market studies by adopting an environmental dimension and incorporating the concept of sustainable development into the study. The study further recognizes that wholesome regional development has wide connotations extending as far as economic , social, environmental and political spheres. As such the concept of sustainable development is central in the present study.

1.3.0 Literature Review

It is important at this juncture to review the existing literature related to the present study. A summary of both theoretical and empirical assessment is given in this section. The main reasons for reviewing the relevant literature are :-

(a)   to ground and provide a foundation for the theoretical aspects of the study.

(b)   to evaluate the contributions which have already been made by other scholars with an aim of identifying gaps or weaknesses so that the study can try to fill the gaps , rectify the weaknesses and / or contribute towards new knowledge .

(c)   to avoid a wasteful duplication of time , effort and financial resources by repeating works done previously by other researchers.

1.3.1 Theoretical Bases

This section discusses periodic markets , periodic marketing and internal trade theories with respect to their spatio-temporal implications in developing regions . A complete

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rationale for periodic markets and market-places as well as for mobile trading would include a discussion of both market origins and their existence (and persistence) and functioning in space and time . In the works of a number of scholars there are frequent but incidental references to periodic markets and periodic marketing (Riddell :1972 , Good ; 1973; Hodder, 1965b;). Contributions to the theory of periodic markets and mobile trading can be placed conveniently in either an economic or a non-economic tradition. The economic approach includes two distinct themes one stemming from Central Place Theory interpretation of periodic marketing and the second from a broader location theoretical context. The first theme views periodic markets as a unique subset of the central place structure and hence a fundamental component of the framework of central places in a regional context. The second theme views periodic markets in a locational context after Loschian location theory. The non-economic tradition views periodic markets as pure social phenomena (Tinkler, 1973, 121).

The economic approach entails the internal trade model and its spatial organisation. An important component of this theory is that of , the spatial organisational structure of trade and marketing . This refers to the specific locations at which production, exchange and consumption occur and to the physical and organisational links between the market participants involved (Smith 1979) . The specific role of periodic markets is complicated by their periodicity and the institutional milieu in which they operate.

The internal trade model identifies two main processes - firstly the bulking processes which involves the accumulation of a small quantity of commodities until the consignment is large enough for transport to the targeted market centre for sale . The second is bulk breaking which is basically a distributive process . This involves

debulking or bulk breaking of the commodity into small quantities for the consumer to purchase for final consumption . These two processes are carried on conveniently in the periodic market such that these "central places" become a concourse of people regularly meeting to market and trade their surplus produce . A very wide range of periodic market and daily markets exist forming a complex market lattice over the space economy . The rural sector of most countries is thus dominated by a network of periodic markets forming a completely interlinked internal marketing system .

The internal trade model which forms the basis for this study was first formulated by Smith and Hay(1969) based on the Central Place Theory of Walter Christaller. These two will be reviewed in detailed here.

The different economic functions performed by periodic markets can be viewed in the context of the different forms of spatial organization of the market places. These economic functions which have been discussed earlier are; facilitation of local exchange,general internal trade and central place functions. The central place function of these periodic markets involves provision of low order manufactured consumer goods ,exotic foodstuffs,craft manufactures and certain services. These are purchased with the cash proceeds of internal trade and occasionally from the sale of export crops and livestock. Most models of internal trade identify periodic markets as one of the most important critical locations of internal exchange (Smith and Hay 1969,Bromley1974, Musyoki 1986 and Wambugu 1990,Wambugu 1995).However most of the models presented by these scholars do not explore the role played by these markets in specialised marketing systems. More specifically, the nature of periodicity and the organisational cum spatial infrastructure of specialised commodity periodic markets are unclear.

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The most widely known marketing system is the central place system popularly denoted as the k = 3 system under Christaller's Central place theory. Under this system the size of a given centre's service area is three times the size of the service area of the next lowest order centre.Such a marketing principle maximises consumer travel efficiency. Periodicity regimes also differ depending on the functions of the periodic market in question such that the market system functions in a complementary fashion. The central place marketing system is depicted in figure 1.1(a) below.

The distinctive feature of central place marketing systems is that each market has a choice between high order and lower order centres with which to interact and this may be modified by periodicity regimes. This spatial flexibility is unique to central place marketing systems.

There are other two periodic marketing systems to be examined in this context,
namely : the dentritic periodic marketing system (fig 1.1b) and the solar periodic marketing systems (figure 1.1c) Under the dentritic periodic marketing system the essential feature is that of its spatial attributes. In this system all lower order level centres are tied to a higher level centre in a chain that is entirely vertical without horizontal links. The key spatial components are the urban primary centres ,market towns,rural wholesale markets and rural retail markets.

Figure 1.1 (a) The Central Place Marketing System ,after Schwimmer,(1976).

● ---Central Wholesale Market

■ ---Retail Markets

△ ---Bulking Markets
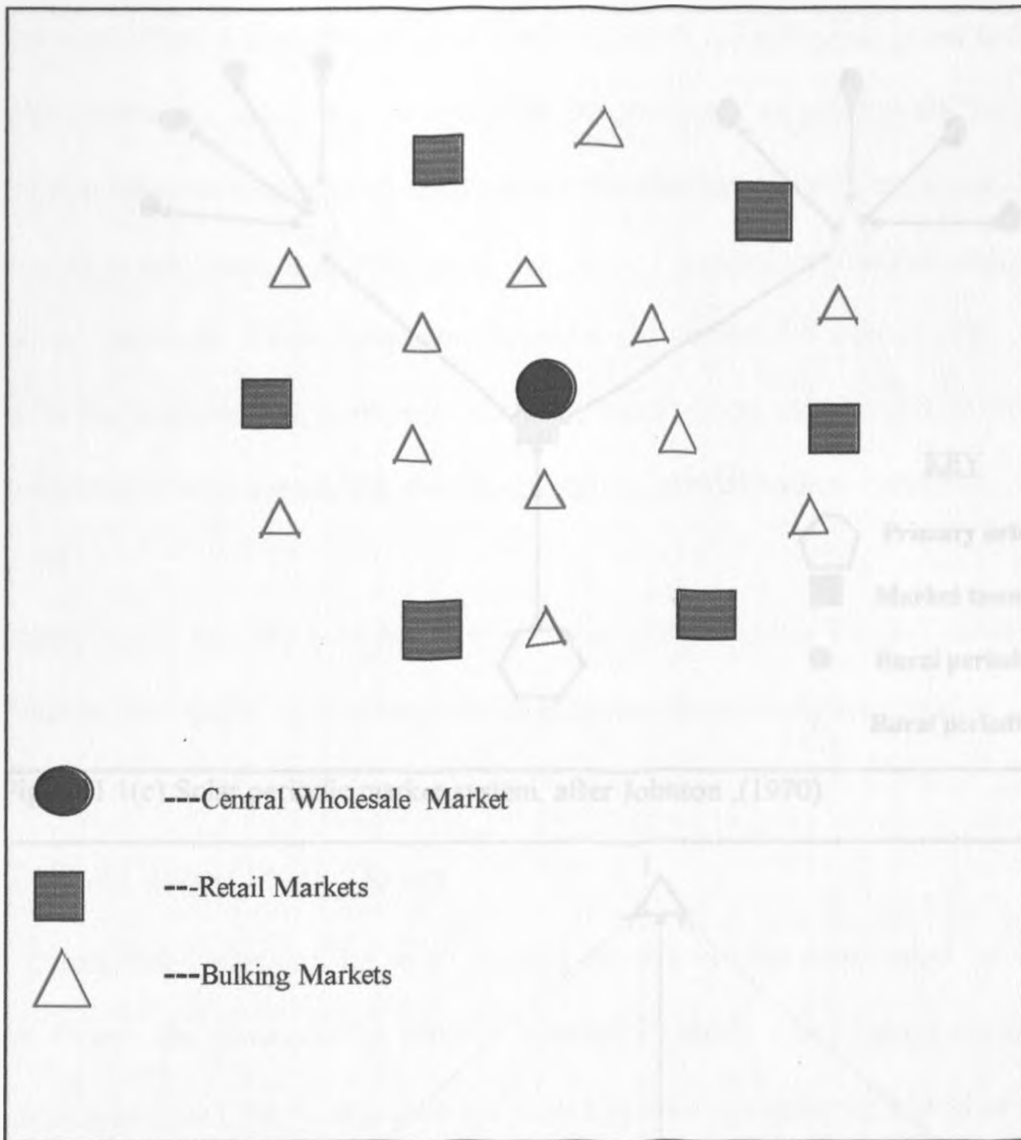
Figure 1.1 (b)Dendritic periodic market system, after Johnson,(1970).

KEY

⬡	**Primary urban market**
▪	**Market town**
●	**Rural periodic retail market**
△	**Rural periodic w/sale market**
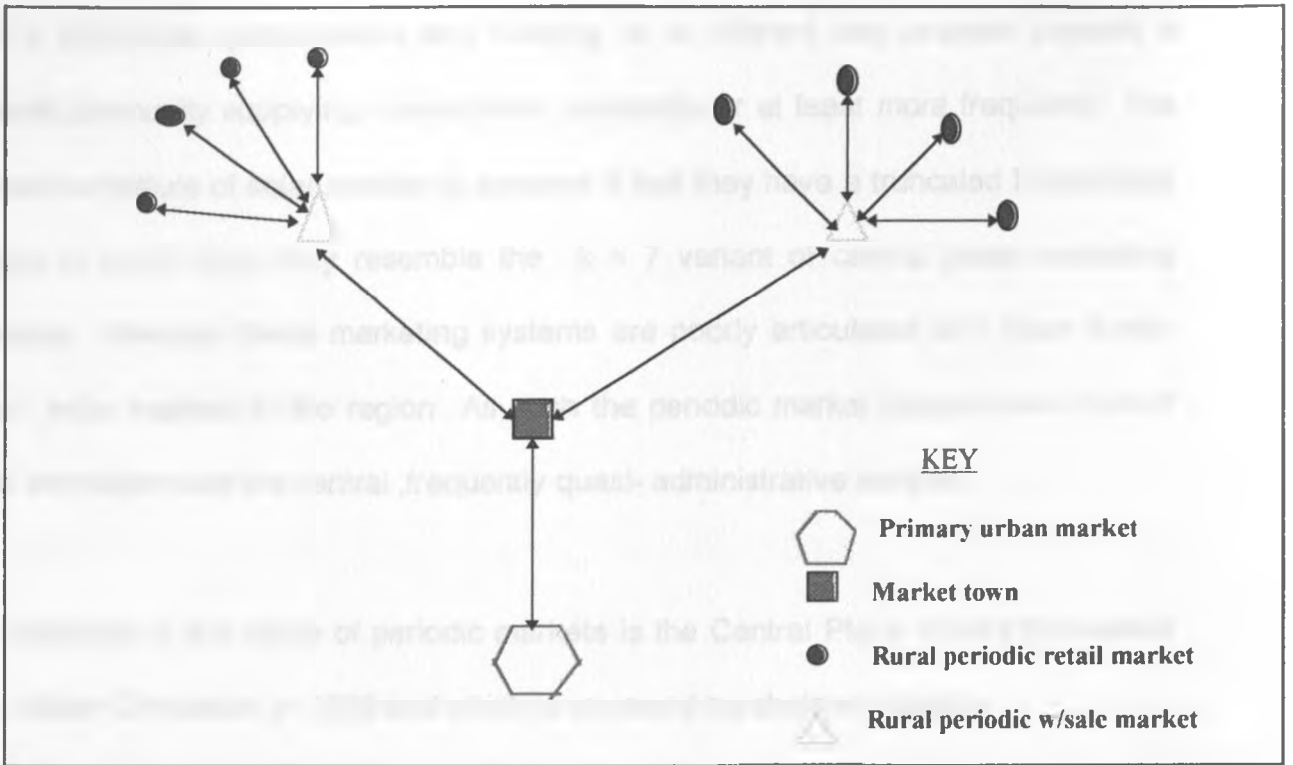
Figure 1.1(c) Solar periodic market system, after Johnson ,(1970).

Key

⊙ Central community market

1,2,3,4 Small market places each with distinct
specialisation

-----Minor interaction _____ Major interaction
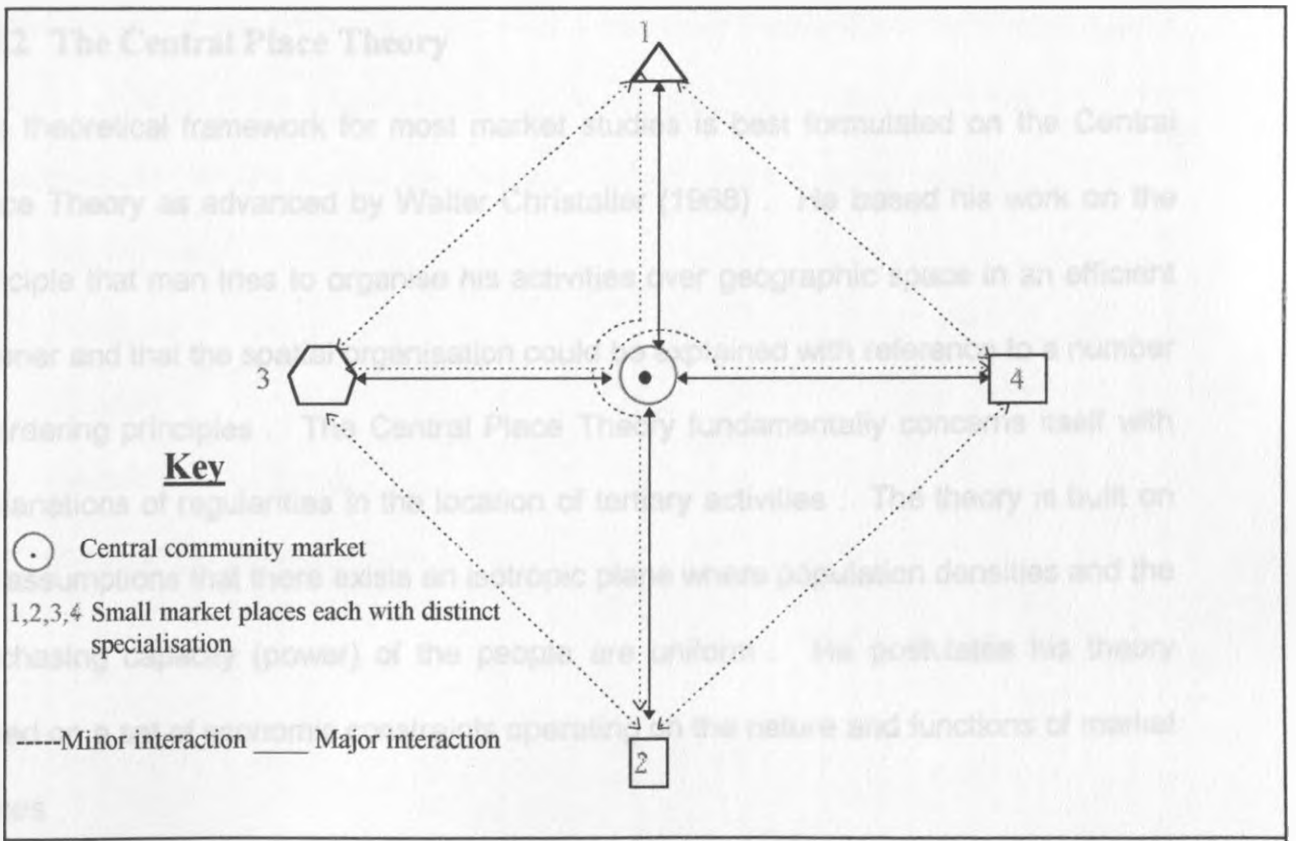
The solar periodic market system includes several small periodic market places ,each with a distinctive specialisation and meeting on a different day.,oriented towards a central community supplying commodities constantly or at least more frequently. The distinctive feature of solar marketing systems is that they have a truncated hierarchical nature in which case they resemble the k = 7 variant of central place marketing systems. However these marketing systems are poorly articulated with other lower-level order markets in the region As such the periodic market places have most of their interaction with the central ,frequently quasi- administrative centres.

Fundamental to any study of periodic markets is the Central Place Theory formulated by Walter Christaller in 1966 and which is reviewed herebelow in details.

1.3.2 The Central Place Theory

The theoretical framework for most market studies is best formulated on the Central Place Theory as advanced by Walter Christaller (1966) . He based his work on the principle that man tries to organise his activities over geographic space in an efficient manner and that the spatial organisation could be explained with reference to a number of ordering principles . The Central Place Theory fundamentally concerns itself with explanations of regularities in the location of tertiary activities . The theory is built on the assumptions that there exists an isotropic plane where population densities and the purchasing capacity (power) of the people are uniform . He postulates his theory based on a set of economic constraints operating on the nature and functions of market places .

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These concepts are ;

(a)   The range of a good .

(b)   The threshold of a good .

He argues that centres dealing with unspecialised goods tend to be numerous while those dealing with specialised goods are fewer and sparsely distributed as they can survive on visits of a large number of people with less frequency . Christaller (1966) argues that with time and if optimum conditions prevail , markets of similar type and size become equally spaced . Drawing examples from Southern Germany he calculated the distances, population and area served by a central place and concluded that central places will become organised in a nested pattern . In trying to formulate his theory he relies much on structural regularities found in the optimum location of settlements which provide central functions . He follows the development of hexagonal market areas and argues that with this shape the precise locations of the largest market centres in relation to the smaller ones may be precisely determined as in Fig. 1.1. Five basic concepts form the core of the classical Central Place Theory, these are:-

(a)   Market place

(b)   Locations

(c)   Spacing

(d)   Hierarchical ordering

(e)   Functions of market places

K = 7 (Administrative principle)
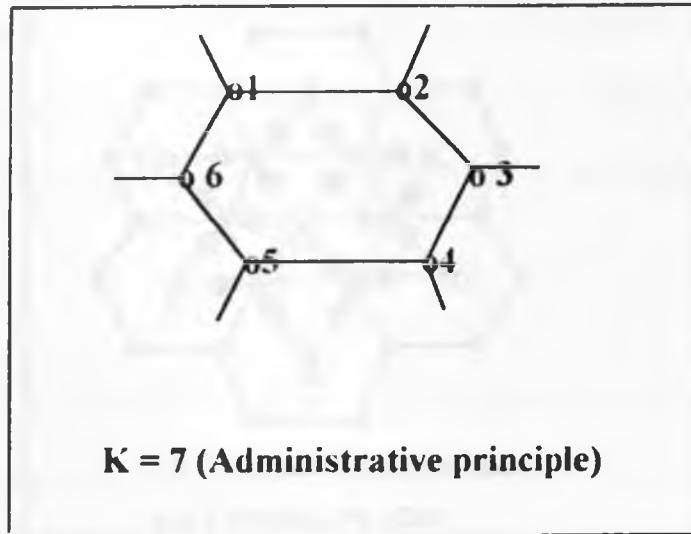
Figure 1.2 (a) The K = 7 Administrative Principle according to Christaller, (1966)

K = 4 (Traffic Principle)
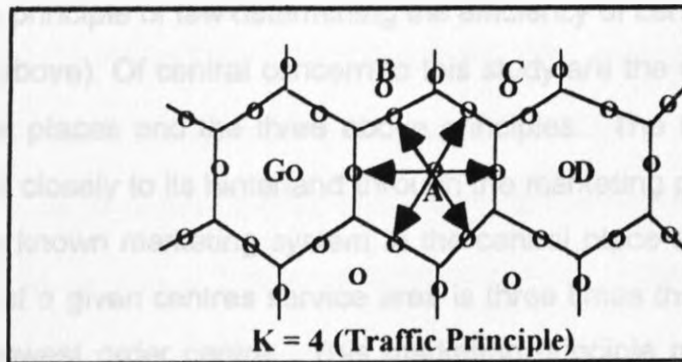
Figure 1.2 (b)   The K = 4 Traffic Principle according to Christaller, (1966).

K= 3 (Marketing principle)
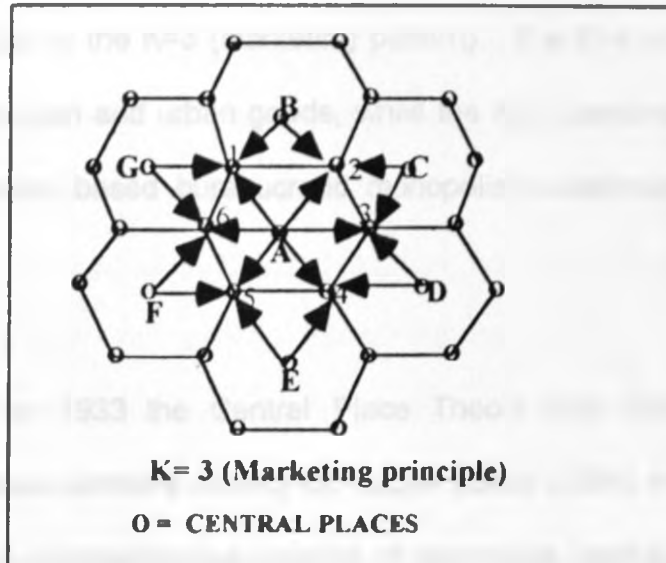
O = CENTRAL PLACES

Figure 1.2 (c)   The K = 3 Marketing Principle according to Christaller, (1966)

Figures 1.2 (a,b & c)   Three possible Spatial arrangements of Central Places
according to Christaller, (1966).

Christaller further constructed three geometric models and explained that each model corresponded to a principle or law determining the efficiency of central places (Fig. 1.2 a, b & c above). Of central concern to this study are the concepts of location, spacing of market places and the three above principles. The trading function of a central place ties it closely to its hinterland through the marketing principle (K=3). This is the most widely known marketing system in the central place system. In the K=3 structure the size of a given centres service area is three times the size of the service area of the next lowest order centre. This marketing principle maximises consumer travel efficiency (C.A Smith, 1975). The radius of a complimentary region served by a central place is a function of what Christaller calls the economic distance. Economic distance is determined by costs of freight, travel time, discomfort of travel and transit losses.

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Smith, (1976) asserts that the pattern that is most efficient for rural consumers and for rurally produced goods is the K=3 (marketing pattern). The K=4 is most efficient for urban oriented distribution and urban goods, while the K=7 (administrative pattern) is most efficient for urban based bureaucratic monopolists attempting to dominate a market.

Since its inception in 1933 the Central Place Theory has undergone landmark modifications by various scholars notably by August Losch (1954) who provided a far more penetrating and comprehensive analysis of alternative central place structures. Berry and Garrison, (1958) and King (1984) observed that Central Place Theory also applied in areas where the unrealistic assumption of an isotropic plane is not met.

A settlement hierarchy could be observed in an area of unequal population distribution and unequal purchasing power. Losch (1954) examined the geometry of hexagonal-shaped trade areas in much detail than did Christaller. Losch did his examination from the point of view of the individual goods supplied by individual firms rather than whole centres. Three significant features characterise the best arrangement according to Losch. Firstly, the spatial differences in population distribution over the landscape; secondly the hierarchy of central places and thirdly differences in functional roles of central places in that centres of the same size do not necessarily provide the same service and goods nor do they perform the same function.

1.3.3 Weaknesses of the Central Place Theory:-

Although the classical Central Place Theory as formulated by Christaller (1933) provides many insights into the hierarchies of urban centres and trade patterns, it has

serious drawbacks. The theory is more or less static, a descriptive and optimal equilibrium seeking model. Secondly, the theory deals with a closed economic system which does not recognise the possibility of foreign inputs into the system. Smith,(1975). Thirdly, the assumptions of the theory notably those of an isotropic plane with uniform population distribution and equal purchasing capacity are quite unrealistic and rather too restrictive. The model also ignores sub-optimal consumer behaviours in which optimisation is not sought. Under normal conditions optimal behaviour is substituted for "satisfysing" behaviour. Classical Central Place Theory was developed under the assumption that central places are permanent and provide goods and services on a regular basis. While this may be the case for an economically advanced area with a high proportions of urban population in predominantly agricultural areas of the developing countries, it does not hold true. Central functions are often provided by periodic markets in a vast majority of developing countries. Thus one major shortcoming of Central Place Theory is its omission of periodic markets as components of the central place structure thus ignoring the aspect of periodicity.

1.4.0 Empirical Bases

The study of periodic markets has featured in a number of current academic research Musyoki, (1986), Wambugu, (1990,1995), Ngau and Gaile, (1995). The confusion that comes out clearly in many works is whether these periodic markets should be classified as components of the national network of central places. However, one should not ignore the fact that despite the ease of analysis that is availed by classifying periodic markets as part of the central place hierarchy, periodic markets are by their very nature distinguishable socio-economic institutions. Undoubtedly though periodic markets do

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exist within an expanse of the wider framework of central places and can for purposes of analysis be termed as central places. Different scholars have discussed periodic markets as extensions of the central place framework Stine(1962), Skinner(1964), Hay(1971), Symanski(1973), Musyoki(1986) and Wambugu (1990, 1995).

The first attempt to provide a coherent and comprehensive theory of periodic markets was by Stine (1962) who investigated the ambulant trader and his ringed chain of periodic markets. He argues that period markets result from the agglomeration of several mobile firms (sellers). He further argues that sellers and consumers submit themselves to a regular discipline of space and time and as such establish a pattern of trade with both spatial as well as temporal regulatory pattern. Stine (1962) based his argument on the two concepts of maximum threshold of a good and range of a good. Wood (1975) studied the interaction and partitions of rural market space in Kenya and had similar conclusions like Stine (1962) that "... a firm offering a good at a permanent site ... requires that the maximum range be equal or exceed the minimum range failure to which the firm may die or become spatially fixed or spatially mobile according to an established temporal pattern.

Skinner, (1964) in his study of the Chinese periodic marketing system analyses periodic markets within the framework and provisions of the Central Place Theory. From his analysis he identifies four (4) hierarchies of periodic markets namely:- minor markets, standard markets, intermediate markets and lastly central markets. He further identified 4 (four) major functions of periodic markets as;

(a)   Distributive function (of local products)

(b)   Exchange function (of Rural surplus   for urban goods)

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(c)   Dissemination of foreign imports

(d)   Socio-cultural function (as social institutions).

Skinner claims that the periodicity feature of periodic markets can be understood from two view points:-

(a)   For the trader the total demand at a fixed point is not enough to sustain the firm, hence the market area is expanded by mobility. The trader will thus move in a circuit of periodic markets to achieve the break-even point of sales and also attain economic viability.

(b)   For the consumer the periodic market is a device to reduce the distance he must travel to obtain the required goods and/or services. He further observes that periodic markets rather than daily markets permit a dense distribution of market places which inturn serve the convenience of spatially disadvantaged villagers.

In Africa and elsewhere in the world most of the studies done in this field have concentrated on the ethnological survey of the existing markets. After 1960 a shift in emphasis from ethnological approach to functional and spatio-temporal analysis within the tenets of the Central Place Theory is witnessed. Unfortunately though, studies done in East Africa unlike in other parts of Africa have been mainly concerned with proving the existence of period markets and not their spatial, functional and operational characteristics (Obudho 1974). Berry (1967) argues that periodic markets arise both in space and time to serve users efficiently may they be sellers or consumers. He further observes that periodic markets structures vary socio-culturally.   Ukuwu, (1969) identifies the possibility of replacing temporal for spatial competition. In his findings proximity in space does imply separation in time which is expected if market threshold is to be realised. A similar view is shared   by Fagerlund and Smith, (1970).

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The economies arising from agglomeration at a particular site gives rise to the establishment of periodic markets even where underlying infrastructure is non-existent (Eighmy, (1972). A similar explanation as that advanced by Skinner (1964) is shared by Hay (1971) who deduces that the trader becomes mobile in order to achieve economic viability. Webber and Symanski (1963) suggest that profitability, vendor overhead costs and transport costs determine trade mobility and that mobility increases profitability.In livestock marketing mobility is a necessary part of the marketing process.This is because the live animals have to be driven to the market or be transported using an appropriate means of transport. Livestock marketing also differs in that dealing with live animals can be not only troublesome but also requires strict adherence to veterinary regulations. A seller may for instance be required to obtain a permit authorising him to move live animals to the market.

1.4.1 The Spatio-Temporal Structure of Periodic Markets

The two components which make up the spatio-temporal structure of periodic markets are

(a)   Spatial distribution patterns (Location in space)

(b)   Time distribution (market days over the week).

These two concepts have been investigated by a number of scholars with exciting findings. Muganzi (1975) analysed the historical growth of the markets, their organizational structure and their role in the future planning and development of rural Kenya. Bromley, R.J, Symanski, R and Good, C.M (1975) considered the rationale of periodic markets. Their article tries to prove the economic, and social role played by periodic markets in a spatial regional context. In a more detailed analysis Hay (1971)

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provides the economic basis for periodic marketing in developing countries. Ishihara (1976) found out that the spatio-temporal arrangement of periodic markets in China was such that market places located next to one another tended to be further separated in time. In India Wanmali (1976) and Shrivastava, (1987), both identified regularities. The closely located markets in space must be separated in time of the market days in order to compensate for and reduce unnecessary competition between neighbouring markets. An even distribution of both time and spatial distances amounts to harmonization of the marketing space and the degree to which the markets are integrated both in space and time is called the degree of spatio-temporal synchronization/integration.

Good (1972) and Wood (1978) have analysed the spatial and temporal distribution of periodic markets in East Africa and particularly in Kenya and Uganda. Good (1972) reported that the periodic markets in Ankole district of Uganda were uniformly distributed; while Wood (1978) shows that only eight out of twenty-seven districts in Kenya had a nearest neighbour statistic significantly different from random. Seven were uniform and one was clustered. Shrivastava (1987) showed that the distribution of periodic markets in Tarai Region of India is almost uniform with a nearest neighbour Coefficient of 1.57, while those of neighbouring Saryupar (1.48) and Awadh plain (1.29) showed a tendency towards randomness as compared to Tarai.

In West Africa, the spatial patterns of periodic markets have been examined in various areas, and although inconsistencies occur, a general tendency towards uniformity is the norm (Smith, 1971). Handwerker's (1978) study in Liberia revealed that the spatial distribution of periodic markets as expected in a competitive environment is not in

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existence in Liberia's rural economy. The nearest neighbour statistic revealed a random rather than a uniform spatial distribution.

Studies regarding the spatio-temporal synchronization of periodic markets have also featured prominently. Fangerlund and Smith (1970) found that there is an inverse relationship between temporal separation in days and location in space. This led to the conclusion that "proximity in space implies separation in time". This is explained by the fact that periodic markets compete for patronage from the hinterland population such that those markets meeting simultaneously or separated by only a short period of time are expected to be further apart in their spatial / spacing or location.

The absence of this spatio-temporal synchronization would imply a poorly organized marketing system operating far below efficiency. In Kenya Wood (1978) notes that government administrative control and historical factors may cause distortion and departures from the norm. Musyoki (1986) and Wambugu (1990) studied the spatio-temporal structure of periodic markets in Machakos district and Nyeri district respectively. In both studies they found that the inverse relationship between temporal spacing and locational spacing applied. Wambugu (1995) further observes that for the consumer the relationship is inverse whereas for the travelling trader this relationship is a direct one. These two findings had earlier been unearthed by Thorpe (1978) whole formulated the consumer inverse hypothesis and the travelling trader direct hypothesis.

A number of studies on livestock marketing have been done in Kenya notably among the nomadic pastoral communities , but it is worth noting that none of the studies addresses itself to the spatio-temporal dynamics of livestock periodic marketing.

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Aldington and Wilson (1968) investigated the marketing of beef in Kenya noting that beef markets are mainly urban with purchases by the Kenya Meat Commission (KMC) being significant though showing a declining trend. Chabari (1986) examined the marketing of goats and sheep from two pastoral systems in Kenya. He compared livestock off-take from Maasailand and Baringo noting that construction of auction yards coupled with price increase acted as incentives to attract livestock buyers from as far as Nairobi, 250 km away.

1.4.2 Factors Influencing Market Provision

A number of scholars have cited population density as the most significant factor influencing market provision Hodder(1965);Hill and Smith(1972),Wood(1972) ; Lindskog(1979) ; Musyoki(1986) and Wambugu (1990, 1995). Population density is used as a surrogate variable for measuring aggregate demand. The general distribution of periodic markets in Yorubaland reflects the general pattern of population distribution and a regular distribution is achieved at a critical population density of approximately 50 persons per square mile (Hodder 1965). Similar findings achieved by Hill and Smith (1972) in Northern Nigeria. and Lindskog (1979), found very high correlations between population density and market provision. Other factors have also been identified as being important in influencing market provision. These include physical factors such as drainage and topography, accessibility,quantity of production surplus, income and government intervention in administration, Bromley (1975; Fagerlund & Smith (1970).

Stewart and Traveller (1966) and Maucho (1978) used distance decay functions to show the relationship between interaction intensity and distance. Maucho for instance transformed the data into logarithmic form and found that a sharp distance decay function existed. It has also been shown that the probability of visiting a market centre for a buyer is a function of the distance from the residential home of the market user to the market itself Ngau and Gaile (1995).

1.5 Livestock Marketing Development and the Associated Environmental Implication

The incorporation of environmental issues in economic development has received increasing attention from both governments and international institutions. A major initial impetus to this concern was given by the report of the World Commission on Environment and Development (UNCED). UNCED's perhaps most important message was the introduction of the concept of sustainable development. Sustainable development is development which provides economic,social and environmental benefits in the long term having, regard to future generations (UNCED 1992). To achieve this, sustainable development considers the use of depletable resources in an efficient manner and the advantages or the disadvantages of alternative courses of action (Gilpin,1996).

The UNCED (1992) report observes that economic development process increases pressure on resources and hence slowing down any increase in living standards. Such sustainable development can only be pursued if the economic development process is in harmony with the changing productive potential of the ecosystem.

Economic development process and the environment are inextricably linked hence stressing the importance of bringing about a sustainable relationship between resources,economic development and the environment. Socio-economic development impinges upon the environment and in a similar manner the environment impinges upon socio-econmic development. For development to proceed it must rely on the available environmental resource base. Increase in production and consumption places increasingly severe stress on the life supporting capacities of the environment. Environmental stress is mainly derived from production ,exchange and consumption patterns. *Human impact on the environment is the direct function of the emission of pollutants into the ecosphere or subjection of the environment to stress during the process of production ,exchange and consumption of goods and services.*

The development of livestock markets can be seen to have two-fold effects on the environment ; one which is positive (conservatory) and the other being negative (degrading). The positive aspect being ; "marketing development as a means of relieving stocking pressure". 'The negative aspect is represented by -:land degradation as a result of concentrating livestock at the market site leading to environmental damage within the market vicinity. Relieving pressure in overstocked areas depends largely on adequate facilities for animal movement,slaughter ,processing and sale. Such facilities may be either lacking or inefficient for meeting requirements (Bekure 1984). The introduction of a cash economy and an elaborate livestock market system can be effective in relieving pressure on overstocked pastureland. As noted by FAO(1980), Bekure(1991) Bekure and MacDonald(1984), socio-economic developments which promote a cash economy are

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fundamental in environmental protection by indirectly helping to reduce overstocking both from the standpoint of habitat conservation and for improving human living standards.

Fundamentally however, the provision of livestock marketing facilities at a place can bring about adverse environmental effects. The establishment of a livestock market attracts a huge number of animals herds thus concentrating stock within a very limited space and hence leading to considerable environmental degradation. The sellers of livestock being profit minded would like to maximise their returns the reason why they would be reluctant to sell below their expected prices. If they get a willing buyer offering the required price they end up selling hence reducing stocking pressure around the market site.

From the above literature review it is clear that a number of studies approach periodic markets from a macro-level which is too aggregated for any meaningful analysis. The present study recognizes that different areas exhibit different marketing structures and as such a number of factors influencing the market such as physical, social, economic and administrative factors are considered. It is important to note that none of the studies done in Kenya so far apart from Musyoki (1986) was done in the marginal Arid and semi arid lands (ASALs). The present study seeks to venture into the analysis of periodic marketing and internal trade systems of semi-arid Kenya notably Laikipia district. Most of the empirical studies outlined above suggest that periodic markets have got an important role to play in promoting regional internal trade and exchange processes. Thus, there is need to plan for them rather than planning against such important economic institutions.

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1.6 Justification of the Choice of Study Topic

The Government of Kenya (GOK) is focusing its emphasis and development strategies to the rural areas and regional development planners have began realising the importance of periodic marketing in regional development. The Rural Trade and Production Centre (RTPC) programme in Kenya is actually in essence a market-based regional planning approach. This approach acknowledges that the private sector relies on the public sector to provide the badly needed infrastructure and the public sector relies on the private sector to be the main actor in fostering economic growth and development (Ngau and Gaile 1995).

It is in the light of the above shift in Government emphasis that, this study can be valuable in enlightening on issues concerning market-based planning. The most compelling logic behind the study of the spatio-temporal structure of internal trade in Kenya, is the need for the total incorporation of the vast rural economy into the national market system. If Kenya is to attain the desired industrialised state by the year 2020, it is imperative that the entire marketing milieu be synchronized both in space and time. The expansion of the agricultural sector and the stimulation of the hitherto ignored rural economy is the key to economic growth in Kenya.

The present study has relevance to development planning in general and rural development in particular. Rural development is of paramount importance in Kenya because 80% of Kenya's population live in the rural areas,(Republic of Kenya 1986). To reduce the ever increasing gap between rural and urban incomes and efficient rural marketing system should be put in place. This will enable the rural people to dispose

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of their surpluses and source their farm input requirements. This study also recognises the importance of environmental quality management and protection in the process of economic development.

In order for balanced development and industrialized state to be a attained, improved access to the market is essential. To develop a thriving and prosperous agricultural market economy in Laikipia district it is imperative that the periodic marketing system be expanded. This will among other things help develop both local and regional trade and exchange processes. This process is contingent upon the expansion of these markets. It is thus necessary to expand the sizes and increase the numbers of market centres of the rural areas in order to enable them to serve as focal points for supplying inputs into the rural economy and as outlets for marketing rural agricultural surplus.

Laikipia district is chosen as a study area because it is a typical ASAL district and hence an ideal representation of Kenya's marketing space. The district therefore, provides an appropriate departure from the usual "high potential emphasis" typical of Kenya's planning and academic research. Laikipia district also exhibits varied micro-climatic conditions creating outstanding inter-zonal complementarities which trigger exchange process most naturally. The proximal juxtapositioning of various ecological zones in the district demonstrates the interrelationship between high potential areas and marginal areas. These agro-ecological contrasts enhance exchange processes and bring about the development of internal trade and such potentials should be fully exploited for the benefit of the rural masses.

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1.7   Objectives, Scope and Limits of the Study

The study broadly aims at examining the spatial and temporal structures of livestock periodic marketing systems of Laikipia district, ; with a special emphasis on the degree of spatio-temporal synchronization of livestock periodic markets. More specifically the study had the following objectives,

1. Examine the spatial and temporal distribution of livestock periodic markets in Laikipia district.

2. Determine the degree of spatio-temporal synchronization of livestock periodic markets in the study area.

3. Examine and analyse the variables responsible for the spatial and temporal structure of livestock periodic markets and,

4. Examine the nature and extent of environmental degradation caused by Livestock markets at the market sites.

1.7.1 Scope of the Study

This study was conducted within the administrative boundaries of Laikipia district The study covered all the small rural trade centres given the status of a "designated livestock market" by the local authorities. The list of designated livestock markets was obtained from the Ministry of Agriculture ,Livestock Development and Marketing at the district headquarters at Nanyuki. A total of ten designated livestock market were studied. Rural trade centres which are not recognised by the Ministry as being designated for livestock were excluded from the study . Thus, not all rural trade centres qualified as livestock markets. Additionally those small towns which had both status of being a designated livestock periodic market as well as rural trade centres were treated as designated livestock markets for purposes of this study.

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1.8. Formulated Hypotheses

In order to empirically study and pursue the above objectives the following hypotheses have been "recasted" from the specified objectives. These hypotheses were tested with a view to validating or nullifying them.

A **H 01** The spatial structure of livestock periodic markets in Laikipia district is not even and market places are randomly distributed.

   H 11 The spatial distribution of livestock periodic markets in Laikipia district is uniform.

B **H 01** The spatio-temporal structure of livestock periodic markets in Laikipia district is such that proximity in space does not imply separation in time

   H 11 The spatio-temporal structure of livestock periodic markets in Laikipia district is such that proximity in space implies separation in time.

C **H 01** There is no significant relationship between population density , accessibility,and degree of regional specialsation with market provision in Laikipia district.

   H 11 There is a significant relationship between population density , accessibility,and degree of regional specialsation with market provision in Laikipia district.

D **H 01** Livestock periodic markets do not contribute towards environmental damage at the enclosed market areas

   H 11 Livestock periodic markets contribute towards environmental damage at the enclosed market areas

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1.9.0 Operational Definitions and Concepts

Assemblers :-   are independent traders or agents. They buy on market days and

resell at the end of the day to regional or national traders.

Arc Info :-   Application software module (package) for analysing GIS data.

Bulking :-   The process of accumulating large stocks of resale commodity for

resale in a different market or at a different market period.

Bulk-breaking :-   The process of breaking large quantities of a commodity into

smaller parcels in order to make them available to the final consumer.

Central Place :-   This is a focal point where members of the community converge to

purchase or sell their goods and services.

Econo-geographic phenomenon:-This refers to any phenomenon which is a product of

an interplay between economic and geographic forces. As such it

exhibits a combination of both economic as well geographic

elemental attributes in such a way that it is incomplete without the

two components. For instance periodic markets present with both

economic as well as spatial cum temporal .

Environment   The totality of the bio-physical components which constitute the

surrounding and the make up of a place.

Environmental degradation The process of destroying and reducing the inherent value

of the general biological and physical condition of the environment.

G.I.S   An acronym standing for <u>Geographic Information System</u> which is

defined as the system of computer hardware and software and

procedures designed to support the capture, management

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	manipulation, analysis and display of spatially geo-referenced data for solving complex planning and management problems.
Internal Trade	This implies the specific complementarity between areas of supply and demand and the process of exchanging goods between different production and consumption areas.
Infrastructure	This can be defined as comprising of the basic services and public utilities essential to the commodity sector of an economy. It is a kind of structure on which human activities are based. It can be divided into; social or human and economic or standard infrastructure.
Marketing	The process of directing goods and services from the producer (source) to the destination or consumer or end user by employing an exchange process.
Market	A centrally located place where people converge on regular basis for purpose of exchanging goods and /or services.
Periodic Market	A market whose frequency of meeting is less than daily.
Range of a good	The maximum distance that consumers travel to secure a good/service
Spatio-Temporal Synchronization	A fundamental form of inter-market co-operation co-operation which has a dovetail arrangement of market dates among spatially neighbouring markets such that markets which are closely located in space will have to be further apart in their timing of meeting days . This implied relationship between temporal and locational spacing is called Spatio-temporal Synchronization.
Threshold -	This refers to the minimum area which is required in order to support an economic activity or good in the market.

Simple Systematic Sampling   This is a sampling approach in which the first element is chosen at random and thereafter elements are selected from the population at a uniform interval that is measured in time, order, or space.

1.8 Conceptual and / or Theoretical framework(s) and Model(s) This

section, provides the conceptual and/or theoretical framework(s) and model upon which the current study is based. The model shows that the improvement of market accessibility through the provision of transport facilities like roads will bring about increased spatio-temporal integration of the marketing space; hence boosting market efficiency.

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Provision of Infrastructural facilities eg Roads.

Improved market accessibility by the local population

Increased Spatio-Temporal integration and improved marketing system.

Vibrant exchange process and increased trade (both regional and interregional.

Establishment of livestock markets

Excessive concentration of livestock at the market

Excessive pressure on the surrounding environment

Environmental degradation

Increased waste generation

Decline in quality of environment in the market enclosed areas.

Policy formulation and decision making systems.

Increased linkages in both interregional and intraregional trade

Growth of the regional economy

Neglect of the environment and/or lack of appropriate policy

Environmental protection and conservation

Increase in regional income and wealth.

Increased Local Gvt tax revenues

Multiplier effect through increased investment

SUSTAINABLE ECONOMIC DEVELOPMENT.

Expansion of economic sectors eg agriculture transport,manufacturing etc

Expansion in communal wealth and incomes.

Increased utilization of resources

Attraction of further capital to be invested in expanding markets

Increased demand

Conceptual Model : Model showing the impact of improved Spatio-Temporal integration of Periodic Markets on the Overall Growth of the Regional Economy.

Source : Research 1998.

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CHAPTER TWO

THE STUDY AREA

2.0 Introduction

The aim of this chapter is to present detailed and comprehensive background information relating to the study area . Information on the physical, economic demographic and the agro-climatic characteristics of the district will be presented as far as they influence the spatio-temporal structure of periodic markets and internal trade systems in the district .

2.1 Location and Extent of Laikipia District in Kenya .

Laikipia district covers an area of approximately 9723 km^2 and it is situated on the leeward side of Mt. Kenya and to the east of the great Rift Valley . The district is a semi-arid , high altitude plateau lying between 1600 - 2200 metres above the sea level . It lies between longitude 36° 10' and 37° 25' east and latitude 0° 20' south and 0° 55' north.

Laikipia district is one of the 16 districts of the Rift Valley Province covering approximately 5.07% and 1.6% of the total area in the province and in Kenya respectively . It borders the agricultural districts of Nyeri and Nyandarua of Central Province to the West and South respectively , Meru and Isiolo of Eastern Province to the East and the predominantly pastoralist districts of Samburu and Baringo in the north and west respectively . The location and extent of Laikipia district in a national context is depicted in Map 1 whereas the administrative divisional boundaries are shown on Map 2 below:-

Laikipia District in National Context

Key
International Boundary
Provincial Boundary
District Boundary

0   75   150   225 Km

Scale; 1:4,000,000

Source: Laikipia Research Programme
GIS - Lab 1996

This district lies east of the great Rift Valley and is generally characterised by levelled plateau bounded by... the eastern slopes of the Aberdares and Mt. Kenya to the South... (2600 metres) to the west of the district.

2.2 Physical and Climatic Characteristics in Relation to Crop and Livestock Production

2.1.1 Surface Configuration and Topography

The surface configuration of an area arises from the... speaks to a way in determining... later and the agro-climatic and ecological zonations and their... agricultural production systems. Road transport networks are... the location of the ... central place system... Laikipia ...generally characterised by fairly level to gently undulating plateau covering ... two main... channels dissect the Lamuria plateau... streams flowing from the Mt. Kenya and the Aberdares...

To the south western part the altitude... above the sea level at Nyahururu, 2614 metres at Marmanet... above the sea level at Mweiga. Generally the district slopes northwards and eastwards. Other important features in the district include the Ewaso Narok swamp (1920 ha) lying between Pesi and Ewaso Narok rivers, Pesi swamp (200 ha) along the Pesi river and Marura (250 ha) between Rongai and Surguret rivers.

Topographical dimensions are reflected in the distribution of both the economic activities and human settlements in the district. For instance in the south-western part of the ...

Map 2

Laikipia District, Kenya

Administrative Units

Scale 1 : 700,000

0 5 10 15 Km

Division	Location	Area (ha)
Nyahururu	Nyahururu	1659
	Igwa Miti	5386
	Maina	4706
	Muhu	16695
Ng'arua	Ol Moran	122668
	Kinamba	1948
	Sipili	19221
	Gitambo	23565
	Muhotetu	16594
Central	Daiga	119551
	Nanyuki	9097
	Nturukuma	17683
	Salama	16661
	Marmanet	16661
	Muthengera	17019
	Mutara	4657
Rumuruti	Sosian	9173
	Rumuruti	134543
	Salama	37683
Lamuria	Ngobit	23564
	Sirima	39934
	Lamuria	57093
	Tigithi	11812
Mukogodo	Il Digri	11448
	Il Gwesi	3606
	Lobor Soit	7130
	Il Motok	10383
	Mukogodo	12634
	Mumonyot	13830
	Sieku	14839
	Il Polei	20565
		5790

Legend:
- District boundary
- Locational boundary
- Sub-Locational boundary

The district lies east of the great Rift Valley and is generally characterised by levelled plateau bounded by the edge of the Rift Valley to the West of the Aberdares and Mt. Kenya to the South. The maximum height occurs in the Marmanet forest (2600 metres) to the west of the district.

2.2   Physical and Climatic Characteristics in Relation to Internal Trade and Marketing

2.2.1 Surface Configuration and Topography

The need for examining the surface configuration of an area arises from the fact that it goes a long way in determining Inter alia the agro-climatic and agro-ecological zonations and their related resultant agricultural production systems. Road transport networks are a direct function of the surface configuration of a place. The topography of Laikipia district is generally characterised by the nearly level to gently undulating plateau covering much of the northern and southern parts. Two main drainage channels dissect the Laikipia plateau namely the Ewaso Nyiro and Ewaso Narok rivers flowing from the Mt. Kenya and the Aberdare ranges respectively.

To the south western part, the altitude rises to 2540 metres above the sea level at Nyahururu, 2611 metres at Marmanet and 2275 metres above the sea level at Mwenje. Generally the district slopes northwards and eastwards. Other important features in the district include the Ewaso Narok swamp (1920 ha) lying between Pesi and Ewaso Narok rivers, Pesi swamp (200 ha) along the Pesi river and Marura (250 ha) between Rongai and Burguret rivers.

Topographical variations are reflected in the distribution of both the economic activities and human settlements in the district. For instance to the south western part of the

district where milder temperatures and higher rainfall are experienced owing to higher altitudes . It is also in this same area where population density and agricultural productivity are highest .

As expected trade and exchange processes tend to be more developed in this same area. Steep and rugged topography is not conducive for settlement and also impedes the construction of good transport and communications networks such as roads . This inturn affects accessibility and deters the rate of settlement and hence the development of internal trade systems and the establishment of a well integrated network of periodic markets . The established periodic markets centres are mostly found in areas of high productivity (agriculturally) and accessibility in terms of road transport networks . The establishment of market centres and periodic markets to a large extent is thus determined by the nature of surface configuration in an area , which also affects road transport development .

2.2.2 Climate

A multiplicity of variables interact to produce the average weather conditions of a place . These factors include altitude , latitude , topography , proximity to the sea or a large water mass , vegetation cover and prevailing winds and pressure belts patterns . The district experiences a tropical highland climate and does not exhibit pronounced climatic variations .

Despite its location astride the equator the district does not experience excessive temperatures owing to its generally high altitude (1800 - 2100 metres above sea level). Temperature variations do however occur spatially with the western and southern parts of the district experiencing cooler temperatures ranging from 17.1°C to 23.2°C . The mean

monthly temperatures tend to vary spatially from area to area depending on the area's location in relation to Mt. Kenya . For instance, areas on the slopes of Mt. Kenya tend to experience cooler temperatures throughout the year to other areas in the district.

It can be observed that variations in temperature in the district determine the spatial variation in the distribution of both the agricultural activities and economic / human settlement patterns in the district . To the western side people practice both small-scale farming and livestock keeping while Mukogodo people can only keep livestock .

2.2.3 Rainfall Patterns

Laikipia district is classified under the Arid and Semi-arid lands of Kenya (ASALs) . Its long term average annual rainfall (in mm) ranges from 600mm in the central plateau and 900mm to the west of the district on the eastern ridges of the Rift Valley . April is the wettest month in the district with over 62.2% rainfall reliability . January and February are the two driest months . The mean annual rainfall is 673.4mm (LRP 1997) . This indicates that Laikipia district is in the semi-arid climatic zone . The rainfall pattern is bimodal with one peak occurring during March-April-May long rains and the short rain October-November-December being the second peak . This seasonal distribution is a function of the influences of the North eastern and south trade winds, the Inter-Tropical Convergence Zone (ITCZ) and the influence of the westerly winds in the middle troposphere in July and August . The annual rainfall totals in the district may seem favourable, but for purposes of crop-production rainfall distribution across the year is more important .

2.2.4 Agro-Climatic Zones (ACZ)

Agro-climatic zones are usually calculated as ratios between rainfall and evaporation and differentiated on the basis of the temperature trends for a particular area . The agro-climatic zones of an area help to define the ecological potential of that area . Laikipia district can be categorised into 5 agro-climatic zones namely :-

(a) <u>Sub-humid Zone :</u> Here rainfall is 65-80 % of the evaporation leading to long cropping periods . This zone supports a wide range of crops including pyrethrum and wheat occupying about 3% of the district .

(b) <u>Semi-humid Zone :</u> This covers about 6 % of the district and the rainfall received here is between 50 - 60% of the evaporation, resulting in long but a weak growing season . Crops grown in this zone include wheat, barley and maize . Beef and dairy cattle are also kept here .

(c) <u>Sub-humid to Semi-arid zone :</u> Rainfall received in this area is 40 and 50% of the evaporation, the area is more suitable for ranching than cropping. Some barley is grown here This agro-climatic zone covers about 13% of the district .

(d) <u>Semi-arid Zone :</u> Covering approximately 49% of the district, the rainfall received in this agro-climatic zone ranges between 25 - 40% of the evaporation hence making the zone very unsuitable for crop production . However drought resistant crops like barley are grown .

(e) <u>Arid Zone :</u> This is the fifth and the last agro-climatic zone with the rainfall received being 25% of the evaporation hence the zone has a very limited potential for crop production . It occupies 30% of the total district area .

2.2.5 Agro-Ecological Zones (AEZ)

Agro-ecological zones are areas of potential land-use as delineated on the basis of natural and/or environmental factors . Laikipia district is divided into 3 (three) main agro-ecological zones namely :-

(i)   High potential lands

(ii)   Medium potential lands

(iii)   Low potential lands

The high potential and medium potential lands cover about 1.7% of the entire district encompassing Rumuruti and some parts of Ngarua division . The medium potential zone cover 9.8 % (or 95,208 ha) of this area and about 78,164 ha of the total area is in central division . About 67% of Laikipia district is classified as low potential . This zone is characterised by moderately fertile soils, inadequate and unreliable rainfall hence not suitable for rainfed agriculture .

The western part of the district is the most fertile and land has been sub-divided into small-scale parcels suitable for small scale mixed farming . Crops such as wheat, pyrethrum, maize and barley are grown in this part . The northern part of the district is generally dry and has poor sandy soils, making it only suitable for livestock farming . The Maasai, Turkana and the Samburu tribesmen practice nomadic pastoralism in this area .

Following major changes involving land sub-division in the district many areas are now small scale holdings with major crops being maize, beans, vegetables, fruit crops, sugarcane and bananas . Horticulture is practised in those areas with abundant water supply for irrigation . Large scale ranching is dominant in the lower highland and upper

midland ranging zones (LH5 and UM6) . Such ranching is practised by the indigenous people, European settler remnants and the Government . The present land-use system is set to experience problems from land pressure resulting from widespread immigration coupled with a high increase in natural population growth . The agro-ecological zones of Laikipia district are presented in Map 3 below.
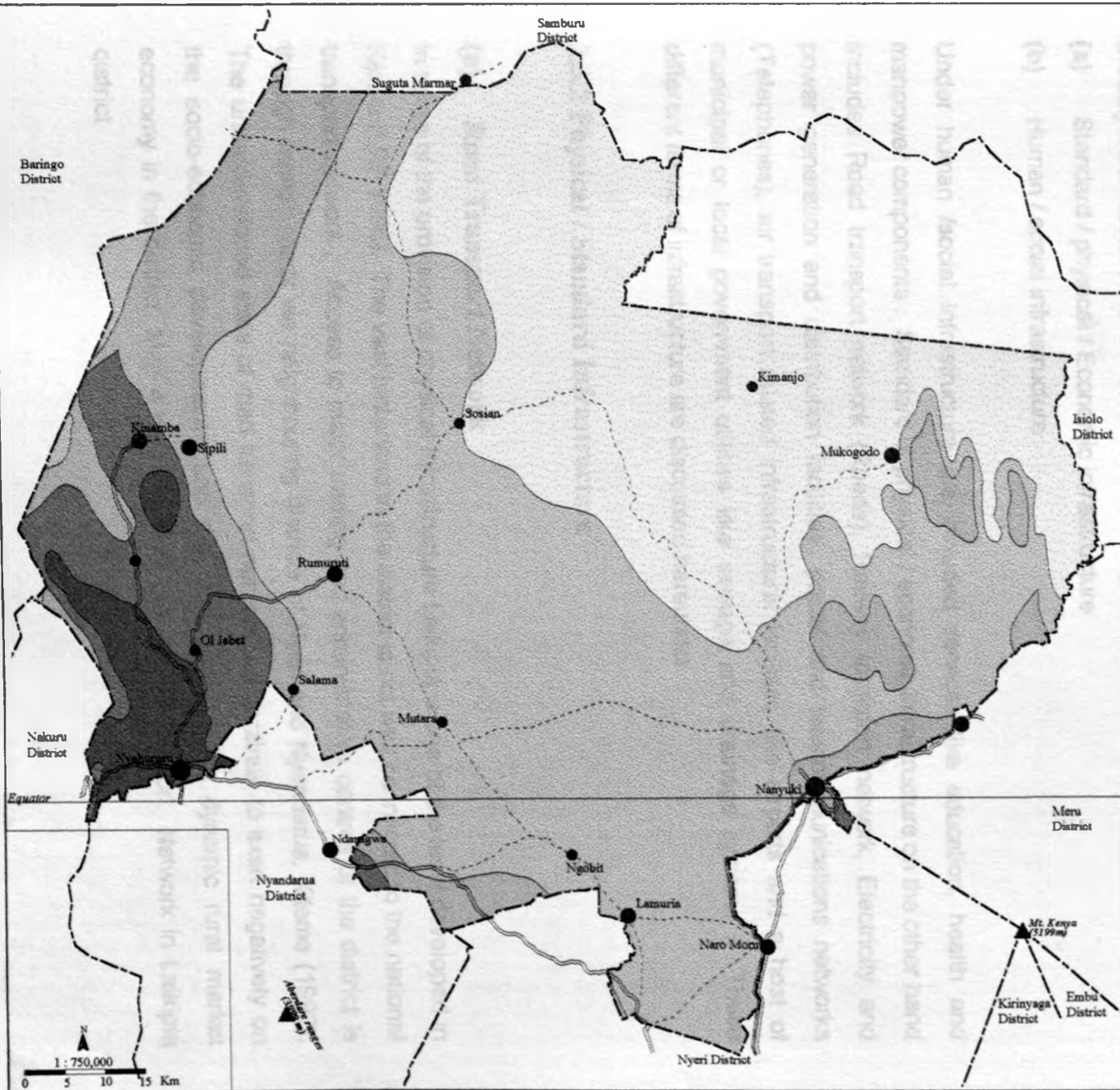
Map 2 A

Laikipia District, Kenya

Agro - Ecological Zones

Agro Ecological Zones

Zone II (Wheat/Maize - Pyrethrum Zone)

Zone III (Wheat {Maize} - Barley Zone)

Zone IV (Cattle - Sheep - Barley Zone)

Zone V (Lower Highland Ranching Zone)

Zone VI (Upper Midland Ranching Zone)

District boundary

Road (Tarmac)

Road (All Weather)

Railway

● Center

Baringo District

Samburu District

Suguta Marmar

Kimanjo

Isiolo District

Sosian

Kinamba
Sipili

Mukogodo

Rumuruti

Ol Jabet

Salama

Mutara

Nakuru District

Nyahururu

Equator

Nanyuki

Meru District

Ndaragwa

Nyandarua District

Ngobit

Lamuria

Mt. Kenya
(5199m)

Naro Moru

Kirinyaga District

Embu District

Nyeri District

1 : 750,000

0 5 10 15 Km

N

Aberdare Range

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2.3 Infrastructural Components

2.3.1 Introduction

Hilling (1974) defines infrastructure as comprising "the basic services and public facilities or utilities essential to the commodity producing sectors of the economy". Infrastructure can therefore be regarded as the underneath structure on which the primary extractive activities of fishing, agriculture and mining together with trade are based . Infrastructure is a very important component in development of trade and any other economic activities .

Broadly infrastructure can be divided into 2 categories :-

(a) Standard / physical / Economic infrastructure

(b) Human / social infrastructure

Under human /social infrastructure are included services like education, health and manpower components . Standard or physical / economic infrastructure on the other hand includes Road transport network (Roads), Railway transport network, Electricity and power generation and distribution facilities, postal and telecommunications networks (Telephones), air transport related infrastructural facilities like airports and a host of municipal or local government utilities like sewage and drainage systems . These different forms of infrastructure are discussed hereunder .

2.3.2 Physical / Standard Infrastructure

(a)   Road Transport Network

In terms of the provision of physical infrastructure Laikipia is one of the least developed in Kenya (LRP 1996). The vast hinterland in the district is not well connected to the national transport network . Access to major trading and administrative centres of the district is through tarmac roads via neighbouring districts of Nyeri and Nyandarua, Kiteme (1992). The underdeveloped state of road transport network will continue to exert negatively on the socio-economic development and the development of a dynamic rural market economy in the district. Map 4 below depicts the Road Transport Network in Laikipia district

Map 4

Laikipia District

Central Places
&
Road Network

Legend:
- ● Major Centres & Divisional Headquaters
- • Other Centres
- ------ All Weather Loose Surface
- ------ Dry Weather
- ——— Railway
- ——— Tarmac

1 : 750,000

0   5   10   15 Km

Aberdare ranges
(3999 m)

Mt. Kenya
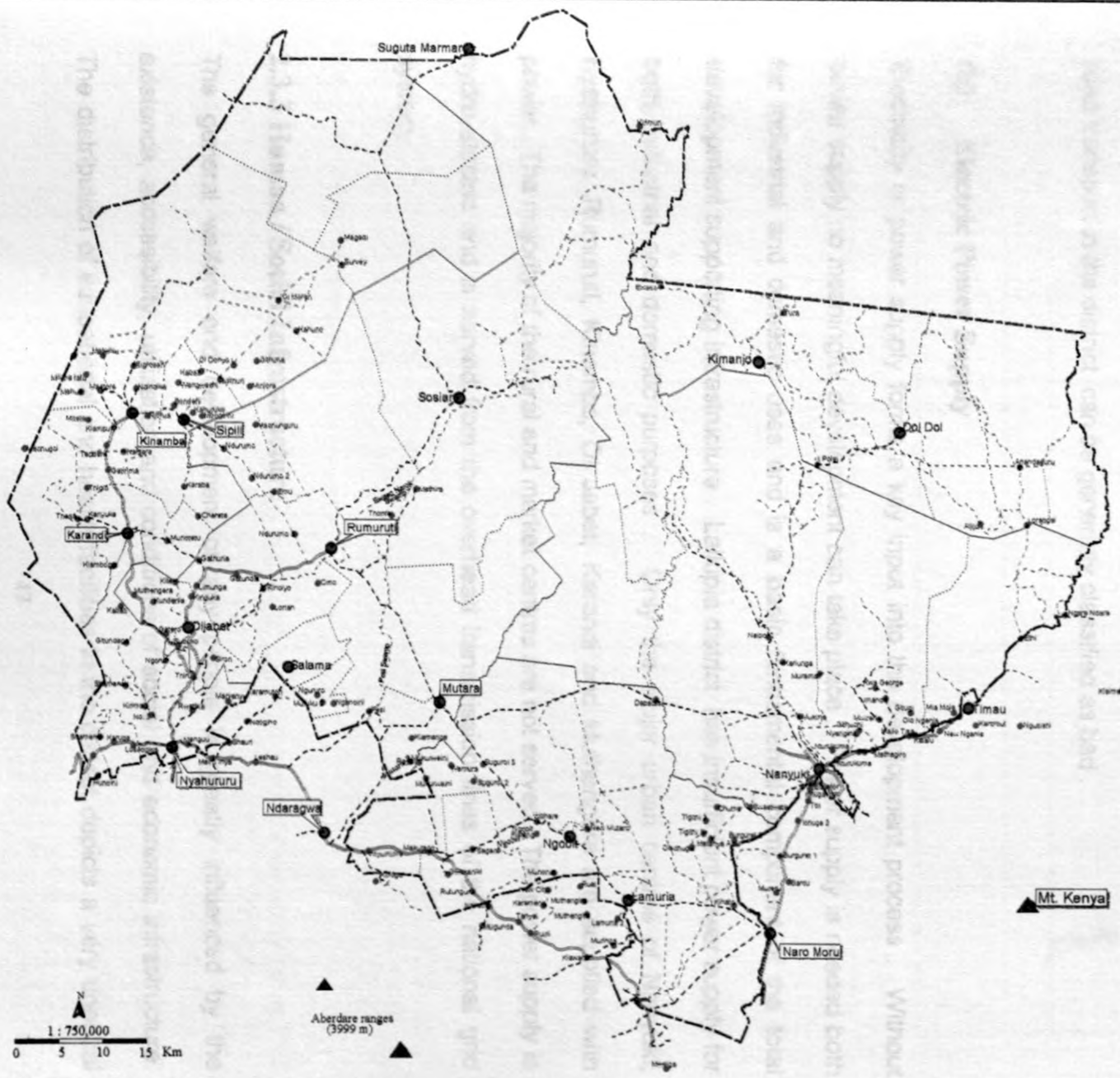
It can be seen from Map 4 above that the general accessibility condition of the district is poor . Secondly it is also noticeable that some blocks within the district are poorly served with roads as compared to others . During the rainy season roads become impassable, hence making some areas inaccessible for extension services and transport of commodities in the market is adversely affected. Transport of milk to KCC depots, horticultural products , cereals and other agricultural commodities to the urban centres becomes difficult and most of the produce is wasted. Poor communication system forms a major constraint to development in the district. In this way therefore, the overall state of road transport in the district can be generally classified as bad .

(b)   Electric Power Supply

Electricity or power supply forms a key input into the development process . Without power supply no meaningful development can take place . Power supply is needed both for industrial and domestic uses and is a basic fundamental component of the total development supporting infrastructure . Laikipia district has insufficient power supply for both industrial and domestic purposes .   Only the major urban centres of Nanyuki, Nyahururu, Rumuruti, Kinamba, Ol Jabet, Karandi and Muthengera are supplied with power. The majority of the rural and market centres are not served. The power supply is hydro-electric and is served from the overhead transmission lines of the national grid system.

2.3.3 Human / Social Infrastructure

The general welfare and development of any people is greatly influenced by the existence, accessibility, utilization and conditions of social and economic infrastructure. The distribution of educational and health facilities in the district depicts a very unequal

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spatial pattern among the divisions. This distribution is depicted below in the following tables.

(a)   Educational Facilities

Table 2.1 : DISTRIBUTION OF EDUCATIONAL FACILITIES/INSTITUTIONS (BY DIVISION)

DIVISION

EDUCATIONAL INSTITUTIONS	CENTRAL	LAMURIA	MUKOGODO	RUMURUTI	NGARUA
PRE-PRIMARY	59	39	21	73	76
PRIMARY	40	34	12	52	57
SECONDARY	5	2	1	7	6
UNIVERSITY COLLEGE	-	-	-	-	-

Source : Department of Education, Laikipia District Laikipia District Development Plan 1994 - 1996
p.40

Ngarua division is the best served with educational facilities followed by Rumuruti, Central division, Lamuria and then Mukogodo. Rumuruti division leads in terms of the number of secondary schools followed by Ngarua then central division. Again Mukogodo division is least served. Overall distribution indicates that most schools are in Ngarua division, Mukogodo division having the lowest number.

(b)   Health Facilities

The spatial distribution of health facilities is also not equitable and closely resembles that of education depicted above. Out of the 19 health institutional facilities in the district, may they be hospitals ,health centres or dispensaries 6 are in Rumuruti, 5 in Central division, 4 in Ngarua while Lamuria and Mukogodo have 2 each. Once again it is noticed that

Mukogodo and Lamuria are worst served in terms of health facilities as shown in table 2.2 below.

Table 2.2 : DISTRIBUTION OF HEALTH FACILITIES BY DIVISION

DIVISION	HOSPITALS	H/CENTRE	DISPENSARY	TOTAL
CENTRAL	2	-	3	5
LAMURIA	-	-	2	2
MUKOGODO	-	1	1	2
RUMURUTI	-	1	5	6
NGARUA	-	2	2	4
TOTAL	2	4	13	19

Source: District Medical Services, Nanyuki in Laikipia Development Plan 1994 - 1996 (p.41)

From table 2.2 above it is shown that there are only 2 hospitals in the entire district both of which are in Central division. There are four (4) health centres 2 of which are in Ngarua one in Rumuruti and one in Mukogodo division. There are no health centres in Central and Lamuria divisions. The district has a total of 13 dispensaries 5 in Rumuruti, 3 in Central, 2 in Lamuria and Ngarua and 1 in Mukogodo.

(c) Co-operative Societies

The co-operative system forms a significant component of the marketing process in any region. They provide the required media of exchange of produce and extension of credit to members in the general process of production, exchange and consumption. The co-operative societies in the district are as shown below in table 2.3

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Table 2.3   Co-operative Societies in Laikipia District

TYPE OF SOCIETY	SHARE CAPITAL (KSH)	MEMBERSHIP (PERSONS)	TURNOVER (KSH)
PYRETHRUM	1,766,289.00	22,034	82,280.00
CEREALS	507,899.00	960	-
DAIRY	3,193,104.00	4,966	1,909,848.00
FARM PURCHASE	53,370,337.00	17,597	-
HOUSING	3,179,686.00	1,498	-
SACCO	60,411,802.00	4,618	5,438,973.00
HONEY	360.00	300	242,500.00

Source: Laikipia District Development Plan 1994 - 1996 (p 42)

The co-operative movement in Laikipia district is one of the most developed and is among the best established in the country. This system of co-operatives provides the institutional arrangement and framework for conducting the economic processes of production and marketing.

(d)   Other Marketing Institutions

A couple of other marketing institutions are in operation in the district especially in distributive trade and agricultural marketing. These include the Kenya National Trading Corporation (KNTC), Kenya Co-operative Creameries (KCC) and National Cereals and Produce Board (NCPB), all of which are Government parastatals. KNTC is involved in the marketing and distribution of such commodities as sugar, hardware items like iron sheets and cement. The KCC is involved in the collection distribution and processing of milk and milk products. KCC factories in Nanyuki and Nyahururu serve the districts diary industry. The NCPB is involved in the sale and distribution of maize, rice and other cereals.

2.4 Structure of Central places and Market Centres

The development of central places in the district goes back to the colonial period. Before the colonial era Laikipia was the home of the nomadic pastoralists particularly the Maasai and the Samburu. The establishment of Rumuruti in 1920 and Nanyuki in 1921 formed the initial settlements acting as colonial strongholds. The district headquarters of Laikipia is Nanyuki which along with other major urban centres like Nyahururu and Sipili form the axis of central places in the district. The market centres will require to be developed further to cater for the increasing requirements of their hinterland. Migration into the district from the neighbouring districts has been partly responsible for the growth of the central places since independence with their functional outlook changing considerably overtime.

With time other towns like Naro Moru, Timau, Dol Dol and Nyahururu (previously Thompsons Falls) came up in what was becoming a system of central places in the district. These towns developed into market collection centres especially with the construction of the Nanyuki - Nairobi - Mombasa Railwayline. Their growth was stimulated as they increasingly became bigger and formed the major input and exit points for products generated in Laikipia. The population at the periphery did not play significant role in the growth of these towns apart from the provision of cheap labour in the emerging urban economy. Production for the local market essentially involves livestock products, cereals and a few manufactured products from the informal section.

Evidence shows that the spatial distribution of market places in the district does not correspond to the actual population distribution. This means that the situation is not yet consolidated. Secondly the spatial-temporal structure of periodic markets needs a careful analysis to establish its degree of synchronization. The establishment of market places in Laikipia precedes the development of infrastructure, a factor that has adversely affected the development of internal trade in the district (Leiser, 1990). The spatial distribution of the central places is shown overlaid on the Road Transport Network (see Map 4 above).

2.5 Demographic Characteristics and Settlement Patterns

The total population of Laikipia district was 65,506 people in 1969 and 134,524 in 1979 showing an increase of 105% over the 10 year period and an intercensal growth rate of 7.3% per annum. The annual increase however fell to 4.56% but still is higher than the national average of 3.35%. The demographic characteristics of the district are diverse depending on factors such as the migration trends, agro-ecological zonations and urban influence among others. Given that these parameters vary in magnitude, both innate and acquired population characteristics such as population size, density, distribution structure, education and income have significant variations (LRP 1996). Table 2.4 below shows population distribution in the divisions for the years 1979, 1993, 1994 and 1996.

Table 2.4   Population Distribution 1979 – 1996

POPULATION

DIVISION	1979	1993	1994	1996
RUMURUTI	48,279	91,324	95,487	103,151
NGARUA	34,868	65,956	68,964	74,498
CENTRAL & SAMBURU	38,792	76,104	79,574	85,959
MUKOGODO	11,585	20,294	21,220	22,923
DISTRICT TOTAL	134,524	253,678	265,245	286,531

Source: Laikipia District Development Plan 1994 - 1996. Projections based on
1979 Population Census -

Based on the 1989 population data, the population distribution and density are as portrayed below in table 2.5

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Table 2.5 1989 Population Distribution in Laikipia District

DIVISION	SIZE (KM²)	MALE	FEMALE	TOTAL	SEX RATIO	DENSITY persons/Km
CENTRAL	2392.2	28,800	24,356	53,156	1.18	22
LAMURIA	1261.0	12,817	12,219	25,036	1.05	20
MUKOGODO	1102.9	5,297	5,619	10,916	0.94	10
RUMURUTI	2919.0	25,834	25,695	51,529	1.01	18
NGARUA	1983.9	32,197	33,711	65,908	0.96	33
NYAHURURU	167.3	14,247	13,070	27,317	1.09	163
LAIKIPIA	9728.0	111,413	107,544	218,957	1.04	24
R/VALLEY	10,596.0	2,511,701	2,469,912	4,981,613	1.02	470
KENYA	582,644.0	10,628,368	10,815,268	21,443,636	0.98	37

Source: Laikipia Research Programme, 1996

Table 2.5 above indicates the population per division, Laikipia as a whole, Rift Valley Province and the National figures as per 1989 census results. The highest density is observed in Nyahururu followed by Ngarua, Central ,Rumuruti, Lamuria and Mukogodo. These patterns are explained partly by the favourable and/or unfavourable climatic conditions in the relevant division. More people have settled in the former white settlers large farms and at the district headquarters. Although there has been new settlement due to immigration Lamuria and Mukogodo divisions are relatively dry and climatic conditions are not conducive for agricultural activities. The main source of livelihood is pastoralism by the local Maasai people. It is within the Central division where game reserves are found hence partly explaining the low population density of the division. Ngarua and Nyahururu have the highest population densities. These areas have relatively high agricultural potential as the climatic conditions and soils are quite favourable for agriculture. People have therefore settled in this area and the land has been extensively sub-divided. Population density distribution and Land use patterns are shown on Map 5 next page ;
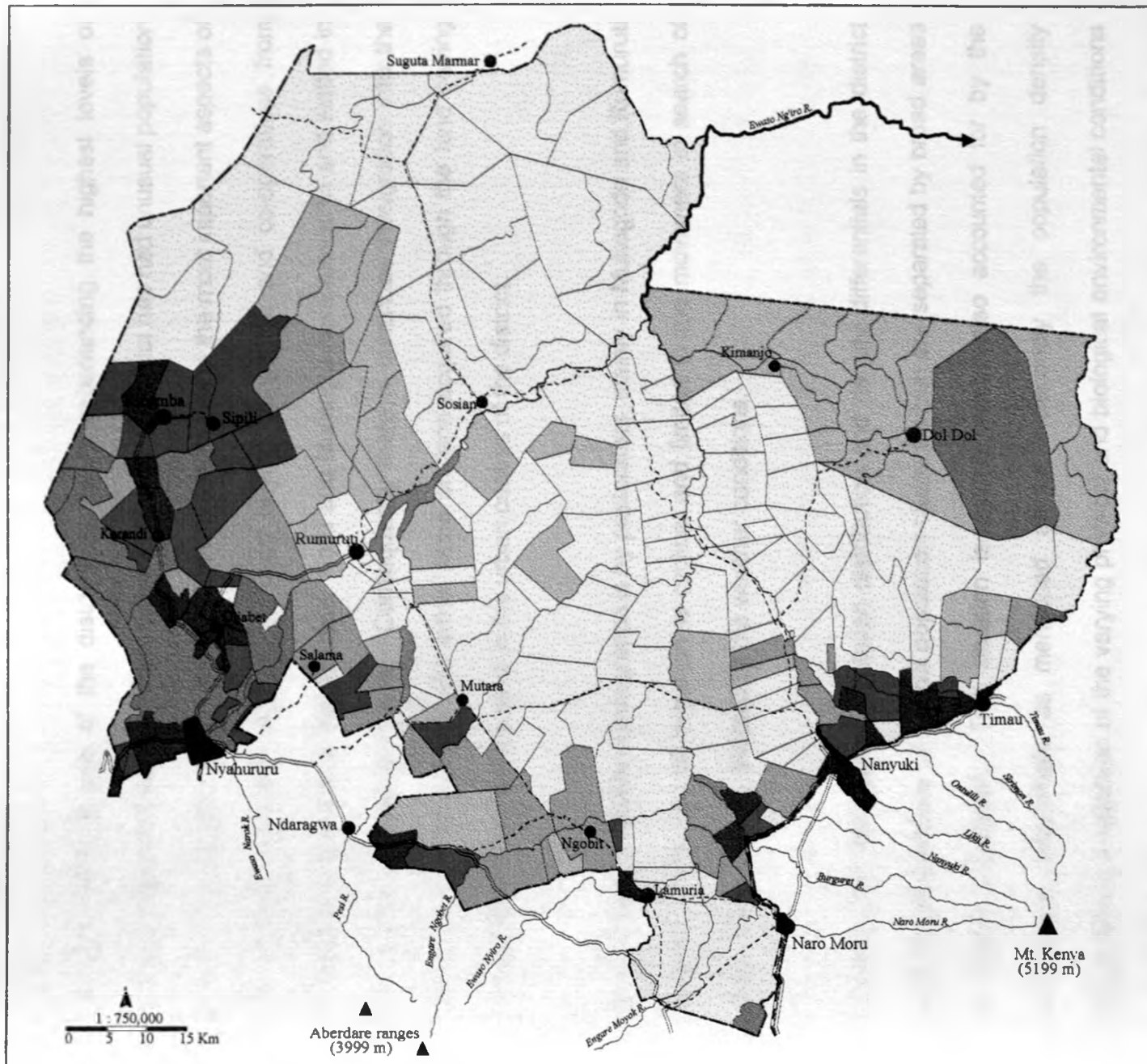
Map 5

Laikipia District, Kenya

Dominant Land Use and Population Density

Urban areas

Small-scale farm areas > 150 persons/km²

Small-scale farm areas 75 - 150 persons/km²

Small-scale farm areas 25 - 75 persons/km²

Small-scale farm areas < 25 persons/km²

Pastoralist area

Large-scale ranching

Forest areas

Swamps

----- District boundary

——— Planning unit boundary

—·—· Railway line

——— Tarmac road

······ All weather road

——— River

●•· Major Centres

S: Laikipia Research Programme Database
Wiesmann U., 1992

U. Wiesmann, 1996

1 : 750,000

0   5   10   15 Km

Suguta Marmar

Ewaso Ng'iro R.

Kimanjo

Sosian

Dol Dol

Mumba

Sipili

Kinamba

Rumuruti

Ngabet

Salama

Mutara

Timau

Nanyuki

Nyahururu

Ndaragwa

Ngobit

Lamuria

Naro Moru

Mt. Kenya
(5199 m)

Aberdare ranges
(3999 m)

2.5.1 Migration Patterns and Trends

Laikipia district is one of the districts in Kenya experiencing the highest levels of population growth from migration. Since 1969 Laikipia district has had unusual population growth from migration. As such migration represents one of the most important aspects of the districts population dynamics. Land buying companies and co-operatives from neighbouring districts of mainly Nyeri, Meru and Murang'a have moved in and settled in the district on subdivided land. Consequently there is continuos immigration into the district by the new settlers who either settle on farm acquired through the land buying companies and co-operatives or in the urban centres of the district.

Another type of localised immigration is by pastoralists, mainly in Mukogodo and Rumuruti divisions. This type of migration is cyclical and limited to the movement in search of pasture and water as dictated by the weather conditions.

In conclusion, the spatial population distribution and density differentials in the district portrays an existence of distinct population clusters which are separated by broad areas of sparse population. This situation is among others, also accounted for by the immigration differentials as mentioned above. Secondly the population density distribution is a reflection of the varying physical and biological environmental conditions in the district.

CHAPTER THREE

RESEARCH METHODOLOGY

3.0 INTRODUCTION

The purpose of this chapter is to examine the various techniques and/or methods which were used in this study. The various methodological aspects to be examined are; experimental design, data requirements, data collection techniques, data analysis techniques, data presentation and application(s) and limitation(s) of the field research.

3.1 Experimental Design

The study area (Laikipia District) has got 6 (six) administrative divisions. All Livestock periodic markets in these divisions ; which are officially recognised by the administrative authorities formed the universe. Representative samples needed not be taken because the recognised (designated) livestock periodic markets in the district were only ten by the time of study. As such all these markets were included in the study .

3.2 Data Requirements

To meet the objectives of this study both primary and secondary data were used. The data collected for this study included the following;

(i)   Data on spatial periodic market patterns in the administrative divisions of Laikipia district. This involved determination of periodic market locations in the study area.

(ii)   Data on the periodic market days for all the periodic markets in the study area. The above two data types were combined to form the spatio-temporal data required to determine the spatio-temporal structure of the internal marketing system in Laikipia district.

(iii)   Data on the variables influencing the location of periodic market places in Laikipia district. These data included:-

(a)   Population densities for each division

(b)   Road network system

(c)   Livestock population densities in all the divisions (surrogate measure for Regional Specialisation).

3.3   Data Sources

(a)   Secondary Data:

For purposes of this study, the relevant secondary sources of data included:

(1)   The Laikipia District Atlas produced by the Laikipia Research Programme (LRP).

(2)   The Local authorities especially the District Council authorities statistical data.

(3)   Publications and information in the Laikipia Research Programme Geographic Information Systems Lab (GIS - LAB, LRP).

(4)   Other published reports, books, journals and literature formed an important part of the secondary sources of data for this study.

It is however noted that data obtained from secondary sources is not free from its own shortcomings. For instance as Harper (1977) points out the purpose for which the data is required should not be significantly different from that which the original data was

intended for. Harper has therefore warned that if the researcher intends to use the data for a purpose quite different from which it was originally intended, it is likely that the sample from which the data was collected had certain special features unknown to the user.

Secondly, secondary data is likely to be obsolete and out of date. This has special significance to marketing systems since they are inherently dynamic especially in their spatial and temporal structures.

Owing to the above shortcomings associated with secondary data it was imperative that secondary data be supplemented with raw primary data obtained directly from the field. Primary data was also used to fill any data gaps in secondary sources, confirm and expand the existing secondary database.

3.4   Methods of Data Collection

(a)   Primary Data

The main techniques which were used to collect this type of data include personal interviews (oral interviews), questionnaires, photography and direct field observation. Questionnaires and Recording schedules were developed for the two classes of market users namely, buyers and sellers. Personal interviews were conducted with the local council authority officials at all market centres and periodic markets recognised by such authorities. Direct field observation was supplemented by the taking of photographs of important scenes relevant to the present study.The rationale behind the use of questionnaires is that they enabled personal contact with the respondent and hence

better communication. Issues which are likely to cause confusion were also elaborated and clarified.

In administering the questionnaire simple systematic sampling was used. Under this approach, the first respondent was selected at random and then every fifth person entering the market was enlisted as a respondent. This process ensured that no biases were introduced into the research. The questionnaire was designed in such a way that it ensured maximum freedom, ease and participation on the part of the respondents. In order to maximise on the quality of data collected both open ended and closed ended questions were used for the appropriate and relevant types of information. The questionnaire was administered using the help of a research assistant who was conversant with the study area. In order to ensure that the data collected was valid (especially non - personal data) the exercise was repeated for each market after a period of two weeks. However , during the second run if an already interviewed respondent appeared he/she was not re-interviewed. The main purpose of this second interview was to confirm the validity of general information collected initially.

3.5   Techniques of Data Analysis and Interpretation

3.5.1   Introduction

Despite the recognition of the role of marketing in the process of regional and national economic development, the exact understanding of the nature and role of periodic marketing and internal trade systems especially in developing countries is limited. Data analysis in this present study was done with a view of providing empirical evidence that periodic markets and internal trade systems have a very critical and significant role to play in the economic development of any given region.

3.5.2 Qualitative Analysis

Qualitative analytical techniques were used whenever data was found to be inadequate or unsuitable for statistical tests to be applied. The qualitative techniques used included; line graphs, bar graphs, pie-charts, frequency tables qualitative maps and Geographic information systems overlaying and buffering techniques.

The above qualitative techniques may not merit further discussion here but the last one needs a little bit of exposition, which is the subject of the next sub-section.

3.5.2.1   Geographic Information System (GIS) Techniques

Geographic Information System (GIS) is a computer based tool for data analysis with an integrated answer approach to resource management. Planning considerations and other decisions are often made in an atmosphere characterised by uncertainty and conflicting values. GIS Technology has application potential for a wide range of land use issues including planning policy formulation, implementation, resource management and monitoring and impact assessment . Thus GIS allows professionals, scholars,researchers, planners and consulting experts more flexibility in analysing alternative scenarios and focus on solving the most complex problems facing development planning . This study involved computer based GIS overlaying techniques using the Arc Info and Arc View software packages (programme) on a number of layers created from field data and from the L.R.P database .Different layers created from field data were overlaid in an effort of trying to identify and interpret important scenarios .

3.5.3 Quantitative Analysis

Analysis of Data Relating to Spatial Distribution of Market Centres

The technique used in examining the spatial distribution pattern of periodic markets was the Nearest Neighbour Analysis. Essentially, geography is a spatial discipline concerned with the distribution of phenomena in space and one of the distributions that the geographer has to consider is that of human settlement (Mc Cullagh & Hammond 1978). The spatial distribution of geographical phenomena can be elusive especially if its distribution is as a result of a multiplicity of non spatial factors .

3..5.3.1 The Nearest Neighbour Statistic (Rn)

Most of the pioneer work in the development of the nearest neighbour statistic was done by M.F Dacey (Mc Cullagh & Hammond 1978). A problem encountered frequently in Geography is to find a single index for measuring patterns in space which run and occur on a continuous scale. One solution, originally devised by botanists seeking to describe plant species distributions, is now widely used by Geographers and is called the Nearest Neighbour Index (Rn). The index is obtained using the formula:-

$$Rn = Dobs/Dran$$

$$\text{Where Dran} = \frac{1}{2\sqrt{N/A}}$$

Where:

Rn   - is the Nearest Neighbour Statistic (index)

Dobs - mean distance between Market centres

N   - is the number of market places in the area

A   - is the size of the study area

To calculate Rn it is necessary to measure the distance between each market place and its nearest neighbour and divide it by the total number of the measured pairs. Thus the Rn is simply given as:-

Rn   = $\dfrac{Dobs}{Dran}$

Where Dran is the mean distance to be expected from a similar number of points randomly distributed in the same area.

Dobs and Rn are as previously defined.
Dran can be computed using the formula.

Dran   = $\dfrac{1}{2\sqrt{N/A}}$

The importance of the nearest neighbour index is that it provides a test for non-randomness and allows, on a continuos scale, comparisons to be made of two or more spatial distributions. The value of the index ranges from 0 to 2.15 (Mc Cullagh & Hammond 1978, Johnson 1980).

Theoretically an Rn of Zero (0) implies a complete aggregation or clustering of market places, while that of 2.15 indicated that all the market places are uniformly distributed. A

special value of Rn = 0.23 indicates a linear arrangement of points in the study area.

Fundamentally however, Rn is no more than a numerical descriptive statistical index of the spatial form of a pattern. An index to show how close to uniformity the distribution of market places is and statistical evidence that it is not most unlikely that such a pattern arose from pure chance should be computed. This is done by qualification of the statistic by being standardised using a Z-score. The formula below can be used:-

$$Z = \frac{Dobs - Dran}{\delta Dran}$$

$$\delta Dran = \frac{0.26136}{2\sqrt{N/A}}$$

Where;

Z   =   is the normal standard variate for the Nearest Neighbour Statistic, Rn.

$\delta Dran$ =   is the standard error of the expected mean distance between market places assuming a random distribution in accordance with a Poisson probability distribution function; and Dobs and Dran are as defined before.

Another weakness of the Rn index is that it does not distinguish between a single and a multi-clustered pattern. Rn also averages out sub-patterns which may exist within the area, and may thereby hide contrasting sub-patterns which cancel each other out when put together to give a false impression of randomness. The selection of the nearest neighbour can also be done arbitrarily. The choice of the second or third nearest neighbour is possible and might produce different results. The fact that a pattern

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emerges with an index approaching 1.0 indicates the kind of distribution which could

result from the independent random selection of each location. This does not mean that

the locations (in this case market places) of the observed phenomena in the real

landscape are necessarily purely the result of chance. Lastly, the distribution of one kind

of phenomenon may largely be determined by that of another (McCullagh 1978).

The two great merits of the Rn index are that it enables more exact comparisons to be

made than hitherto, and it demonstrates clearly point patterns that are not random and

which therefore require explanation (Johnston 1978) in any calculation of the nearest

neighbour statistic (Rn) the value of N may be determined with precision and provided

care is taken , so may be the value of Dobs. Also using exact and appropriate methods

the value for A can also be calculated with considerable precision. The only problem

associated with the value for A is that of boundary delimitation across a continuos

landscape (Carter 1972, PP 193 - 211).

3.5.4 Technique for Analysing Data on the Temporal Distribution of Periodic Market Days

Introduction

Different market places meet on different days with some days being primary and others

being secondary market days. In order to determine the temporal distribution of market

days in the study area, a non statistical technique which determines whether there are

special days which are preferred to others had to be used.

The expected frequency distribution is the equal proportion of the total market meetings in

the study area spread equally throughout the 14 day marketing week.. Due to the small

number of livestock markets in the study area qualitative descriptive techniques

specifically graphing techniques were used to present data relating to the temporal distribution of livestock periodic markets.

3.5.5 Technique for Examining the Degree of Spatio-Temporal Synchronization of Periodic Markets

Introduction

In order to assess the degree of spatio-temporal synchronization (DSTS) both the consumer and the travelling trader hypothesis (Thorpe, 1978), together with the model of maximum synchronization of markets with a three day market periodicity (Skinner, 1964) was employed. A similar approach has been used by Wambugu (1990, 1995) in analysing the spatio-temporal structure of periodic markets in Nyeri district. The consumer hypothesis proposes that there is an inverse relationship between periodicity and locational spacing and, the travelling trader hypothesis proposes that a direct relationship is more appropriate. The technique most appropriate is the Pearsons Product Moment correlation co-efficient, Wood (1974), Musyoki (1986), Lado (1990), and Wambugu (1990, 1995).

3.5.6 The Multiple Product Moment Correlation Co-efficient (R)

This is the most powerful test of correlation which measures the degree of relationship existing between two or more variables. In this case the study will involve simple correlation as there are only two variables.

The correlation Coefficient r is defined by the formula -

$$R = \frac{\Sigma(x_1 - x)(y_1 - y)}{\sqrt{\Sigma(x_1 - x)^2}\sqrt{\Sigma(y_1 - y)^2}}$$

Where ;

R is the Multiple pearsonian product moment correlation coefficient

X and Y are the independent and dependent variables respectively.

The correlation coefficient only indicates the degree of the relationship between variables in terms of its strength but says nothing more about the nature of the relationship. R therefore is a measure of the degree of covariability of the variables X_1, X_2 - X_n and Y; and assumes values between -1 to +1. If R = + value then the two variables X and Y increase together and they are thus positively correlated. If R = value then the relationship is negative and hence inversely correlated. A zero value for R indicates that the two variables are uncorrelated, (Koutsoyiannis (1977), Hammond and Mc Cullagh (1978) and Johnston (1980).

3.6 Techniques For Examining the Factors Determining Market Provision in Laikipia District

The density of periodic market places in any given area determines how accessible the markets are to the surrounding population provided the spatial distribution is uniform and not clustered. Several factors which are thought by scholars to influence market provision are population density, accessibility, physical topography, degree of regional specialisation, and population income per capita. Several scholars see population density as the most significant factor of market provision Hodder (1956 b), Wood (1972).

Lindskog (1979), particularly uses correlation analysis in establishing the relationship between markets and population density. Multiple correlation was employed in this study because three explanatory exogenous variables (population density , accessibility and the degree of regional specialisation were used against market provision as the dependent variable. This approach is adopted because market provision is a function of a number of factors and hence joint variance effect of X_1, X_2 and X_3 cannot be ignored - for this reason multiple linear correlation analysis was used.

3.7 Accessibility.

The accessibility for each division was measured using the Geographic Information System (GIS) arc attribute table facility. The number of kilometres of all weather loose surface roads (R3), dry weather roads (R2) and tarmac roads (R1) were computed for each division in the study area using the GIS facility mentioned above. This computation was done with a high degree of accuracy ,that is to the nearest 0.001km. A subjective weighting was then applied in order to recognise the relative importance of each type of road. This weighting was based on the proportionate travel times for a distance of 100 km on each type of road. This data which was obtained from the livestock traders (see appendix 2) was also confirmed by way of field excursions by the researcher using different roads. The total stretch of R1,R2 and R3 for each division was weighted by the weights generated above and added to give the total number of kilometres for each division. The figure obtained above was then divided by the area in square kilometres for each district so as to obtain the degree of accessibility in terms of the number of kilometres of road per square kilometre of area (Km / Km^2) This resulting figure was then used as a measure of accessibility in correlation analysis.

3.8 Degree of Regional Specialisation

The degree of regional specialisation was measured in terms of livestock production surpluses for each division in the study area. The data was obtained from the Ministry of Agriculture, Livestock Development and Marketing, at the district headquarters at Nanyuki. Livestock population density was used as a surrogate measure for the degree of regional specialisation. Livestock population data from the Ministry was thought of as being very reliable in indicating commodity surplus areas. Livestock population densities were thus computed for each division in order to show how specialised in livestock production a given division was/is. The resulting livestock densities were used in correlation analysis, to determine the factors influencing market provision in the study area.

3.9 Market Going Behaviour and Distance Decay Variations

Market going behaviour is always a function of the distance that the market user is from the market. The number of visits that a market user makes to a particular market is determined by the distance he/she is from that market. The further away from the market the fewer the number of visits the user makes to the market within a given period of time. This implies that as distance from the market increases the probability of the user visiting the market diminishes ,Ngau & Gaile (1995). This relationship between the number of visits that a user makes to the market relative to the distance he/she is from the market is termed as the distance decay relationship. This relationship always assumes a typical hyperbolic function where the curve approaches the axis but never actually touches it.

The data on market use was collected by use of a questionnaire administered at the market site. The data was then logarithimically transformed in order to subject it to analysis. This logarithmic transformation was aided by use of computer generated natural logarithms for the data on rate of market use,(measured by the number of visits per fortnight) and the distance the user is from the market. Distances from the market were generated using the GIS attribute tables on the Laikipia Research Programme database. The obtained data was subjected to linearity tests to find out, the nature of the relationship between distance and the number of market visits. Since the relationship was found to be non-linear this necessitated logarithmic transformation of the original data .

The transformed variables were

X' = Logarithmically transformed X (distance traveled in kilometres)

Y' = Logarithmically transformed Y (number of visits per 14 days marketing calendar)

Such that X' and Y' are the natural logarithms of X and Y to base 10 respectively.

A log linear model was then fitted to depict the relationship between distance traveled and the number of visits made to any particular livestock market. The simple correlation coefficient (r) and a coefficient of determination (r^2) were the computed to indicate the total variation in the number of visits to a livestock market accounted for by distance.

3.10 Multiple Linear Regression Analysis

Linear regression analysis is a statistical tool that can be used to study the relationship(s) between a dependent variable (Y) and one or more independent explanatory variable(s) X_i. If there are more than 1 explanatory variables the analysis is termed as multiple regression analysis.

The general form of the multiple linear regression model with Y as the dependent variable and k independent variables, the Xs is expressed thus;

$$Y_j = \alpha_o + \beta_1 X_{1j} + \beta_2 X_{2j} + \ldots\ldots\ldots\ldots \beta_k X_{kj} + e_j$$

Where : α_o β_1, β_2 and β_k are sample estimates for the population parameters.

X_{ij} are the explanatory variables.

e_j is the error term.

Y_j is the dependent variable.

In the multiple linear regression analysis (MLRA) model the parameter estimates are actually partial slope co-efficients of the relationship between Y holding all other independent variables constant.   These coefficients were generated by an SPSSpc package version 4.1 on the computer.

The shortcomings associated with regression analysis are basically due to its restrictive assumptions which must be observed for the model to appropriately apply. If one of these assumptions are violated serious problems of multicollinearity, heteroscedasticity and autocorrelation.

3.11 Limitations of The Field Research

The limitations of research methodology include:-

(i)   The tools (discussed above) used for data analysis such as the nearest neighbour statistic, multiple linear regression and the computer based Geographic Information System (GIS) have both conceptual and/or technical shortcomings.

(ii)   Acquiring primary data sometimes proves to be difficult especially where the methods of data collection are inadequate.   Remote parts of the district proved to be inaccessible. Language barriers were also a serious problem.

(iii)   Computer-based data analysis   involved enormous costs which were prohibitive. Financial constraints are however expected in any research and means of dealing with them were devised as need arose.   Even though the above listed difficulties were encountered, efforts were made to find suitable solutions to each one of them so as to obtain reliable data for the valid conclusions reached by the study..

CHAPTER FOUR

THE SPATIO-TEMPORAL STRUCTURE OF LIVESTOCK PERIODIC MARKETING IN LAIKIPIA DISTRICT

4.0 Introduction

The purpose of this chapter is to examine the degree of spatio-temporal synchronization

of periodic livestock markets in Laikipia District, Kenya. Further but in a separate

context the chapter will elucidate on the spatial structure of these markets and their

temporal distribution. The level of spatio-temporal synchronisation of these Livestock

Periodic Markets, their spatial ordering and time scheduling are analysed in the general

context of the Central Place Theory bearing in mind the localised idiosyncratic

departures typical of an evolving peasant/pastoral economy. Tendencies towards

sedentarisation over the last two or three decades have completely changed what was

initially a cashless nomadic pastoral economy to a market orientated pastoral cum

peasant economy; thus necessitating the establishment of a complex spatio-temporal

configuration of market locale. The spatio-temporal interaction of phenomena has

therefore resulted into the development of distinctive distribution and organization of

the periodic markets in the study area.

4.1 Spatial Location vis-a-vis Temporal Periodicity

Fagerlund and Smith, (1970) and Wood, (1972) have unraveled the relationships

existing between the spatial locational patterns and the temporal periodicity of markets

and hence determining their degree of spatio-temporal integration.

Their general conclusion is that there exists different typologies of market integration. Highly integrated markets exhibit an inverse relationship between spatial and temporal proximity, while poorly integrated periodic markets have a direct relationship between spatial and temporal proximity (Wambugu, (1995); Lado, (1990); Musyoki, (1986); Obudho and Waller, (1976); Good (1975) and Wood, 1(975).

This relationship between spatial location and temporal periodicity is what is termed as spatio-temporal structure of a marketing system. The spatio-temporal structure and pattern of periodic market places depends upon the function of the marketing system in a region. Markets that facilitate local exchange are distributed differently from those facilitating interregional trade or providing a specialised commodity. Livestock periodic markets fall under the latter caption as they are also interregional focal points of national or regional importance.

Evidence shows that the economic roles of these livestock markets in Laikipia district transcends beyond the need for a localised neighbourhood exchange process. As such no hierarchical groupings can be distinguished in livestock periodic markets because their functional diversity in terms of number and size of goods and services is always related to their location and the quantity of product surplus in the adjacent neighbourhood. In every other aspect the markets are virtually the same.

4.2 The Spatial Structure of Livestock Periodic Marketing in Laikipia district

Great interest in the theoretical bases for the spatial phenomena of rural periodic markets gained ground as a result of Stine's (1969) work in Korea whereby market periodicity was placed within the context of Central Place Theory. As regards the rural livestock periodic markets in Laikipia district, the objective is to gain an insight into the spatial equilibrium of the economic exchange system of an agro-pastoral society.

The origin of periodic markets in the study area and the role they play in the overall economic exchange system can be explained from two separate perspectives. Firstly, livestock periodic markets have grown out of an inherent need for bartered exchange in the general context of the highland-lowland interaction complex which is quite typical of the district . As it has been indicated elsewhere in this study Laikipia district is a district of contrast exhibiting a wide range of agro-ecological variations and also having agricultural and livestock production swing zones. Such a diversity in production calls for a well instituted and organized system of commodity exchange and flow so as to bridge the gaps between surpluses and deficits. Secondly, pockets of demand and supply tend to develop automatically due to the existence of production surplus. When such conditions exists over the marketing space, then institutional formalisation of exchange tends to develop unhindered. In other words the markets are as a result of the rise in local demand and supply and market place function as local exchange focalities (focal points)/foci.

The above perspective is rather orthodoxical in that it attributes the origin of periodic markets to endigenous forces The origin of livestock periodic markets in Laikipia district is attributable to forces exogenous to the local economic set-up and their function is to facilitate the exchange of commodities between different regions. This view is also supported by different authors as the quote below tends to confirm -

"The economic role of periodic markets has a major influence on the spatial organization of market places in a region. The economic roles of these periodic markets transcend beyond the need for a localised neighbourhood exchange process (Ghosh, 1981).

Consequently therefore, the development of livestock periodic markets in Laikipia district has been due to the need for an institutional framework capable of facilitating interregional trade. The spatial mobility of the traders gives rise to market sites being strategically located to minimise spatio-temporal competition and thus articulating maximum spatio-temporal integration

Chart 4.1 below shows the percentage distribution of marketing opportunities per division in Laikipia district . Mukogodo and Ngarua divisions each accounts for 27 % of the total marketing opportunities in the district . These relatively higher percentage shares of marketing availability are explained by the degree of regional specialization in Mukogodo and high population density in Ngarua division . Lamuria division with extensive ranching activities has a reasonably high share of 20 % while Rumuruti and Central divisions have 13 % of the total distribution . Nyahururu division does not have any livestock marketing opportunities at the moment .

Chart 4.1

Chart 4.1 Market provision in Laikipia district :
percentage of Market days per division

- 13%
- 13%
- 0%
- 20%
- 27%
- 27%

Legend:
- Central
- Lamuria
- Mukogodo
- Ngarua
- Nyahururu
- Rumuruti
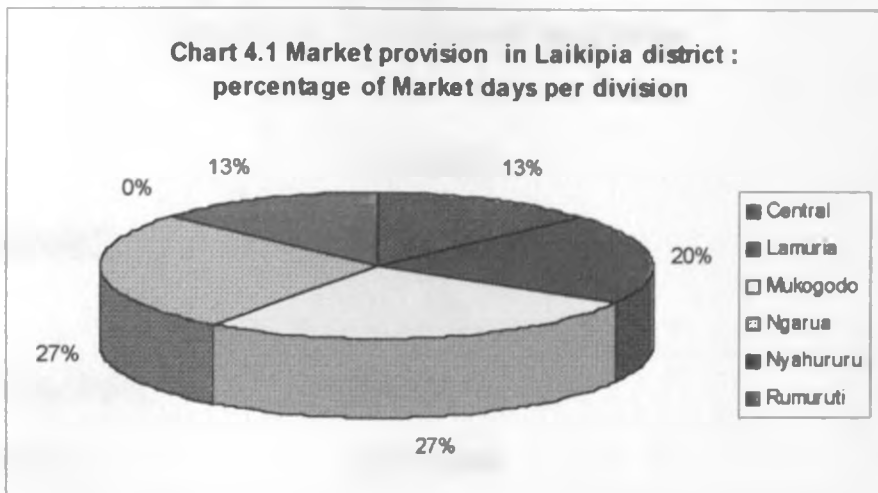
<u>Source :</u>**Researcher 1998.**

The spatial distribution of designated livestock periodic markets in the study are is depicted in map 6 (see chapter 5). These markets show some degree of randomness in their spatial distribution. The nearest neighbour statistic (Rn) is used to test the hypothesis that "market locational pattern tends to have a uniform pattern". This test statistic provides some non-randomness using the formula:-

The nearest neighbour distances between the periodic markets are shown in Table 4.2 below. Deploying the continuous scale comparisons (King,1969) the nearest-neighbour index ranges from 0 for highly clustered markets to 2.15 for regularly spaced markets. The computed index is 1.0753 as shown below:

Table 4.1   Livestock Periodic Markets and their
Distances to the Nearest Neighbour

MARKET	NEAREST NEIGHBOUR	DISTANCE IN (KM) NNI
OL MORAN	SIPILI	18.50
SIPILI	GATIRIMA	11.50
KIMANJO	DOLDOL	19.00
DOLDOL	KIMANJO	19.00
MATWIKU	SIPILI	12.50
DEPATAS	NAIBOR	15.63
NAIBOR	DEPATAS	15.63
GATIRIMA	SIPILI	11.50
WITHARE	DEPATAS	20.40
RUMURUTI	SIPILI	23.75

<u>Source :</u>Researcher 1998.

Σ NNI   = 167.39

   N   = 10

$\therefore \Sigma$ (NNI)/ N   = 16.739 (Dobs)

       A   = 9693 Km^2

       Dran = 15.567352

       Rn = Dobs/Dran

       Rn = $\underline{16.7390}$

           15.5674

       Rn = 1.0753

The above computation tends to suggest that there is disparity in the distribution of markets outlined above. An Rn statistic of 1.0753 being close to 1 suggests a random distribution of livestock periodic markets but they could not be definitely located in areas where topographical features and general terrain may pose a hindrance to their accessibility. The randomness of these markets could also be affected by the spatial distribution of population and productivity surpluses; and other socio-political and economic factors.

As computed above an Rn statistic of 1.0753 may be meaningless unless it is standardised using the normal standard variate or the Z-score. The normal distribution

standard variate for the nearest neighbour statistic, Rn can be used here to check if the observed pattern may have arisen from pure chance.

The Z-score is computed below:-

$$Z = \frac{Dobs - Dran}{\delta\ Dran}$$

Where

$$\delta\ Dran = \frac{0.26136}{N\ (N/A)}$$

$$\delta\ Dran = \frac{0.26136}{10 \times (\ 10\ /\ 9693\ )}$$

$$\delta\ Dran = \frac{0.26136}{0.1015677}$$

$$\delta\ Dran = 2.5733$$

$$Z = \left(\frac{Dobs\ -\ Dran}{\delta\ Dran} \right)$$

$$Z = \frac{16.739\ -\ 15.56735}{2.5733}$$

$$Z = 0.45530$$

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The interpretation of this Z is as follows

The critical value of the standard normal variate at a significance level of 0.05 under one tailed test is 1.324 which is greater than the computed value of Z = 0.4553. The test therefore shows that we fail to reject the null hypothesis at 0.05 confidence level and conclude that the distribution of the livestock periodic markets in Laikipia district is random. The reason behind this random distribution follows logically from the nature of population distribution which is highly clustered but interspersed with pockets of very sparse population.

4.3 The Temporal Distribution Of Rural Markets

According to Berry (1967) periodic market days need to be scheduled in such a way that a simple market excursion enables a trader to visit as many markets as possible. For this to happen therefore, each single day of the marketing week should have a market assigned to it. The temporal spacing of markets should ideally enhance their survival and also allow for maximum range of the flow of goods and services into the market. Thus, the periodic structure of markets allows the marketers (businessmen) to move to most markets so that they can get relatively large numbers of buyers. Theoretically, periodic markets are supposed to be arranged both spatially and temporally so as to enhance the long-term areal demand in order to avoid competition of several markets operating the same day (Lado 1990).

Table 4.2 *Market places and their meeting days*

LIVESTOCK MARKET	MARKET DAY
NAIBOR	Tuesday
RUMURUTI	Thursday
SIPILI	Saturday
OL MORAN	Tuesday
KIMANJO	Wednesday
DOLDOL	Saturday
MATWIKU	Monday
GATIRIMA	Friday
WITHARE	Wednesday
DEPATAS	Wednesday

<u>Source :</u>**Researcher 1998.**

Chart 4.2 below depicts the temporal distribution of Livestock periodic markets using a 14 day marketing calendar typical of high order commodity marketing systems.

The most popular market days appear to be Wednesday and Saturday each with a temporal distribution of 3 days out of the possible 14 days.Thursday and Tuesday each has a distribution of 2 while ,Monday and Friday each has a temporal periodicity of 1.Sunday apparently appears to be unpopular for marketing activities .

Chart 4.2

Chart 4.2 Temporal Distribution of periodic Livestock markets using 14 day- marketing calendar in Laikipia district

Legend:
- ■ Monday
- ■ Tuesday
- ■ Wednesday
- ■ Thursday
- ■ Friday
- □ Saturday
- □ Sunday

Y-axis: Periodicity (0 to 3)
X-axis: Days (Monday -Sunday)
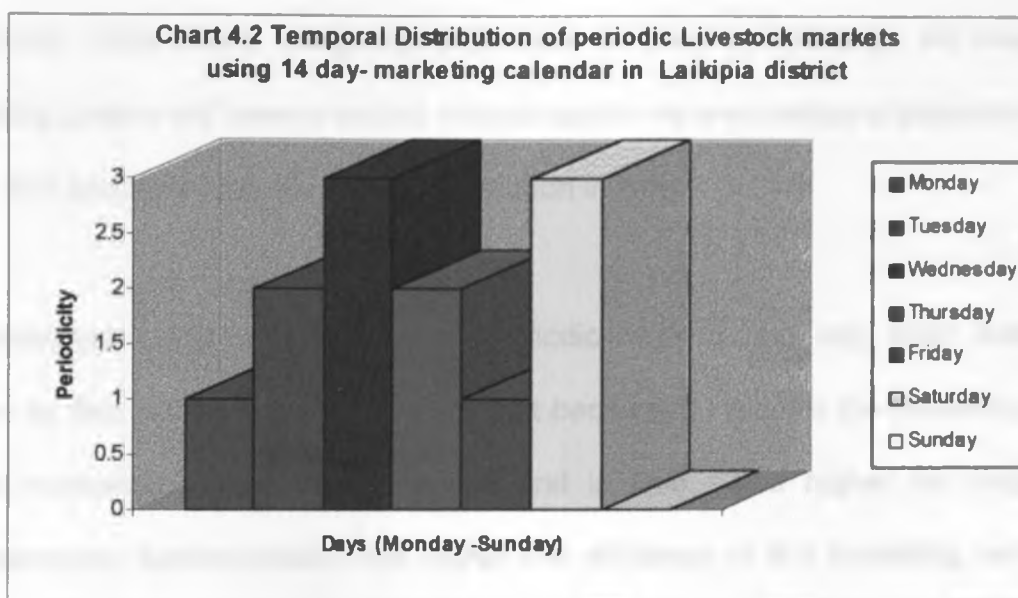
<u>Source</u> :Researcher 1998.

4.4 The Spatio-Temporal Structure of Livestock Periodic Markets

After examining the spatial and temporal distribution patterns of L.P.M in the previous sections separately, this last part of the chapter analyses them together in an effort to establish how well the market system is spontaneously integrated.

Having analysed the separate components of spatial and temporal distribution of livestock periodic markets in Laikipia district this sub-section attempts to bring together the two components. The complex relationship between spatial location and temporal periodicity indicates how well (or otherwise) the marketing space in integrated.

Highly integrated markets have an inverse relationship between spatial and temporal distribution while poorly integrated ones have a direct relationship. An integrated marketing system will have to exhibit inverse spatial vis-a-vis temporal proximity to the extent that proximity in space implies separation in time.

Spatiotemporal integration of livestock periodic markets and any other marketing system for that matter, is extremely important because it indicates the efficiency of the overall marketing system both in space and in time. The higher the degree of spatiotemporal synchronization the higher the efficiency of the marketing network. Based on a functional criteria, it is possible to identify idealized categories of central places. The temporal efficiency and the underlying spatial ordering is neatly organized within the livestock periodic marketing sub-sector. The spatiotemporal structure of this subsystem is a unique one being that of a specialised commodity market. This functional specialization does not imply the absence of other typologies of trade but indicates to a bigger extent the favourability and suitability of the market to handle a special trade commodity namely livestock. A whole lot of factors determine which centres are to be designated as Livestock Periodic Markets (hereafter LPM) although traditional factors like population density and accessibility have been noted to play a significant role.

Periodicity in Livestock marketing is quite crucial because livestock are actually regarded as 'high order goods'. This explains why the traders would travel long

distances from Nairobi, Nakuru, Nyeri, Kiambu and Thika to attend livestock auctions in Laikipia District. Periodicity typologies in livestock marketing can be classified as below :-

(a) Daily Marketing Periodicity

(b) Weekly Marketing Periodicity

(c) Mid-month (fortnightly) Marketing periodicity

(d) Monthly Market Periodicity

(e) Annual Market

Only two typologies of periodicity were identified in the study area, that is Weekly and Fortnightly markets. Daily markets would be inappropriate for Livestock marketing because of the nature of the commodity. Weekly markets are Rumuruti, (every Thursday), Sipili (every Saturday), Dol Dol (Wednesday and Saturday) and Kimanjo (Wednesday and Saturday).

4.4.1 Analysis of Data Relating to the Spatiotemporal Structure of Marketing:-

In the analysis of the data relating to the spatiotemporal structure of livestock periodic markets instead of using over the route distances, linear distances were used as the classification of roads was virtually difficult. However, these distances were generated using a reasonably high level of accuracy using the Geographic Information System

(GIS) tools. Measurements were taken from each of the 10 livestock periodic markets to the nearest market of the same size or larger meeting on the

a) Same day (temporal separation of 0 days)

b) Pre-post adjacent day (temporal separation of 1 day)

c) One day earlier/later (temporal separation of 2 days)

d) 2, complete days earlier (temporal separation of 3 days)

The distances were averaged to give mean locational distances for each category of temporal separation: 3, 2, 1 & 0 days.

Pearsons product moment correlation coefficient was used to depict the relationship between the temporal separation in days and the corresponding locational spacing in kilometers. The two data sets were initially subjected to linearity and normality tests using skewness and kurtosis. The data sets were found to be normally distributed hence amenable to correlation analysis.

The mean locational distances between neighbouring periodic markets separated by various lengths of time are recorded in table 4.6 below.

Table 4.3: **Temporal/Location Spacing of Livestock Markets in Laikipia District.**

TEMPORAL SPACING (Separation)	MEAN LOCATION DISTANCE
Same day (0 Days)	73.9 Km
+/-1 day	72.10 Km
+/-2 days	68.11 Km
+/-3 days	45.12 Km
+/-4 days	32.13 Km
+/-5 days	24.14 Km
+/-6 days	22.5 Km

Source Researcher 1998.

For the consumer hypothesis the proposition which has come to be called "Temporal - Locational hypothesis", correlation between temporal separation in days and mean locational distances (in Km) yielded a very high Pearsons product moment correlation coefficient of -0.96057 significant at 95% confidence level.

The inverse relationship tends to confirm the temporal-locational hypothesis which stipulates that proximity in space implies separation in time; The null hypothesis that

"Livestock periodic markets in Laikipia district are not synchronized in space and time is thus rejected". However, this spatiotemporal synchronization only works good for the buyers. Numerous studies elsewhere (Thorpe, (1978), and Lindskog (1982) indicate that whereas for the buyers the relationship is inverse for traveling traders it is supposed to be a direct one. As such, movement around the markets is not easy for market users without reliable transport. Spatio-temporal synchronization is thus only expected in areas where market places are well connected and integrated with each other. A large inverse Pearsons correlation coefficient of -0.96057 implies a very efficient marketing space system even though the distances are quite apart. However, this compares very well with that of the neighbouring Nyeri district of -0.92400 as found by Wambugu (1990).

The optimality of spatial and temporal distribution of livestock periodic markets has been examined from the general framework provided by the central place theory and a host of empirical studies in the scope of periodic marketing. It has been concluded that, the physical spacing of markets whose meetings are separated by different lengths of time do actually display a certain degree of order. If the logic and form of the central place theory is followed livestock periodic markets in the study area are found to be presenting a crucial departure from the traditional views. The market areas and the sizes of the thresholds of goods are extremely large with a radius of over 100 Km. Whereas sellers are basically locals the buyers come from far. Secondly there exists a great influence on the functioning of these markets exerted by neighbouring districts

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and traders tend to treat the entire marketing space as homogeneously uniform. This trans-boundary influence/effect to some extent distorts the spatial temporal ordering of the markets rendering the district boundary demarcation rather artificially manmade and hence arbitrary. In the absence of this cross boundary effect a spatiotemporal ordering with a poorly organized marketing system would be expected and hence a high degree of unnecessary spatial and temporal competition.

4.5   Market Going Behaviour and Distance Decay Variations in Livestock Marketing

A survey of the reasons behind making a visit to the market showed that 70% of the marketers (buyers or sellers) preferred those markets offering

  (a)Good prices (i.e. high selling prices for sellers and low buying prices for

  buyers as dictated by the prevailing demand and supply forces).

  (b)Wide variety of livestock and health animals which would fetch good prices

  (c)Security of the market from banditry, theft and quarantine restrictions

  (d)Nearness (proximity) to the market

  (e)Good transport

Market proximity was found to be one of the most important factors determining why a market would visit a market.

To work out a quantitative measure for the distance on the number of visits made to the market the following null hypothesis was subjected to test using field data from all the 10 livestock designated markets in the district.

"Distance from the market does not significantly influence the number of visits made to a particular market".

On subjecting the obtained data to linearity tests it was found that, the relationship between distance and the number of market visits was non-linear and hence necessitating logarithmic transformation of the original data as below

The transformed variables were

X^t = Logarithmically transformed X (distance traveled)

Y^t = Logarithmically transformed Y (number of visits)

Such that X^t and Y^t are the natural logarithms of X and Y to base 10 respectively.

logarithmic No. of visits to a Livestock Periodic Market(Y).

b_1 = (-0.6097)

b_0 = (0.5140)

$\text{Log}_{10} Y = 0.5140 - 0.6097 \log_{10} X$

The log linear model fitted depicts an inverse relationship between distance traveled and the number of visits made to any particular LPM. The correlation coefficient of - 0.6097 and a coefficient of determination (r^2) of 0.371795 (37%) tends to indicate that of total variation in the number of visits to a LPM only 37% is accounted for by distance. In turn this implies that market users rate is to a lesser degree determined by the proximity to that particular market.

The correlation coefficient which is significant at 95% confidence interval with 49

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degrees of freedom, further confirms that such a relationship is unlikely to have arisen from chance; the null hypothesis is thus rejected.

The explanation behind this is that, L.P.M offer a specialised commodity and even though one would wish to secure livestock for trade from the nearest market, there are only a few designated livestock markets where a sizeable efficient and convenient auctions are conducted. Secondly a majority of traders were found to be coming from outside the district and hence required to travel long distances to attend an auction in the few markets available. The commodity in trade being rated as a high order good as distinct from low order goods like household consumables, does not require frequent disposal say on a weekly bases, but can be disposed off on quarterly or monthly periodicity.

Poor means of transport within some pockets of the district tends to reduce tremendously the number of visit the market users would make per given time period. A number of traders have a cycle of markets they visit per time period and so do not necessarily put distance into consideration so long as other factors are favourable. These other factors include affordable prices, good and healthy stocks, security and risk of loss of stock to banditry and raiders and government policy and quarantine restrictions. The number of visits can be explained only 37% by distance and the other factors account for the remaining 63%.

A distance decay function for the relationship between the number

of visits and the distance from the market is depicted by Graph 4.1

below with the number of visits per month being plotted against distance kilometres. The graph clearly shows that the number of visits made to the market is a function of the distance that the market user is from the market. As the distance increases the number of visits gets fewer and fewer hence producing a hyperbolic distance decay function.

Graph 4.1   Distance-Decay Graph Depicting the Relationship between
Distance and the Number of Market Visits.

Graph 4.1 Distance Decay Function depicting the relationship between No of visits and distance from the market
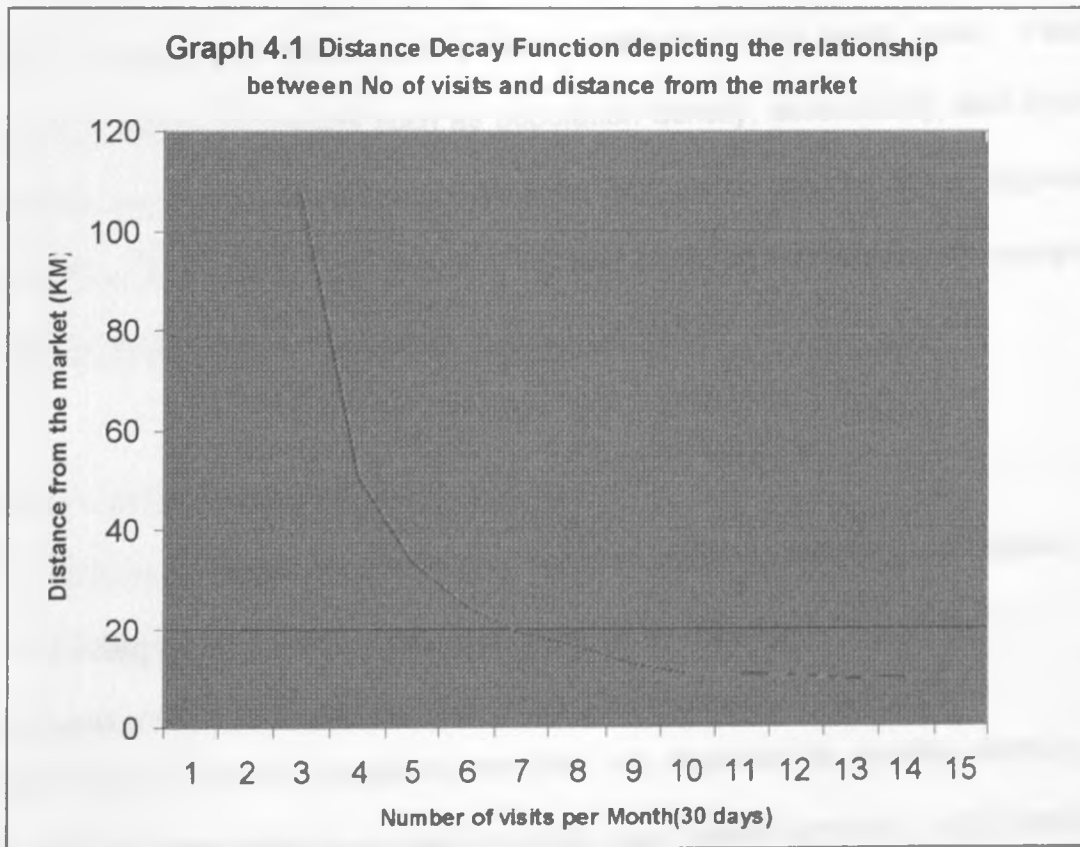
<u>Source</u> **Researcher 1998.**

CHAPTER FIVE

LOCATIONAL FACTORS INFLUENCING MARKET

PROVISION AND STRUCTURE OF LIVESTOCK TRADE

IN LAIKIPIA DISTRICT

5.0 Introduction

This chapter is focused on examining and analysing the variables influencing the

spatial and temporal structure of periodic markets in the study area. Factors

influencing market provisions such as population density, accessibility, and regional

specialisation were analysed both quantitatively using multiple linear regression

analysis and qualitatively using overlaying and buffering techniques on computer-

based Geographic Information System (GIS).

The null hypothesis tested in this chapter is:

"There is no significant relationship between population density, accessibility

and degree of regional specialisation with the level of market provision"

The mission of the current chapter is to validate/invalidate this hypothesis.

Areas with high market provision densities are expected to overlay directly and

coincide with areas of high accessibility (high road network density) , high population

density. This was done using overlying techniques of the Arc info GIS software.

This forms an illustrative and pictorial qualitative approach of validating or invalidating the above null hypothesis

The spatial patterns of geographic phenomena are always as a result of a complex interplay of an array of variables that interact with each other to produce a compound/hybrid phenomenon. In this chapter, an examination of the factors affecting market provision in Laikipia District will be attempted with a view of identifying some of the most important underlying constructs of the structure of livestock marketing in the district. "

5.1 The General Framework of Livestock Marketing in Laikipia District

The efficiency of the performance of the livestock marketing system or subsector is itself linked to the overall marketing network and the general typological frameworks of interregional and national trade. For this reason, in order to understand the general nature of the trade, livestock marketing should be viewed as an elemental subsector of the wider regional and national trade system. For instance the prices of livestock (animals) within the district were found to be influenced by the prices of other agricultural commodity products like cereals, coffee and tea in the neighbouring agricultural districts. When the prices of say tea , coffee or wheat were high the prices of animals (livestock) tend to go high despite a slight adjustment due to vagaries of weather. Thus, the sellers, who are primarily private large scale and small scale ranchers, co-operative ranchers and individual farmers tend to peg the livestock prices on the fluctuations of other commodities. In this way they are able to reap

maximum benefit from any emerging boom and hence hedge against risks. Through

price regulation by the natural forces of demand and supply, the marketing system

plays an important role in affecting production and redistribution patterns.

The first step towards improving the effectiveness of the livestock marketing subsector

is to understand its functional characteristics and its underlying constructs. Marketing

of livestock just like the marketing of other agricultural products, begins when the

animal parts with the primary producer and ends when the meat reaches the final

consumer. However, for purposes of the present study emphasis is laid on the

marketing of live animals.

Figure 5.1 below illustrates the livestock marketing channels identified and currently

in operation in the district .

The major channels include:

• Sale to large and small scale interdistrict traders by the pastoralists;

• Purchase from ranchers by meat wholesales say large wholesalers in Nyeri,

   Nakuru, Nairobi and the like;

•Sale to local butchers by pastoralists and co-operative ranchers; and,

•Sale to slaughter houses outside the district by co-operative ranchers,

pastoralists and private ranchers.

The need to improve marketing channels between the producer (ranchers and

pastoralists) and the consumer is an essential component of improved and

efficient livestock productivity and marketing.

RANCHERS

PASTORALIST

LOCALISED EXCHANGE & LOCAL SLAUGHTER

SMALL TRADES

LARGE TRADERS

By or without the Auction system

CO-OPERATIVE LIVESTOCK RANCHERS AND MARKETERS

LOCAL BUTCHERS

THE KENYA MEAT COMMISSION

SLAUGHTER HOUSES

EXPORT MARKET

MEAT WHOLESALERS

FINAL CONSUMER
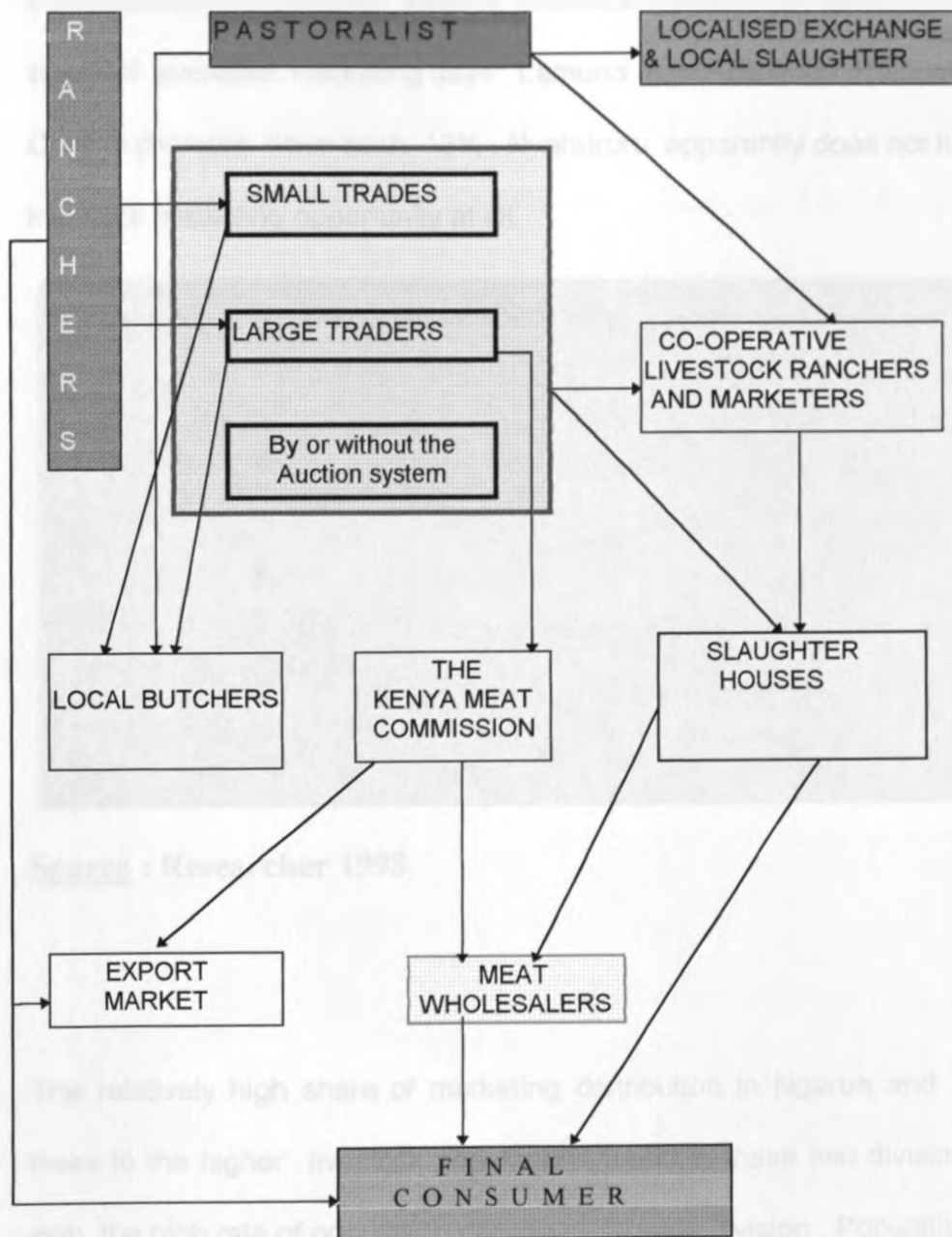
Fig 5.1 Livestock Marketing Channels in Laikipia District.

<u>Source:</u> **Researcher 1998.**

Chart 5.1 below shows the spatial variation of the provision of marketing

opportunities in the district . Ngarua and Mukogondo each have 27% of the total

share of available marketing days . Lamuria has 20% while Rumuruti and

Central divisions have each 13% . Nyahururu apparently does not have any

livestock marketing opportunity at all.

Chart 5.1 Market provision as a percentage of number of days per division in Laikipia district
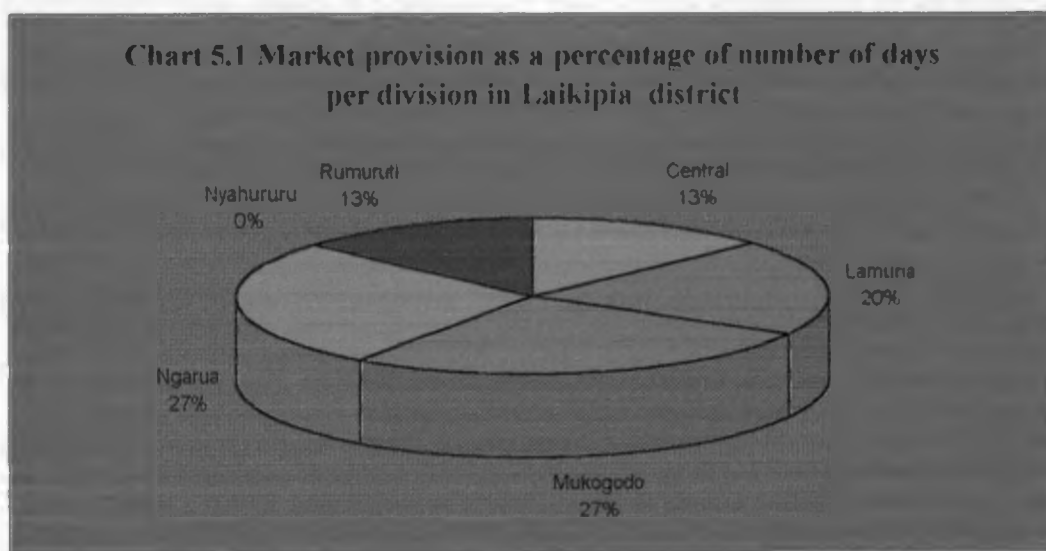
Source : Researcher 1998

The relatively high share of marketing distribution in Ngarua and Mukogondo

owes to the higher livestock populations found in these two divisions , coupled

with the high rate of population density in Ngarua division . Population density

and livestock density are two very important determining factors of livestock marketing provision

In Chart 5.2 the distribution of market provision is depicted in a different format using the number of days per division . As it can be noticed this differs significantly from chart 5.1 above but the relative importance of each division is somewhat similar . In chart 5.2 Ngarua still has the highest number of marketing days (40 %) while Mukogondo and Lamuria have 20%.Rumuruti and Central have 10% of the total market days available in the district . Once again this indicates that both in terms of temporal and spatial distribution Ngarua division and Mukogondo divisions tend to have a bigger share of the total available livestock marketing opportunities in Laikipia district .

Chart 5.2 Market provision as percentage of Market places per division in Laikipia district .

- Central
- Lamuria
- Mukogodo
- Ngarua
- Nyahururu
- Rumuruti

Source : Researcher 1998.

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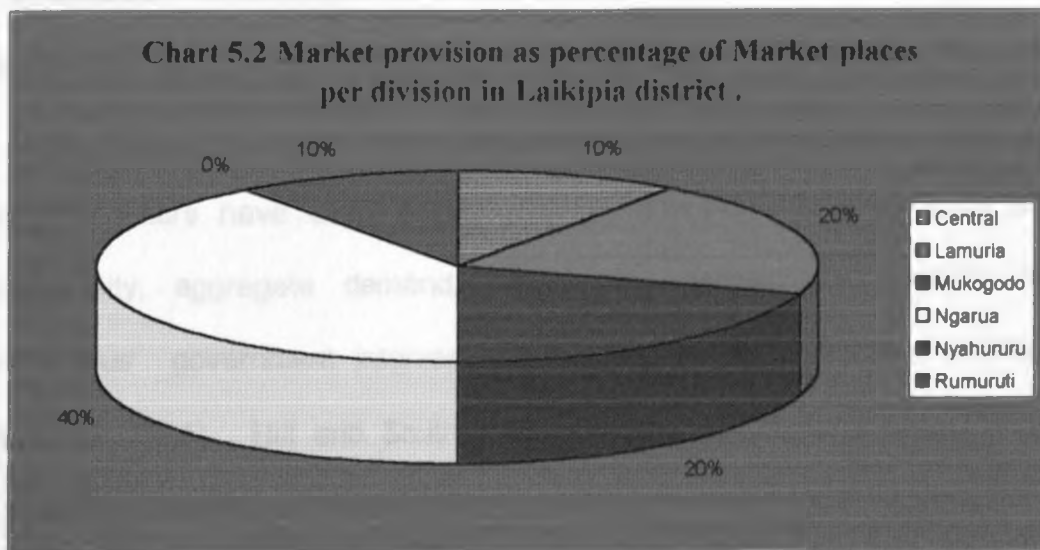
The factors responsible for this spatiotemporal structure of livestock periodic marketing in the district form the subject of the next subsection where they will be discussed in detail.

5.2 Locational Factors Determining Market Provision

In the previous chapter the spatio-temporal pattern of Livestock Periodic Markets was discussed at length. This section of the present chapter is aimed at providing a full analysis of the factors responsible for the spatio-temporal structure of livestock marketing in the district. The spatio-temporal pattern of periodic market places depends upon the function of the marketing system in a region. Marketing places that facilitate local exchange would be located differently from those that facilitating interregional trade or those providing urban goods to the rural areas. The effects of changes in transport infrastructure and consumer behaviour on market location pattern also depend upon the organization of the market system (Ghosh, 1981).

A number of scholars have cited several market provision variables such as population density, aggregate demand, topography, accessibility, quantity of production surplus government intervention, and regional specialization among others (Hodder (1965), Hill and Smith (1972), Wood (1972), Lindskog (1979), Musyoki (1986) and Wambugu (1990, 1995).

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In the present study three determinant factors were considered, namely;

(a)   Population Density.

(b)   Accessibility (Road Network density),

(c)   Degree of Regional Specialization.

5.3 Population Density as a Factor of Market Provision

Markets being human social institutions do provide a framework of commodity exchange within a socio-economic set-up which requires that they serve their hinterland catchment (zones) areas effectively.

Table 5.1 below provides data on the population densities and density of livestock market places and market days for each of the six administrative divisions of Laikipia district. It is important to note that most livestock periodic markets operate on a two-week calendar as opposed to the traditional one-week calendar for other markets. This fourteen-day calendar market scheduling is due to the nature of the stock in trade –, livestock which is considered as a high order good. hence requiring a longer marketing period . In this study therefore, the marketing calendar will be taken to be fourteen days. However, some of the livestock periodic markets are weekly like Rumuruti and Sipili.

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Table 5.1: Population Density and Livestock Periodic Market Provision in Laikipia District

DIVISION	POP DENSITY (Km²)	MARKET PLACES	MARKET DAYS	DENSITIES OF MARKETING OPPORTUNITIES	
				Places/Km²	DAYS
Central	37	1	2	0.000418	0.000418
Lamuria	37	2	3	0.001586	0.001586
Mukogodo	16	2	4	0.001813	0.003626
Ng'arua	65	4	4	0.002016	0.002520
Nyahururu	174	0	0	0	0
Rumuruti	31	1	2	0.0003589	0.0007170
Laikipia	39	10	14	0.0010316	0.001444

Source: Researcher (1998).

Correlating population density with livestock market provision a positive Pearson's correlation of +0.1831 significant at 95% was found. Thus population density explains partly the total variation of market provision in Laikipia district. The total number of marketing days in an area is more crucial to population density than the number of market places. Similar findings were presented by Wood (1978), Lindskog (1979) and Wambugu (1995). The hypothesis that there is a significant relationship between population density and market provision is thus supported by the results.

Population is thus seen to be a factor determining the provision of livestock marketing opportunities although not as important as regional specialization.

The table below represents the population distribution for the six divisions in the study area for 1997/98 (estimates).

Table 5.2: Population Density and Livestock Periodic Market Provision in Laikipia District

DIVISION	AREA (km²)	POPULATION (1997)	POPN. DENSITY /km² (1997)	POPULATION	POPN. DENSITY /km² (1998)
Central	2392	82,670	35	86,779	37
Lamuria	1261	38,936	35	40,875	37
Mukogodo	1103	16,976	15	17,820	16
Ng'arua	1984	102,502	62	107,596	65
Nyahururu	167	42,483	165	44,594	174
Rumuruti	2786	80,141	30	84,124	31
Laikipia	9693	340,532	37	357,456	39

Source: **Laikipia Research Programme Database (1996).**

The spatial population distribution and density differentials in the district portray a clustered pattern separated by large pockets of sparse population. In turn this situation is a reflection of the varying physical and biological environmental constraints in the areas concerned. According to the findings of this study, the spatial distribution of population is not strongly associated with the distribution of livestock markets and livestock marketing opportunities although it is a positive association.

5.4 Transport Network and Market Provision in Laikipia District

Infrastructure shapes the development of the rural economies largely through its impact on the operations of various markets. Because road transport network is the key contributor to development in rural areas it is considered here as a factor of market provision. Accessibility was found to affect not only the success of the livestock periodic market in terms of its size and activity but also in terms of its periodicity, and the availability of inputs like veterinary drugs. Those livestock periodic markets served with a good system of road transport network were also found to be amply supplied with modern technical inputs of a wider variety.

Studies on the profound effect that infrastructure has on rural economies especially for the developing countries have been documented elsewhere. Raisuddin and Mohabub (1990), in a study on the development impact of rural infrastructure in Bangladesh indicated infrastructural development caused household incomes to rise by 33% and incomes from agriculture and livestock/fisheries to increase by 24% and 78% respectively.

Development of road transport networks not only increases the speed of technological diffusion but significantly reduces the cost of marketing and improves the operation of both input and produce distribution markets through improved linkages with other sectors (see conceptual model). Infrastructure is one of the most frequently used jargon in Economic Geography and other allied disciplines such as Economics but there is no consensus in both literature as to what is its precise meaning. As a result

the term infrastructure and Social Overhead Capital (SOC) have been used interchangeably. Lewis (1955) prefers to include public utilities, ports, water supply and electricity in the definition of infrastructure. Higgins (1959) includes transport, public utilities, schools, hospitals and other social institutions. Hirschman (1959) includes in his definition of infrastructure the facilities of law and order, education, public health, transportation, communications, power, water supply, irrigation and drainage facilities. He further, distinguishes between what he calls hard core infrastructure (transport and power) from the rest of social overhead capital listed above.

The component of infrastructure dealt with in present study is transportation especially road transportation because it is the major and dominant mode of transport in the study area. The role of infrastructure is complex and its effects cannot be direct. Infrastructural development reduces the overall cost of marketing. About 20% of marketing costs are due to transport a factor directly related to availability of a reliable transport network.

Lack of a well developed system of transport especially in Lamuria is responsible for the consequential market fragmentation. The methodology used is that of correlating relevant target variable of market provision in terms of number of market days per two week marketing calendar with the degree of accessibility on a divisional level. Other variables used to explain market provision are population density and the livestock population density as a surrogate variable measuring regional specialization.

Although transport/accessibility was found to be positively correlated with market provision the association is quite weak with a value of +0.2234. The practical underpinning truth explaining this low positive correlation between accessibility and market provision in livestock trade, lies behind the nature and organisational structure of the trade ; cattle, sheep and goats are actually "salable goods" that can walk to the market. The most commonly used mode is actually trekking (on foot) 40% of the traders used this mode .Privately owned motorized transport forms an important mode of transport to and from the market .Most traders owned pick-ups while a few owned lorries. Hired transport is not as popular because of the costs involved .

The various modes of transport used by livestock traders are depicted in Chart 5.3 below

Chart 5.3 Means of Transport used by Livestock Traders.

Transport modes used by Livestock traders
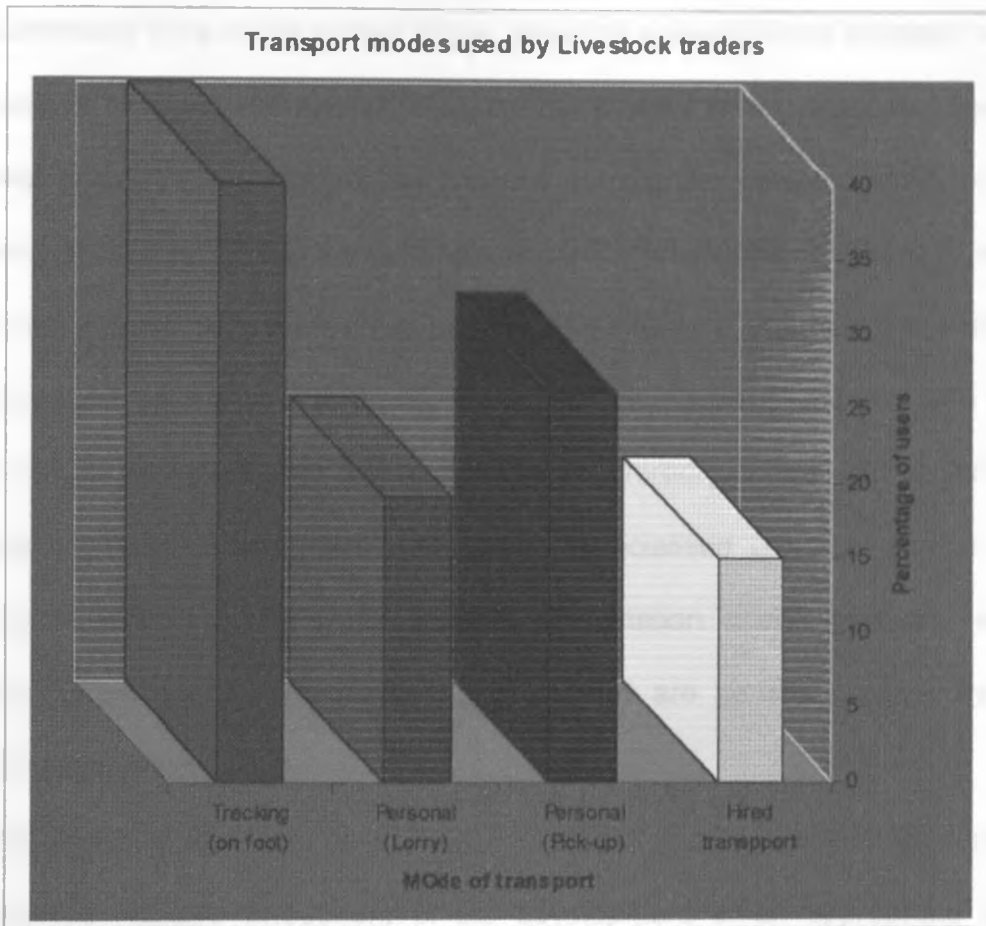
Source : Researcher 1998.

Unlike many other types of commodity markets, livestock markets are not largely and necessarily located in areas with relatively developed infrastructure. This owes to the fact that the sellers of livestock do not need elaborate transport system so as to get to the market. They would drive their livestock/animals on foot as this is cheaper.

This does not however mean that all market users do not need an elaborate transport network. 80% of the buyers interviewed were from outside Laikipia district and or the divisional market, hence needing a reliable transport network. Traders from Nyeri,

Nairobi, Nakuru, Kiambu, Thika and Molo normally use trucks to transport their purchased stock to the market hence requiring a reliable road transport network. The present road transport network in Laikipia District is not adequate, considering the vast and highly developed pastoral and commercial ranching economy. The main arterial is that linking Nanyuki-Nyahururu-Rumuruti/Kinamba-Sipili a larger part of which lies on the Laikipia-Nyeri border. The interior of the district is characterized by very poor accessibility and very limited marketing opportunities. The predominant modes of transport used include, private and hired pick-ups, trucks (lorries) besides trekking. Hired Transporters form a very specialised group of market participants whose role is quite significant. Transportation costs constitute an important component of the total marketing costs and are generally borne by the buyers (livestock traders).

The institutionalisation of a fully commercialised livestock marketing framework requires massive investment in the development of an appropriate and efficient infrastructure capable of providing/ensuring both the delivery of inputs and the distribution of the output. Generally this infrastructure is provided by the governmental and sub-governmental sector. It is desirable that most investment decisions for agriculture should be made at the regional level where localised needs and opportunities are best appreciated. Additionally infrastructural components for livestock marketing should be construed in the general framework of a total agro-distribution system (FAO, 1985).

The development of marketing infrastructure has hitherto been the responsibility of the auctioneer on the one hand and the local authority on the other hand. These two being constrained by the availability of funds cannot ensure effective delivery of such facilities like auction yards.

Development of infrastructure is found to have a positive though weak effect (correlation co-efficient of 0.2234). on the marketing of livestock but of course not for other related agricultural products and allied trade . The development of allied activities alongside these livestock periodic markets was also found to be influenced by the level of infrastructural development. Improved access makes it possible for the delivery of agro-veterinary products like veterinary drugs and textiles, light hardware and tools.

Even though adequate transport network makes it possible for traders to access markets faster in livestock marketing it is not seen as a major hindrance. It would be acceptable therefore to conclude that the importance of a generally good network of transport infrastructure is commodity specific. Livestock can be driven along footpaths over long distances hence mitigating the importance of an elaborate network of roads. This therefore explains the low correlation between provision of livestock marketing opportunities and accessibility.

5.5   Regional Specialization and the Provision of Livestock Marketing Opportunities

Laikipia district is a district of contrasts exhibiting 5 agro-ecological zones (see the Agro-Ecological Zone Map 2 in Chapter 2), and having a fairly sophisticated highland -lowland interaction complex. The bulk of Laikipia district's land use is under livestock production ranging from smallholders ,nomadic pastoralism to large scale commercial ranching. The highland - lowland interaction complex is quite developed in Laikipia district and as such there are areas of deficit/surplus and swing zones in agricultural productivity. The relationship between the cereal producing and the livestock producing zones is clear cut in that commodity flows from areas of surplus to areas of deficits are well perfected.

Mukogodo division to the north has low population density and poor cultivated agricultural performance but the highest livestock population density of 145.74 heads/km².

Extensive livestock keeping activities are mainly found in agro-ecological zones IV, V and VI as follows:(Refer to Map No.3)

Zone   IV: Cattle, sheep, goats and other ruminants

Zone   V :   Lower highland ranching zone

Zone   VI: Upper midland ranching zone

Regional specialization is cited in many literature as one of the most important determining factors of market provision ,Good, (1972) Wood, (1972, 1975;).

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Table 5.3: Livestock Population Trends,1992-1997, Laikipia District

TYPE	1992	1993	1994	1995	1996	1997
DairyCattle	31,200	26,306	29,200	31,750	33,800	35,500
Beef Cattle	200,300	236,696	204,050	213,000	208,000	221,000
Wool sheep	53,000	23,400	22,900	21,810	21,200	22,000
Hair sheep	338,140	204,600	231,575	256,500	261,000	270,000
Goats	138,960	174,000	185,750	218,900	217,000	232,200
Pigs	562	650	690	1,300	4,310	1,480
Donkeys	3,870	4,565	4,335	4,670	4,700	5,420
Camels	2,210	1,667	2,400	4,828	4,550	5,380
Total	789,242	671,884	680,900	752,758	754,560	792,780

Source: **Ministry of Agriculture, Livestock Development and Marketing, Laikipia District** Annual Report (1998).

Table 5.3 above shows an increasing trend in livestock population in the district depicting the importance of the livestock industry in the study area .

Regional specialization is thus indicated by the major predominant economic activity within a region as dictated by the economic principle of comparative advantage and the region's predominant resource endowment. In this way Laikipia district (and a majority of its divisions) are predominantly specialised in livestock production with large/small scale ranching. The district exports livestock to a number of neighbouring districts and elsewhere in the country as shown in the table below.

Table 5.4: **Livestock Exports from Laikipia District to Other Districts in 1997**

EXPORT TYPE	QUANTITY	EXPORT DESTINATION (MARKET)
Cattle	12,693	Nakuru, Nyandarua, Nairobi, Nyeri & Kiambu
Sheep	16,057	Nairobi, Nyeri & Kiambu
Goats	10,418	Nairobi, Nyeri, Nakuru, Kiambu & Meru
Poultry	11,755	Nairobi & Meru
Pigs	1,500	Farmers Choice Ltd.(Nairobi)

<u>Source:</u>   **Ministry of Agriculture, Livestock Development and Marketing, Laikipia District Annual Report. (1997).**

The above data indicates that Nairobi, Nyeri, Nakuru and Kiambu tend to be the most important markets for Laikipia livestock exports. A bulk of the exports are meant for slaughter in the urban centres in the Rift Valley, Central and Nairobi Provinces. The availability of these urban markets have provided a significant booster/incentives for increased livestock output in the district and hence making it a regionally specialised zone for livestock production.

Upon correlating market provision and the degree of regional specialization a high correlation coefficient of 0.6030 was found .This tends to indicate that commodity specific markets like those established for livestock in the district are actually heavily dependent on commodity availability and would locate in areas with marketable surplus. If an area is highly specialised in producing a certain commodity it will most certainly have a higher concentration of the marketing opportunities for that particular commodity. A typical example of the interrelation between production surplus and marketing provision is that depicted by the maintenance of large herds of livestock in

extensive areas of grazing and ranching within the district. Although in nomadic pastoral production systems herd owners are influenced more by tradition and social considerations to keep large herds of cattle, the economic incentives provided by the availability of marketing outlets cannot be ignored.

In the present study livestock density is used as a surrogate variable measuring the degree of regional specialization. Stocks are not sold only when forage is scarce and when there is eminent threat of drought but also at other times for both economic cum social motives. Therefore, lack of access to suitable marketing facilities and/or opportunities should not be seen as one of the isolated cases when economic motivation cannot overcome the inhibiting traditional norms. 70% of sellers would sell their stocks for purely economic motives especially due to good market prices.

As the number of livestock per square kilometre increases it is expected that the marketing opportunities available also increase although at a decreasing rate. The major livestock activities in the district are beef, cattle production, dairy farming; goats, sheep bee-keeping and poultry production. There is an organized marketing system in the district. Laikipia district has remained the main supplier of livestock (cattle, sheep, goats) for both slaughter and breeding to the neighbouring districts.

The table below shows livestock population for 1997 in the six divisions of Laikipia district.

Table 5.5:   Divisional Livestock Population for 1997, Laikipia District

ITEM	DIVISION					
	Central	Lamuria	Mukogodo	Ngarua	Nyahururu	Rumuruti
Dairy	10,000	4,500	-	8,000	7,000	6,000
Beef	53,000	64,000	38,000	15,000	1,000	50,000
Sheep	41,000	83,000	44,000	55,000	9,000	59,000
Goats	35,850	44,300	84,000	20,000	1,320	51,400
Camels	600	-	3,000	-	-	1,780
Donkeys	300	150	2,800	200	500	1,500
Total	**140,750**	**195,950**	**171,800**	**98,200**	**18,820**	**169,680**

<u>Source:</u>   **Ministry of Agriculture, Livestock Development and Marketing, Laikipia District Annual Report. (1997).**

Significant marketing opportunities are concentrated in Rumuruti, Mukogodo, Lamuria and Ng'arua. With Lamuria having a bigger share of commercial ranches a majority of which are privately owned

5.6   Commercial Ranching and Regional Economic Specialization in Laikipia District

Commercial ranching is a major economic activity within the district . Most of the ranches are commercially operated by owner managers.   80% of the district is suitable for extensive livestock production , Ministry of Agriculture and Livestock

Development (1997). The district remains the main producer of first grade beef, dopers and meat goats within the region;. A number of privately owned ranches produce for the export market where live animals are exported directly to overseas markets especially in the Middle East and the Gulf states. Besides producing for the foreign export market a number of ranches sell their animals to large-scale wholesalers and butchers from major towns in the country like Nakuru, Nyeri, Nairobi and Kiambu. Livestock and livestock products are also sold to other ranches, local butchers, Kenya Meat Commission (KMC) and Agencies like Gilani supermarkets (Nakuru). Fundamentally however, only large and privately owned ranches target the foreign export market, though citing problems of export licensing, unpredictable foreign markets and risks in transport and shipment. Also cited as a major hindrance to the foreign export market was the exceeding number of bureaucratic procedures required not only in licensing but also with the customs and the veterinary departments. In order to move livestock within and out of the district one is required to have a "letter of no objection" from the Veterinary Department allowing the movement of the livestock from the source to the destination.

Besides commercial livestock production ,these ranches also practice game ranching for touristic purposes and for ecological reasons. The ranches have thus played an important role in encouraging the development of tourism both by local nationals and foreigners. There are approximately 14 camping sites in the district owned by commercial ranches. A common feature of livestock ranching in the district is that of

group ranches, a majority of which are found in the pastoral area of Mukogodo and some parts of Rumuruti, Lamuria and Central divisions.

The table below shows the situation of commercial livestock ranching in 1996 in the district.

Table 5.6: Commercial Ranching in Lamuria Division (1997)

Ranches	Number
Ranches bought and subdivided	47
Ranches bought and not subdivided	24
Ranches owned by whites	28
Individual ranches	22
Total No. of Ranches	**121**

<u>Source:</u>   **Ministry of Agriculture, Livestock Development and Marketing, Laikipia District Annual Report. (1997).**

5.7 Analysis of Data Relating to Market Provision
Population Density, Accessibility and Regional Specialization

This last section of the chapter attempts to examine the relationship between the levels of livestock marketing opportunities and market provision variables; with a view to testing, interpreting and presenting the result(s) of the null hypothesis that "There is no significant relationship between livestock market provision and population density, accessibility and regional specialization (livestock population density) in Laikipia district.

An analysis of the relationship between the levels of livestock market provision and the above named three variables reveals that there exists a strong relationship between these variables as the computed multiple correlation coefficient (R_Y. X_1 X_2 X_3) of 0.876240 tends to confirm. The degrees and direction of this linear association given by the computed slope co-efficients of +0.01039, +7.55 and +0.02317 for population density ,accessibility and regional specialization indicates that with any increase in these explanatory variables there occurs a positive (direct) increase in the marketing opportunities available with the highest contribution coming from accessibility and regional specialization and human population density in that order.

The coefficient of multiple determination, or the squared multiple correlation coefficient of 0.76779 indicates that together, these three variables explain about 76.7% (77%) of livestock market provision in the district. The remaining 23% would probably be explained by factors like government policy, social norms and cultural values and income/purchasing power differentials.

In order to test for the statistical significance of the calculated multiple co-efficient of correlation the F-test was made use of at a = 0.05 level of confidence. It was found that the computed F of 1.10216 is greater than the significant F of 0.5889 and in this way based on this computed F-statistic it is safe to suggest that there is enough evidence to reject the null hypothesis that "there is no significant relationship between livestock marketing provision and human population density, accessibility and regional specialization (livestock population density) in Laikipia District". Instead the alternative is adopted which states that there is a significant relationship between the

level of livestock periodic market provision and human population density,
accessibility and regional specialization measured by the surrogate variable of
livestock population density

When any of the two explanatory variables were held constant for purposes of
computing the partial correlation coefficient it was found that regional specialization
tends to be more strongly associated with market provision followed by accessibility
and then human population density   The partial correlation coefficients computed
were:

$R_Y X_1 . X_2 X_3$ = 0.1831

$R_Y X_2 . X_1 X_3$ = 0.2235

$R_Y X_3 . X_1 X_2$ = 0.6031

where:

Y = Market provision, X_1 = Population density, X_2 = Accessibility, X_3 = Regional
specialization (livestock population density)

The partial correlation coefficients tend to indicate that the degree of regional
specialization measured in terms of the livestock population density is more strongly
associated with livestock marketing provision, than either of human population density
or accessibility   When population density and accessibility are held constant the
partial correlation coefficient is 0.6031 thus indicating a strong association between
regional specialization and population density Theoretically, this can be explained by
the fact that livestock periodic markets are actually commodity specific and tend to
locate in areas of commodity surplus and hence in those areas where livestock

populations are quite high. Secondly, livestock marketing on a local scale is not heavily dependent on an elaborate system of road transport network although this is essential for purposes of the buyers using motorised transport like lorries and pick-ups. This is so because the livestock can always be driven on foot (trekking) over long distances thus obviating not only the need for heavy dependence on motorised transport but also significantly reducing marketing costs. Thirdly, those areas with high human population densities tended to be occupied with cultivated agriculture hence reducing extensive livestock grazing areas. Livestock ranching areas and pastoral areas are better served with livestock marketing opportunities than densely populated (human population density) agricultural zones.

Based on the foregoing analysis, it is important to make the following conclusions. That commodity surplus as an indicator of regional specialization, in this case measured in terms of livestock population density, accessibility measured in terms of road network densities and population density explain much of the variation in the provision of livestock marketing opportunities in Laikipia district. Thus it is imperative to step up regional development through the appropriate manipulation of relevant variables, especially road transport network and regional productivity. Map 6 below shows the Arc View/Arc Info GIS software output after overlaying three different layers to determine whether any spatial correlations exist. Layer 1 was generated as the dominant land use coverage,Layer 2 was the population density coverage and layer 3 was the designated livestock market coverage created from data collected from the

field.It is clearly observed that spatial correlations do exist in between livestock market provision and the two explanatory variables of regional specialization and population density. Dol Dol and Kimanjo are bathed in a pure pastoralist area while Matwiku,Sipili, Gatirima represent a centrad of markets located in areas with a population density of either above 150 persons per square kilometre or between 75-150 persons per square kilometre. The rest of the markets ,that is Naibor,Depatas,Withare,Ol-Moran and Rumuruti are surrounded by areas practicing intensive livestock production,large-scale ranching or by small-scale farms with 25-75 persons per square kilometre.

In this way it can be concluded that population density and regional specialization are major factors in determining livestock market provision in Laikipia district as shown by the GIS Map overlay next page(see Map 6 below).

Map 6

Laikipia District, Kenya

Dominant Landuse and Population Density & Designated Livestock Markets
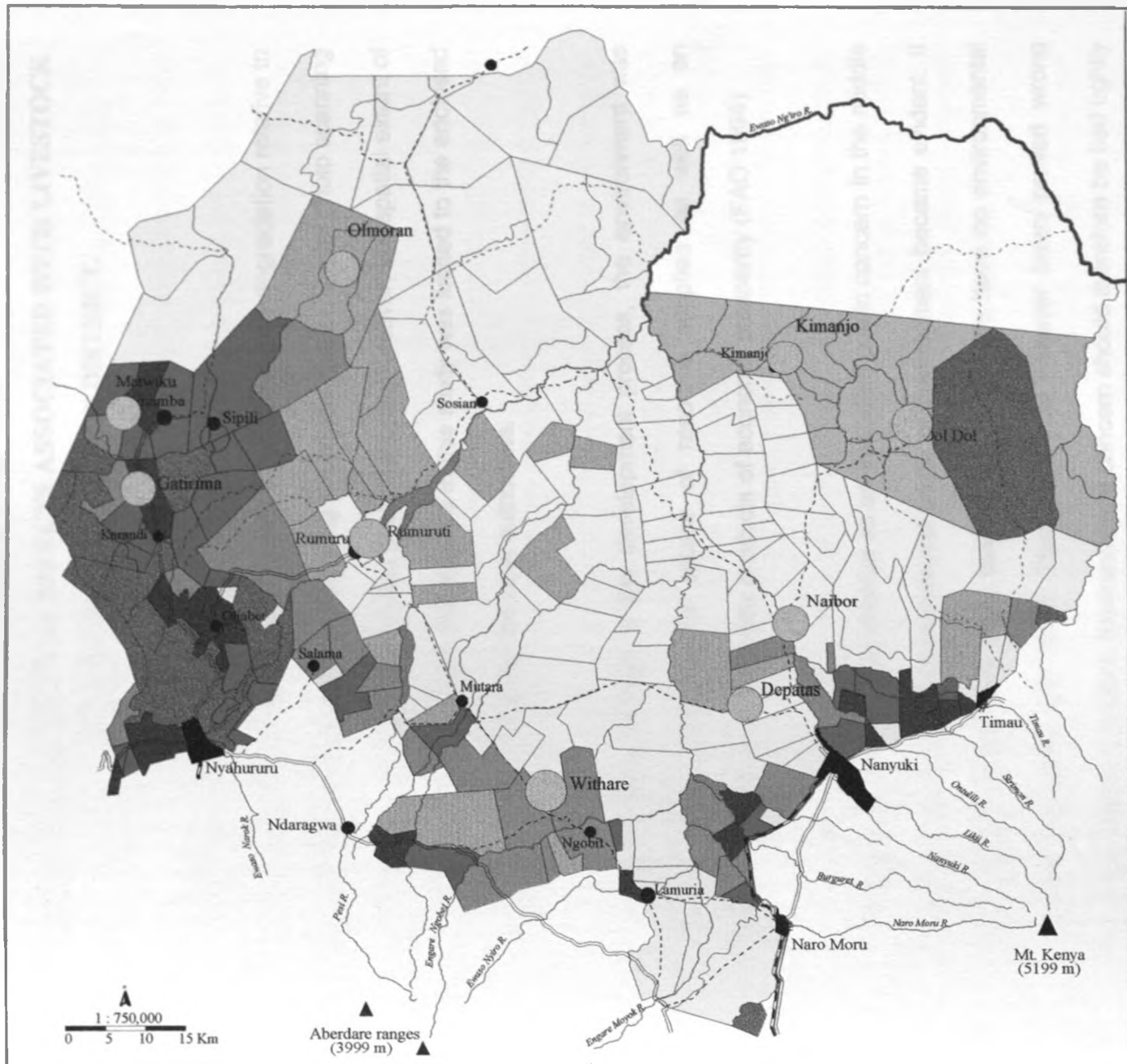
Legend:
- Urban areas
- Small scale farm areas > 150 persons/km2
- Small scale farm areas 75 - 150 persons/km2
- Small scale farm areas 25 - 75 persons/km2
- Small scale farm areas < 25 persons/km2
- Pastoralist area
- Large scale ranching
- Forest areas
- Swamps
- ----- District boundary
- ───── Planning units boundary
- ╾╾╾ Railway line
- ═════ Tarmac road
- ------ All weather road
- ──── Perennial River
- ─ ─ Episodic Stream
- ●● Major Centres
- ● Designated Livestock Markets
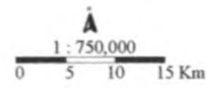
Source: Laikipia Research Programme Database

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CHAPTER SIX

SOME ENVIRONMENTAL EFFECTS ASSOCIATED WITH LIVESTOCK MARKETING IN LAIKIPIA DISTRICT.

6.1 Introduction

This chapter discusses visual indicators of environmental degradation relative to the development of livestock marketing in Laikipia district. Digital photo scanning was used for the purposes of data presentations. Moreover, the spatial extent of environmental degradation investigated in this study was limited to the enclosed market area as defined by the local authorities.

During the early phases of the development process, the environment was viewed as an inexhaustible source of resource supplies as well as an unbounded sink for the harmful products of economic prosperity (FAO 1994)

The environment began to emerge as an important public concern in the middle of this century as the environmental costs of development became evident. It was initially thought that some development processes have no environmental effects associated with them. This belief has however been proved wrong through empirical studies. Environmental concern should therefore be tied tightly to any activity of development undertaken by development agents (U.N. 1994).

The age-old belief that sound environmental practices retard economic growth and that environmental objectives clash with socio-economic objectives have been responsible for the ignorance of environmental protection. Most actors in the development planning process are either environmentally ignorant or have practically no environmental ethics. This general lack of sense of responsibility to protect the environment is entirely responsible for the great extent of environmental degradation.

6.2 Sustainable Development in Livestock Marketing

From the Rio de Janeiro declaration on environment and development to the World Food Summit and in a number of international conventions on biological diversity ,The Montreal Protocol on the emission of green house gases and the Convention to Combat Desertification the concept of sustainable development has featured prominently. One of the biggest challenges facing world economies today is how to preserve its natural resource base while maintaining the badly needed economic growth thrust and momentum. At the same time alarming symptoms of deterioration of the natural resource base are being observed worldwide.

As indicated in the U.N 1994 publication on Environmental Impact Assessment, environmental problems in developing countries find their root cause in poverty, and as such they have a greater social, economic and cultural rather than technological dimension.

The concept of sustainability can be considered an attempt to reconcile human activities especially human socio-economic activities and the natural environment. Principle 4 of the Rio de Janeiro Declaration on environment and development emphasizes the concept of sustainability - as quoted below:

> **"In order to achieve sustainable development, environmental protection shall constitute an integral part of the development process and cannot be considered in isolation from it."(UN 1994 Rio declaration-Principle 4).**

Sustainability is construed in both senses of intergenerational and intragenerational equity. As defined in the Bruntland Commission, sustainability also connotes the idea that economic benefits for the current population should not be at the expense of future generations. Similar concepts are shared by FAO's definition of sustainable development as below:

"The management and conservation of the natural base and the orientation
of technological and institutional system change in such a manner as to:

> ensure the attainment and continued satisfaction of human needs for
> present and future generations. Such sustainable development
> (in agriculture, forestry and fisheries sectors) conserves land, water,
> plant and animal genetic resources and is environmentally non-
> degrading,technically appropriate, economically viable and socially
> aceptable.(FAO 1995).

Many human activities have environmental consequences which include a wide variety of different phenomena. For sustainable development in livestock production and marketing to be achieved, big and fundamental challenges must be surmounted.

The generalized determinants of sustainability presented below in Figure6.1 set the general framework within which development planning must proceed for it to be sustainable.

Whereas few farmers and market agents/participants (buyers, sellers, auctioneers, local council authorities) are acutely conscious of the local environmental impact of their actions they are certainly not aware of their local habitats and generally speaking they follow no particular set of regulatory frameworks for environmental protection and ethics.

The figure below shows the components of sustainable development in planning.
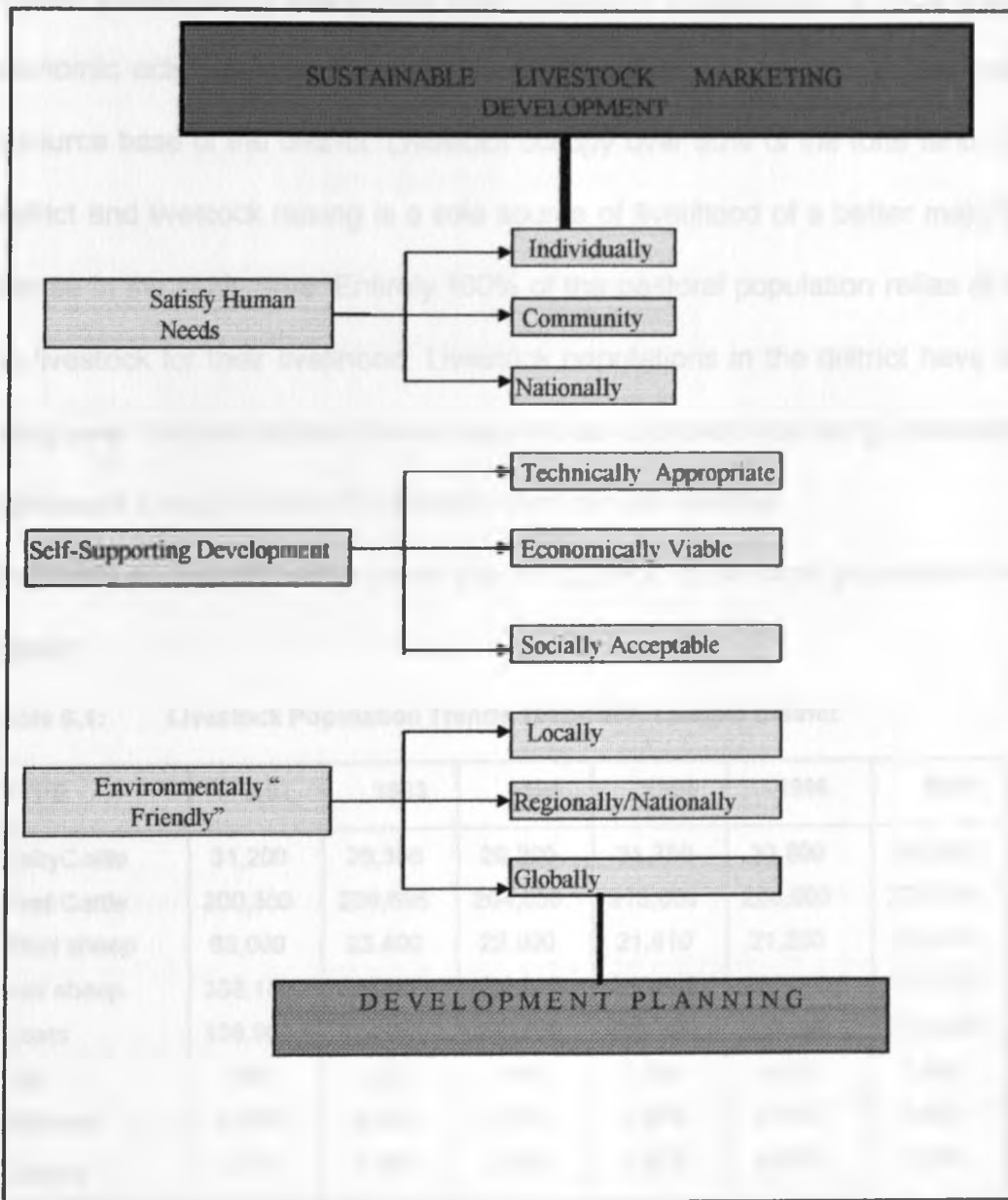
Figure 6.1 Components of Sustainable development
planning in Livestock Marketing

Source Adapted from Nadine Gouzee *(1995)*,
(The UN Commission on Sustainable Development)

6.3 Livestock- Environment Interaction

Animal production is one of the most important components of local Laikipia economic activities, and livestock forms one of the main users of the natural resource base of the district. Livestock occupy over 60% of the total land in the district and livestock raising is a sole source of livelihood of a better majority of people in the study area. Entirely 100% of the pastoral population relies directly on livestock for their livelihood. Livestock populations in the district have been rising over the past decade hence requiring an improved marketing (institutional) framework through which off take from land can be effected.

The table and graph below depict the rising trend of livestock population in the District.

Table 6.1:   Livestock Population Trends 1992-1997, Laikipia District

TYPE	1992	1993	1994	1995	1996	1997
DairyCattle	31,200	26,306	29,200	31,750	33,800	35,500
Beef Cattle	200,300	236,696	204,050	213,000	208,000	221,000
Wool sheep	53,000	23,400	22,900	21,810	21,200	22,000
Hair sheep	338,140	204,600	231,575	256,500	261,000	270,000
Goats	138,960	174,000	185,750	218,900	217,000	232,200
Pigs	562	650	690	1,300	4,310	1,480
Donkeys	3,870	4,565	4,335	4,670	4,700	5,420
Camels	2,210	1,667	2,400	4,828	4,550	5,380
Total	789,242	671,884	680,900	752,758	754,560	792,780

Source: Ministry of Agriculture, Livestock Development and Marketing,

Laikipia District (1997).

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The above tables shows an increasing trend in livestock population in the district as also depicted by the graph below (Graph 6.1) depicting the importance of the livestock industry in the area of study.

GRAPH 6.1 LIVESTOCK POPULATION TRENDS IN LAIKIPIA DISTRICT 1992-1997
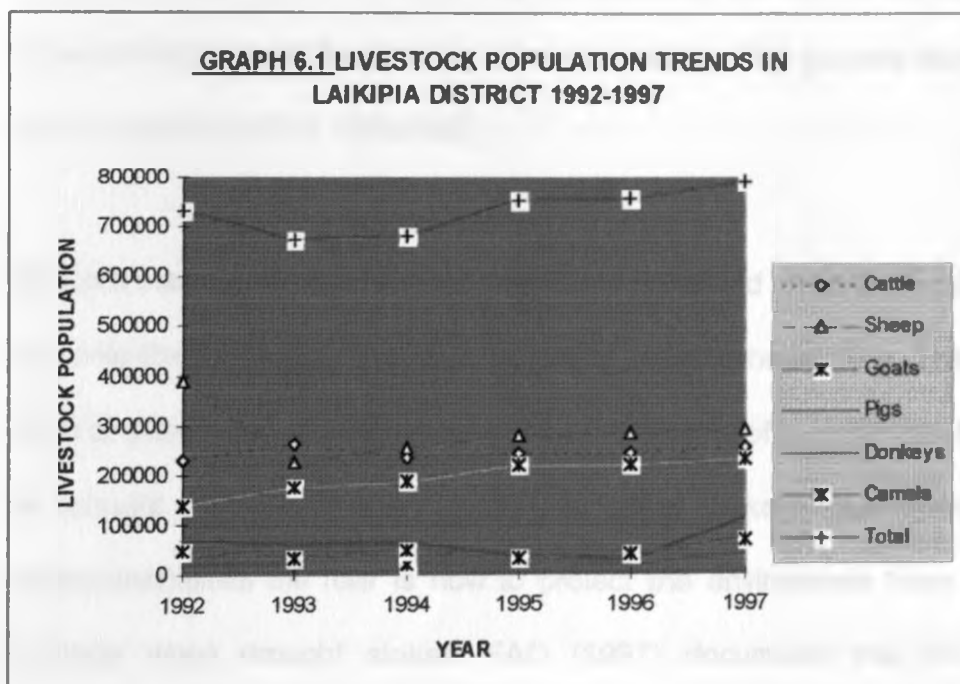
Source : **Researcher 1998.**

Livestock production may specifically contribute to land degradation through soil erosion, pollution of air and water resources, the emission of greenhouse gases especially methane and the erosion of ecological bio-diversity. Livestock interact with land (soil, vegetation, water and air) producing large quantities of wastes. Where animal concentrations are high, wastes pose an enormous environmental hazard (FAO 1997, Blackburn 1996). De Haan (1995) indicates that livestock and livestock wastes cause gaseous emissions with importantant local and regional/global impact on the environment.

6.4 The Role of Periodic Livestock Markets as Destocking Outlets.

Livestock environment interactions are wide and complex and are basically second level problems because it is not livestock per se but the way in which livestock are used by the growing human population that governs their impact on the environment (FAO 1994/1997).

Drought management techniques in arid and semi-arid rangelands have deluded not only the pastoralists but also the policy makers themselves. The fear in the mind of pastoralists is that of how to sustain the size of their herds at the advent of drought calamity. In the mind of the policy makers, conservationists and environmentalists the fear is how to protect the environment from irreversible damage when drought strikes. FAO (1997) documents that the origin of irreversible land degradation in arid lands if it occurs stems from high stocking rates during droughts.

The appropriate management strategy is to destock as early as possible when the animals are quite healthy, rather than seeking to maintain maximum stock numbers. However it is illogical to expect destocking without the proper mechanisms being in place.

Policies and institutional frameworks which support such destocking need to be placed forth and a well established market system developed. Such policy framework should encompass the following :-

- A well connected and regulated livestock marketing

- Infrastructural investment in roads, slaughter houses and delivery market systems

- A freer and secure pastoral economy free of the risks of rustling and raids

- Promotion of early off take techniques like the establishment of fattening zones in the non-pastoral rangelands.

- Levying grazing trees on co-operative communal areas prone to the danger of "tragedy of the commons"

- Lifting market fee charges on the side of the buyers and sellers

The removal of price distortions for other agricultural inputs, in order to reduce the conversion of pastoral key resources into marginal cropland and agricultural encroachment. Even where there is no deliberate attempt to distort markets, valuable natural habitats are converted to agricultural production including livestock because other costs like loss of bio-diversity have not been accounted for.

Responses of traditional pastoral herders to changes in cattle prices has been subject to much debate and the perception of a negative price response (less cattle sales when cattle prices rise) and keeping of animals for prestige still prevails.

Evidence shows that with the establishment of proper marketing channels animal before the off take more than doubled.

The depressing effect of off-take by price fluctuation is much more out of supply and demand forces rather than the perception of the pastoralists. Secondly, weather fluctuations also determine off-take. If there are good pastures the supply dwindles and the prices tend to rise; and vice versa. However, with a well functioning market these weather implications tend to be cushioned off by the more attractive economic benefits and incentives. Improved infrastructure, especially roads and markets allow a smooth movement of goods and services and rapid herd off-take especially in times of drought.

Local and regional market integration and commercialization greatly increases the volume of animal waste at market sites. Thus the most important environmental effect results from waste generation at the market site. The problem is basically that of waste concentration at one given area rather than just waste production as such (see plate 6.1 below). All these markets being public utilities lack funds to maintain quality operations and clean up programmes. Market fees need to be kept low so as not to distort the economic viability and the social acceptability of any given environmental protection programme.

PLATE 6.1 High concentration of Livestock at the market site leading to the generation of enormous quantities of waste.

The waste generated is responsible for further environmental damage. However it is not just the generation of waste *per se* which is the problem but the point concentration of large quantities of manure over a long period of time can have serious environmental consequences.

Fundamentally however, the waste generated at the market site is "a big blessing in disguise" in that it can be used as a substitute for the inorganic fertilizers in crop agriculture and in enhancing the highland -lowland interaction complementarities in the district.

Quite clearly livestock do not set out on their own and decide to degrade or not to degrade the environment. It is rather, the socio-economic and political

context defined by humans which determines livestock effect upon their surroundings (Blackburn (1997)). Livestock and the environment can achieve a balance while at the same time fulfilling humanity's food needs and contributing to sustainable economic growth and development (De Haan (1996). Thus, the role played by livestock is not all negative and purely devastating. Livestock should not be used as scapegoats for environmental degradation as the quote by FAO below tends to warn; on the issue of scapegoats and missed opportunities :,

> "Perhaps it is no coincidence that the scapegoat is an animal. From statements like "livestock have been criticized for damaging the environment in a number. of ways (FAO 1998) and "livestock have been charged with the wholesale devastation of African rangelands and irreversible destruction of soils and desertification (Winrock International Institute 1992) it would appear that livestock themselves go out and decide to destroy or not to destroy the environment. Two centuries after enlightenment we still need a scapegoat literally. Livestock do not move, produce or reproduce without us wanting them to do so. They are completely dependent upon us. Livestock do not degrade - humans are the ones who do so by their management of livestock. As a result these misconceptions about livestock, development institutions and governments continue to miss opportunities which would permit the livestock sector to make its full contribution towards total human welfare and economic growth!! (FAO 1997: 90).

Where high livestock populations and poverty coincide, such as in pastoral areas poor management of livestock degrades resources still further. This pressure calls for new policies, institutions and markets and require the

development and adaptation of new technologies to make livestock environmentally more benign. The scope of such an endeavour is enormous and so is the task.

6.5 Effects of Established Markets on the environment:

The establishment of livestock markets lead to the proliferation of a wide range of activities such as open air cooking,snack and fruit hawking retailing light of hardwares/home tools & utensils and selling of veterinary drugs among others. PLATES 6.2A, 6.2B below. Show the selling of veterinary drugs by a businessman at Kimanjo Market in Mukogodo division. Such markets do not only facilitate technological uptake they are the humble beginnings of what may become large rural trade centres. Such auction markets attract large numbers of both people and livestock.

PLATE 6.2A

PLATE 6.2A/B   A businessman selling veterinary drugs from his pick-up truck during a
Livestock auction at Kimanjo.

PLATE 6.3   Rumuruti Livestock auction showing heavy and intensive concentration of livestock and human population at the market site

These activities in total have serious spillover effects.   Of much concern is the surrounding vegetation and soil.   While the periodicity of the markets is not worrying the large number of animals and human populations in attendance cause such environmental damage that by the next auction the area will not have recovered from the trampling effect and the stress suffered during the previous meeting.   Animal and human population concentrations are so high that they can by their very own cause enough vegetation removal hence exposing the soils to other forces of erosion.   In addition these animals spend the day browsing on any vegetation on sight as well as intensive trampling of the soil surface. (see plate 6.3)

Such intensive concentrations as depicted in the plate above are typical in livestock markets and persist for long hours. Thus such concentrations lead to trampling effect causing a lot of stress on the soil and on any available vegetation. The actual auction exercise is done under conditions of high livestock concentrations as shown in plates 6.4A and 6.4B below

PLATE 6.4A   The auctioneer (holding a microphone and a clipboard) conducts an auction at Kimanjo Livestock market under conditions of high livestock concentration.

PLATE 6.4B Livestock (cattle) awaiting sale at the Rumuruti auction yard. These animals running to their hundreds are kept under such "concentrated" conditions for long hours causing serious trampling.

Equally important in accelerating environmental degradation at the market site is the large number of trucks at the market site. Livestock trade is heavily dependent on motorised transport especially over very long distances and as such the use of lorries is commonplace. PLATE 6.5 here below shows the presence and the effect of such trucks (lories) at a livestock auction site in Rumuruti. The environmental damage done at these markets is therefore the cumulative total of the isolated contributing agents like livestock trampling, vegetation removal by people and trampling by heavy trucks.

PLATE 6.5 Heavy trucks (lories) are a common feature at most livestock auction markets.
They eventually "make their own roads" where none was planned resulting
to serious destruction of the soil and vegetation in the entire market

These trucks are a major source of the total effect of vegetation removal and soil

trampling at the markets. Due to the trampling effect of the tyres and with time

"roads" develop and eventually they form themselves into rills and gullies. With

increased and prolonged exposure to such conditions the result is bareground

and loose soil both of which contribute to increased soil erosion by wind and

water. With increased erosion and continued pressure from both animals and

human population coupled with heavy traffic, the soils are loosened and the

gullies become wider. The loosened soil is washed away once it rains leading to

serious land degradation. Such elaborate and big markets need well planned

roads. This scenario is demonstrated by PLATES 6.6 and 6.7 hereunder

PLATE 6.6 A gulley in the making inside the market grounds. Such are accelerated by the effect of heavy vehicles on the bare ground.
(Please notice the notebook indicating the depth)

Livestock marketing attracts a variety of other activities which are in themselves environmentally degrading. For instance, in order to feed the large numbers of people at the market ,a number of traders establish "open air cooking" and "food hawking".Thus trees within the market area are cut to provide fuel for this activity (see plate 6.7 below)

PLATE 6.7 Showing a gulley which has developed in the market. Notice the depth- (see where the notebook is placed). Also notice the activities going on at the background (open air cooking, and also the track developing where the cyclists are passing. This will with time worsen the gulley.

For the market to be officially established several social facilities/utilities must be provided. These include most importantly pit latrines. The construction of such facilities definitely requires the clearing and removal of vegetation however minimal which may disturb the smooth functioning of the ecosystem. The plate below shows the establishment of such a facility.
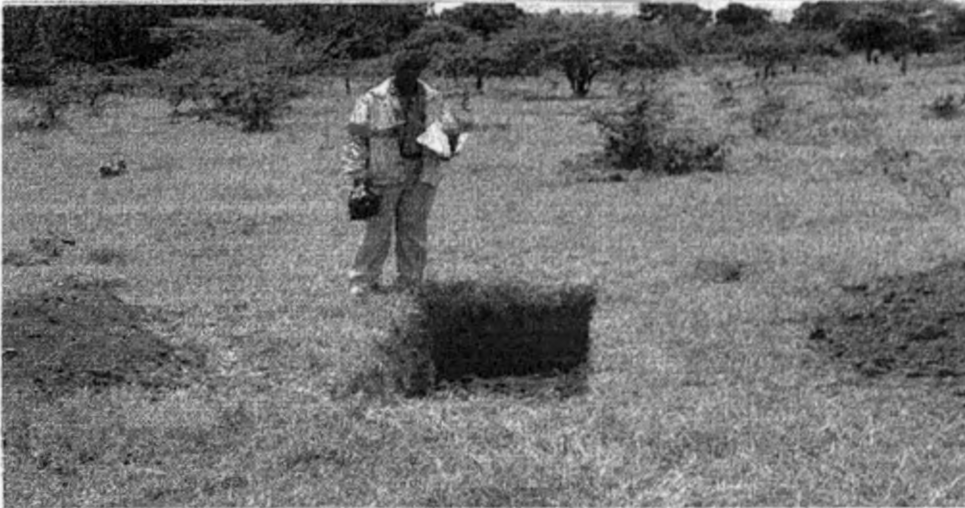
PLATE6.8   Shows a pit latrine being dug at Rumuruti Livestock Auction
Site as a basic requirement for the market by Public Health Authorities.

Other marketing related "infrastructrure" must also be developed at the market site.   Plate 6.9 and 6.10 show the "Loading bay (Crush)" constructed of timber and a trench.   Such a facility is used to direct stocks into the lorries for transport. See plate 6.9 & 6.10 below. The loading bay area in each market is always seriously trampled. The construction of such facilities is not only timber intensive but also requires the removal and clearing of vegetation hence leading to exposure of the ground to forces of erosion. In plate 6.9 below it is clearly noticeable that the grass around the crush has been completely removed thus exposing the soil to forces of erosion and further degradation.
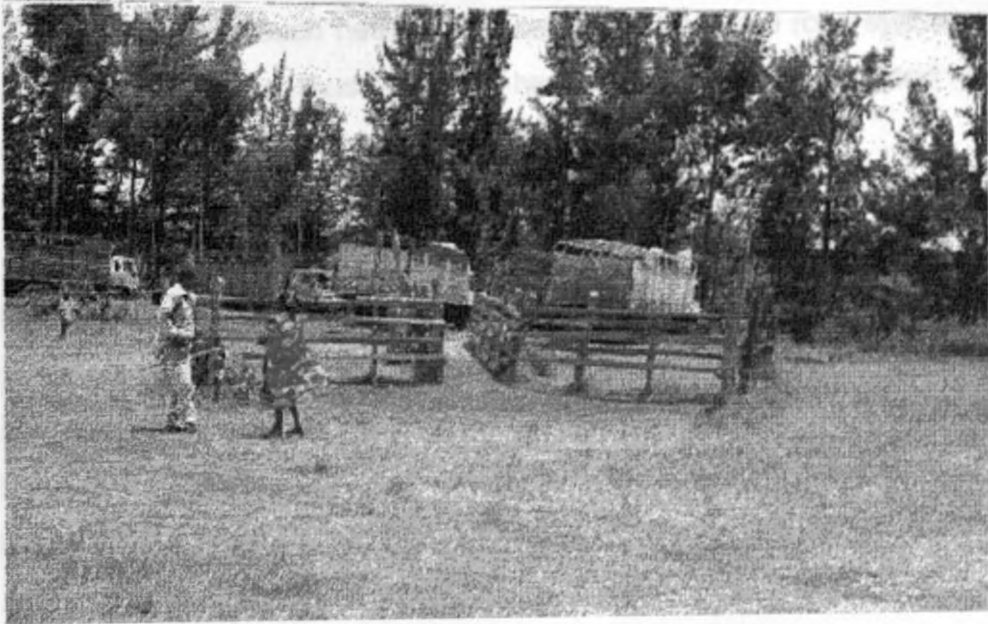
PLATE 6.9 Showing serious trampling and vegetation removal at the loading bay

PLATE 6.10 The actual loading exercise. (Notice the lorries queueing at the loading bay).

Transportation of Livestock requires heavy motorized trucks partly because of the weight and also due to the long distances over which they are transported. Plate 6.9 above shows a section of trucks at Rumuruti market awaiting loading at the "loading crush". Such heavy traffic needs an elaborate road system around the market. The market thus eventually has to be made accessible and with time clear cut roads develop due to repeated use by heavy traffic.

(see also plate 6.5)

For safer transportation of the animals a "stablilizing material" is used on the floor of the trucks. This is mainly sawdust gotten from sawmills in the district. Several markets were observed to have piles of sawdust which the truck owners used to make the animals stable in the lorries while in transit. Such material is left in big piles in the market and it is expected to interfere grossly with the general ecosystem characteristics besides being a form of sight/eye pollution

PLATE 6.11 Shows such a pile of sawdust. See where the book is stuck at the middle. Sawdust is used to make the animals stable in the lorry while in transit and hence avoid injuring them (or one another)

Such piles of sawdust pose as ugly sights in the markets and are considered environmentally pollutive

6.6 Conclusion

The effect of livestock concentration at the market site depends on the type of animal and also the type of vegetation. In most market sites the effects are noticeable only after some time of market operation. In other markets like Rumuruti and Sipili the effects are quite obvious and advanced.

Comparing plates 6.12 taken from Gatirima and plate 6.13 from Sipili with plate 6.6 or 6.7 above from Rumuruti market which is relatively older and with more intensive livestock concentration one notices a clear cut difference in the extent of environmental degradation on each market.

PLATE 6.12   Gatirima livestock market (mainly a cattle market). Despite the heavy El Nino rains the trampled bareground had not recovered

PLATE 6.13   Sipili small Ruminant market (Goats & Sheep only) The browsing effect of the small ruminants at the market site can be clearly seen at the foreground where the grass has been completely removed.

However, to the left bottom corner of Gatirima market (plate 6.12) some effects are already noticeable. The waterlogged and bare spot is used for the auction. during price bidding

Sipili market which is a weekly small ruminant market (goats and sheep) has developed extensive bareground. This is attributable to the fact that small ruminants are browser's on small herbs and grasses often cutting off the growth shoots hence uprooting or killing the plants/vegetation.

Heavy livestock concentration of cattle around watering points as agents of accelerating soil erosion has been documented elsewhere. Ridley (1988) points out that:

"Overstocking of pastures and concentration of cattle around watering points accelerates soil erosion."

It is indicated clearly that heavy concentration of livestock can cause soil erosion regardless of whatever scale and intensity. As evidenced by plates 6.14 and 6.15 below it is clear that the specific requirements of auctioneering are that the herds be restrained and hence concentrated. It is undeniable therefore that grass removal through trodding is a direct consequence of such concentration. plate6.14 and plate 6.15 show auction yards enclosing about 450 and 300 animals awaiting auction; at Rumuruti and Kimanjo Livestock auctions respectively.

PLATE 6.14 Escessive livestock concentration at the auction site in Rumuruti market.

PLATE 6.15 Excessive animal concentration at Kimanjo livestock auction market. Such concentration is responsible for severe environmental degradation.

Secondly the hypothesis that there is no difference in the nature and extent of environmental damage in various livestock markets is also rejected. It has been shown that the nature and extent of environmental damage is actually determined by the size of the market in terms of the attendant human and livestock populations and the age of the market. Markets with large livestock populations like Rumuruti, Sipili and Kimanjo had suffered relatively much more severe environmental damage. Older markets like Rumuruti and Dol Dol also had more obvious and advanced indicators of environmental degradation.

CHAPTER SEVEN

SUMMARY , FINDINGS POLICY RECOMMENDATIONS

AND CONCLUSIONS

7.1 Summary

The present study set out to investigate the spatiotemporal structure of livestock periodic markets and the association they have with their environment. With specified structural components of marketing dynamics being pivotal in this study the overall system of Livestock period Markets was examined in the general context of the Central place theory. The general theoretical framework of the central place theory was used despite the idiosyncratic peculiarity of livestock periodic markets because these markets are seen as an important integral component of the total central place structure of any given region. Secondly, although the elemental characteristics of these markets differ from other non-specialised central places, they were not expected to present with any significant departures from the traditional norms. It can be said quite validly that, livestock periodic markets do form an important part of the system of spatial points (nodes) which articulate local, regional as well as national exchange process.

In this final chapter , a comprehensive summary is provided, elucidating the relevant research findings, related conclusions and the resultant

recommendations in the light of the stated research objectives and hypothesis as earlier stated. Also to be presented are the specific contributions made by the current study.

The component objectives of this study were :

(i)   to examine the spatial structure of Livestock Periodic Markets in Laikipia district

(ii)   To examine (determine) the temporal distribution of livestock periodic market.

(iii)   To determine the degree of spatiotemporal synchronization of livestock periodic markets in the district.

(iv)   To investigate the factors determining market provision in Livestock trade in Laikipia district.

(v)   To determine whether livestock periodic markets contribute towards environmental degradation /damage within the enclosed market areas.

In order to facilitate meaningful and utility yielding statistically quantitative and qualitative analyses, the above objectives were recast into their respective null hypothesis and each subjected to statistical testing for purposes of rejecting or failing to reject it.

The recasted hypothesis are as follows:

A H 01   The spatial structure of livestock periodic markets in Laikipia

district is not even and market places are randomly distributed.

    H 11   The spatial distribution of livestock periodic markets in Laikipia

district is uniform.

B H 01   The spatio-temporal structure of livestock periodic markets in

Laikipia district is such that proximity in space does not imply

separation in time

    H 11   The spatio-temporal structure of livestock periodic markets in

Laikipia district is such that proximity in space implies separation in time.

C H 01   There is no significant relationship between population density ,

accessibility,and degree of regional specialisation with market

provision in Laikipia district.

    H 11   There is a significant relationship between population density ,

accessibility,and degree of regional specialsation with market

provision in Laikipia district.

D H 01   Livestock periodic markets do not contribute towards

environmental damage at the enclosed market areas

    H 11   Livestock periodic markets contribute towards environmental

damage at the enclosed market areas

7.2 Research Findings

The research findings presented here proceed directly from the stated objectives that governed the study. The salient findings on the spatiotemporal structure and factors of market provision are each given separate treatment distinctively and the various interrelationships investigated in the study are presented in subsequent sections.

7.2 (I) Spatio-Temporal Structure of Livestock Periodic Markets.

Within the general context of determining the structural nature of Livestock Marketing and in pursuance of the more specific objective of examining the spatiotemporal structure of periodic markets it was imperative to focus on the single elemental components of space and time. In this regard the spatial and the temporal structures of these markets were split and treated separately and later combined in the analysis of the degree of spatiotemporal synchronization.

The Following are the Summary Findings:

7.2 (I) (a) Spatial and Temporal Elements.

(1)   The spatial distribution of Livestock Periodic Markets is random and there

is disparity in the distribution of markets in the district. A Nearest

Neighbour Statistic (Rn) of 1.0753 suggests a random distribution.

(2) The spatial random distribution of Livestock Periodic Markets follows logically from the nature of the population distribution which is clustered into pockets of high concentration interspersed with pockets of very sparse population.

(3) That Ngarua division accounts for 40% of the total number of Livestock market places in the district and 27% of the available market days. This is followed by Mukogodo with 20% and 27%, Lamuria with 20% and 20%, a Central 10% and 13% and Rumuruti with 10% market places and 13% market days respectively. Nyahururu dose not have any Livestock Periodic Market at all.

(4) That, the temporal distribution of marketing days is not normal and some divisions have more or less than their fair share of the available marketing opportunities in the 14 day Market Calendar. Wednesday and Saturday are the most popular days for Livestock auctions with a total of 6 auction market sites in the district. Sunday is not preferred for auctions because of religious factors.

(ii) Spatiotemporal Structure of Livestock Marketing

The separate elemental components summarized above are integrated here with a view of presenting the findings on the degree of spatiotemporal integration of Livestock Markets in the study area. As earlier indicated the nature of Periodic

Marketing systems is such that proximity in place implies separation in time and this is termed as the *Temporal Locational hypothesis*

The salient research findings under this heading are as follows:

(1)   That there is an inverse relationship between the spatial location and temporal spacing of Livestock Periodic Markets.

(2)   That the degree of spatiotemporal synchronization of Livestock Periodic Markets is quite high with an inverse correlation coefficient of -0.96057.

(3)   That, the optimality of both the spatial and temporal distribution is maximized even in areas of low population densities indicating the dependent nature of livestock markets on other market provision variables like regional specialization.

(4)   That areas with better road transport network did not necessarily exhibit better market integration despite the important role played by accessibility in the process of integrating markets. This is due to the fact that market provision in Livestock trade is more a function of the availability of commodity surplus.

7.2(I) (b) Market Provision Variables in Livestock Trade.

Population density, accessibility and Regional specialization were found to significantly contribute towards the provision of marketing opportunities. Regional specialization as a surrogate measure of commodity surplus accounts

for a bigger percentage of the total variation in Livestock Market provision. Together the three variable explain 76.779% (≅ 77%) of market Provision in the district. Regional specialization tends to be more strongly associated with livestock market provision than either of accessibility and human population density.

Specific findings in this subsection can therefore be summarized as below -

(a)   There is a significant relationship between market provision and
       population density, accessibility and the degree of regional specialization
       in the study area.

(b)   Livestock periodic markets are actually commodity specific and tend to
       locate in areas with substantial quantities/volumes of commodity surplus,
       implying those areas with high livestock population densities.

(c)   Human and physical infrastructural components tend to influence the
       development of livestock marketing to a great extent

(d)   On the very local level livestock marketing is not heavily dependent on
       an elaborate system of motorized transport network although this is quite
       essential on the regional level. This is basically because most traders
       (marketers) use "trekking" in transporting their stock.

7.2 (I) (c) Market Going Behaviour, Distance Decay Variations and Livestock Marketing

The relationship between market usage rate and the distance from the market was found to be strongly inverse with a typical hyperbolic distance decay function.

The major findings of this section are :-

(i)   Market proximity is one of the most important determinant factors of the rate of market usage.

(ii)   Distance from the market does significantly influence the number of visits made to a particular market. Alternatively this is put that market going behaviour is a function of proximity to the market;

(iii)   Due to the poor nature of the transport network in some pockets in the district ,the number of visits to a particular market is tremendously reduced.

(iv) T he number of visits are explained only 46% by distance and other factors account for the remaining 54%.

(v)   The relationship between distance and rate of market usage is not-linear but log-linear hence depicting a phenomenon explained by a loglinear model.

7.3 RECOMMENDATIONS

Based on the research findings arrived at above in the foregoing sections, this section presents recommendations for various interest groups:- namely planners, policy makers, researchers and scholar.

7.3 (a) Spatio-Temporal Structure of Livestock Periodic Markets

7.3 (a) (I) Recommendations for Planners and Policy Makers

Regional planning as is argued in this present study should recognize the role played by the local central places both as market sites as well as local foci for socio-economic interaction; and as service points for their overlying hinterlands. As such, these foci should not be ignored but should be seen as important locale of an integrated system of central places. Fundamentally though Livestock Periodic markets can be functionally differentiated as this study has shown.

A well articulated circuitry of markets providing service of high order goods (Livestock) has been identified. This system of markets though operating in the overall structure of central places, it exhibits unique spatio-temporal characteristics quite idiosyncratic to it in particular.

Regional Planning Policy Should Therefore Recognize the Following -:

(1)   That the benefits accruing from an integrated regional economy can only be realized on the identification of a well articulated structure of central places which provides an efficient spatio and temporal organization both at the local as well as the regional level. Such a system should be devoid of duplication, waste and unnecessary spatiotemporal bottlenecks.

(2)   That different circuits of central places with specialized functionalities do exist within the general spatial framework and structural network of central places. Such specialized central places should be treated in planning as "systems within a system" and hence given specialized planning attention. Livestock periodic markets fall under this classification and their presence is a clear indicator of a more elaborate economic reality that of regional specialization which should be planned for and not against.

(3)   Laikipia district being a livestock Producing zone has a tremendous potential for a pure livestock economy of a rare type. As a result this has brought about a sub-system of livestock periodic markets behaving like typical central places but forming an interface between the rural and the urban sub-system of the National space economy.

(4)   Regional policies should redirect resources to infrastructural development

in the right priorities. This can be achieved by the provision of basic

physical/standard infrastructural facilities and requirements like roads.

(5)   That in trying to discern the spatiotemporal structure of livestock periodic

markets, their expansion and spatiotemporal elements are of

considerable planning cum diagnostic utility, and this is because their

establishment proceeds rather than follows other typical socio-urban and

economic developments like the sitting of administrative , educational and

health facilities. The direct planning implication of this, is that, the

success of a livestock periodic market is a strong indicator for the

potential establishment of a successful rural service centre.

(6)   Lastly, that the centrality of a Livestock Periodic market is a measure of

how well it can attract the largest number of saleable goods (stocks) and

buyers. Although large populations do turn a larger volume of business

(for lower order goods); this doesn't always hold true for livestock which

are considered to be "high order goods". This is of critical planning and

policy relevance because densely populated areas may not necessarily

be ideal for setting up livestock markets; but areas with reasonable

commodity surplus are definitely suitable provided they have minimal

formal infrastrusctural network.

It is only logical therefore to conclude that the spatiotemporal structure of the periodic market system should not be isolated from the general regionalised specialization and production capability potentials of any given area. The structure is thus commodity specific. There is need to differentiate between the periodic market place sub-system and the urban sub-system. Although the later is not part of the former , the former is an integral component of the latter.

In this way the Central Place Theory (CPT) was used to explain the actual pattern of central places in the study area and to show how the development process can be directed towards a balanced regional development strategy.

The Following Specific Recommendations need urgent attention as they Currently affect the Performance of Livestock Trade in the District.

(a) There is urgent need to stump out cattle rustling and boost the general security situation in the district. Cattle rustling and armed raids are not only a menace to the entire livestock production system but are also a threat to the overall economic progress of the district and the region as a whole. Withare and Ol Moran livestock auctions are examples of markets affected by serious insecurity.

(b) Complex bureaucratic trade procedures should be dropped in favour of market stimulating ones. In this regard "the Letter of no objection" and the government permit should be issued at the market site by the relevant ministry or

department. The current practice of having traders "hunt" for them is not only time wasting but also unnecessary

(c) Attempts should be made to rationalise the fee charged by the local authorities with an aim of ploughing it back to the source market for its development rather than remitting it to the headquarters at Nanyuki. Such remission is counterproductive and development retarding.

(e) There is urgent need to improve the road transport network in Mukogodo, Central and Lamuria divisions as their current situation is impassable. These divisions hold a significant proportion of the overall investment in the livestock subsector.

(f) The "auction system" should be popularised by the relevant arm of government ministry because it has a higher potential for improving the already worsening security situation and also validating and authenticating any transaction. This would discourage "theft of stocks" as there would be no market for such stolen animals.

(g) New markets should be established to complete the integration of the marketing *spatiotemporarily* . The establishment of a new market could be achieved by incorporating a new market day in the marketing calendar (that is

temporal approach) or by sitting a new market place (spatial approach) or by both spatially and temporally (spatiotemporal approach).

(h)Lastly Livestock periodic Markets should be popularised as important locale for the injection of locally produced livestock into the distributive network besides acting as distribution points for imported manufactured goods and as convenient centres for technological uptake.

II Recommendations for Researchers and Scholars

Given the nature and scope of the present study a number of crucial aspects have been excluded in an effort to keep the research within realistically manageable limits as dictated by the time, scope and the financial resources at the disposal of the researcher.

Possible Areas for Further Research include:-

1) Studies should be undertaken on the overall periodic market system with a view of identifying the underlying hierarchical stratification and potentials. Such a study should comprehensively address the nature of periodic marketing in its component elements of space and time .

2)   A detailed study on periodic marketing rings and circuits in the district
     needs to be done aimed at identifying incomplete from complete
     marketing rings and devising a policy framework for rectifying such.

3)   There is need for a comparative study on the nature of livestock
     marketing in typical semi-arid area as well as a high potential area for
     purposes of identifying similarities, differences and departures from the
     present study. This should also address the spatiotemporal elements of
     the marketing system.

4)   Lastly, studies directed towards understanding the delimitation of market
     hinterlands and areas needs to be carried out purposely with the prime
     intention of identifying the underserved populations and populations
     without access to a market.

7.4 Livestock Marketing Development and the Environment

The study has established that livestock periodic markets do actually contribute
towards environmental degradation / damage. Due to intensive concentration of
livestock at the market sites several environmentally degrading repercussions do
occur. Of major importance is the removal and destruction of vegetation , the
generation of large quantities of waste (manure) and the trampling of soil making
it loose and vulnerable to forces of erosion. Also contributing towards significant

environmental damage is the effect of heavy and numerous trucks which are used in transporting purchased stock out the market. The hypothesis that livestock periodic markets do not contribute towards environmental damage within the enclosed market area is thus rejected and the conclusion reached is that these markets are actually responsible for a considerable deal of environmental damage.

Livestock marketing policy formulation must proceed/occur within the context of a comprehensive understanding of the requirements of environmentally sustainable livestock sub-sector development, and in full view of the interactive market forces. Yet to be incorporated in development planning in the rural areas of the Third World Countries is the realm of population and resource utilization nexus under the umbrella of the current broader theme of population, environment and sustainable development.

Economy wide and sectoral pricing policies often pursue social or economic objectives outside the sector and often fail to address the environmental dimension. For the livestock sector, this often means a policy to promote the provision of cheap accounting for the environmental costs involved in their production and marketing. This has also been distorted through inappropriate incentives on inputs and by constraining beneficial livestock-environment synergies Dysfunctional marketing systems and unnecessary government

intervention don't promote sound environmental protection measures.

The salient research findings in this subsection are summarised below

(I) Much of the controversy about the impact of livestock on the environment is due to lack of quantitative and /or enough descriptive qualitative information to describe not only the livestock production system but also the ecosystem in which it is set.

(ii) Oftenly ,policy makers in the district (and also the country at large) are not aware of the environmental effects of the policies they make. Resource use in the process of development should be closely monitored using appropriately designed technologies like Geographic Information Systems (GIS).

(iii) With good management livestock production can make a tremendous positive contribution to the natural ecosystem and resources, by enhancing soil quality and fertility, increasing plant and animal biodiversity and productivity and by substituting for scarce mineral inorganic fertilizers. Such a case in point is Laikipia Ranching Ltd. which uses the large quantities of manure generated by the thousands of animals in the ranch for wheat production. Such livestock-environment positive interactions should be encouraged.

(iv) Livestock are capital goods which are highly "mobile" and "liquid" and as such can be liquidated rapidly if economic incentives are unattractive. Such case

of liquidation and mobility makes livestock production much easier to manage in their interaction with the environment as their numbers can always be controlled by sale or movement

(v) Institutional weakness were seen to be mainly responsible for damages done to the environment by livestock. The local authorities, marketers, farmers and the auctioneers seemed not to appreciate the full environmental effects that carelessly organized and unplanned marketing systems can have on the environment.

(vi) Inadequate level of infrastructure may lead to poor disposal mechanisms and hence concentration of large amounts of waste. It also constrains rapid de-stocking of such arid ecosystems and so stifling their adaptive ability to the prevailing erratic climatic conditions. However, as has been partly the case in Laikipia district infrastructural development in form of livestock markets establishment has paved way for reckless exploitation and destruction of vulnerable ecosystems of the arid and semi-arid rangelands: But by and large except in a few isolated cases infrastructural development and in particular marketing infrastructure can be a powerful instrument in mitigating negative environmental impact .

It is essential that as the livestock sub-sector grows and develops, adequate measurements are taken.

To make it comprehensively sustainable, its here(by) suggested that:

Inappropriate incentives should be discarded in order to pave way for responsible environmental protection (e.g. cattle rustling and communal property tenure regimes which expose the environment to the fallacy of the tragedy of the commons.

The strengthening of traditional pastoral institutions and resource management practices, by getting institutions right and by empowering the pastoral people.

Development of effective co-management regimes and forging of partnership between the state, local councils, sellers, buyers and auctioneers for purposes of constructing environmentally sound facilities, institutional frameworks and policy guidelines in environmental protection.

Marketing fee charges should be kept low so as to prevent the development of a defective market system which can adversely affect the success of any environmental protection and conservation Programme.

Policies must be multifaceted for them to be able to address all the relevant components of total comprehensive development. For example to make arid range livestock systems more sustainable, market pricing for livestock need to

be accompanied by inter-alia, institutional changes in access to key resources. Also any sustainable livestock development strategy in marketing has to take full account of producer and consumer objectives not forgetting environmental objectives. Policies need to be consistent with both protection and conservation.

Ideally commodity prices should include all direct environmental costs in order to give market signals that embody the proper valuation of environmental costs. At the moment, the fees charged at the markets are not used for environmental protection ,cleaning, waste disposal and undoubtedly they do not have any environmental cost loading. The use of participatory approaches in environmental issues and policy formulation should be encouraged instead of adopting the self-defeating top-down approach.

7.4 I (i) This Study Makes the Following Specific Recommendations to Planners and Policy Makers.

(a) Policies which internalise environmental costs should be put in place and adequate load sharing mechanisms designed for purposes of generating funds for market maintenance.

(b) Market point pollution should be turned into a win-win scenario by enhancing the highland-lowland interaction complementarities. The large qualities of manure generated in these markets should be "sold" or transferred and used for

crop production in the agricultural areas instead of being left to decompose hence destroying the market site or being washed away into rivers and hence polluting water sources.

(c) The inherent problem of internalising environmental costs should be done in all markets and not at one market because that would be placing the concerned producers at a relative competitive disadvantage vis-a-vis the other producers.

(d) Caution should be taken on the development of infrastructure. Oftenly infrastructure is seen as the "magic key" to development, but it should be understood that infrastructure is like a double edged sword .Infrastructure is often a pre-requisite for technology uptake and resource access and exploitation, but it does not only alleviate pressure on natural resources but it may also make them accessible to uncontrolled exploitation and destruction. In case of Laikipia district, and Mukogodo, Central and Lamuria divisions in particular, the development of marketing and transport infrastructure should be encouraged for purposes of rapid destocking of relieving pressure on fragile ecosystems.

7.4 I (ii) Conclusions

As indicated earlier, periodic markets are a unique subset of the total structure of central places that articulate local commodity trade and exchange. Taken in isolation periodic markets form a clear cut system of central places exhibiting

idiosyncratic characteristics of a rare type. They are central places by virtue of their spatial and locational attributes and functional utility. Livestock periodic markets are not only functionally specialized they also form an important component of the system of the rural trade system in total.

Fundamentally however, a departure from the traditional factors determining market provision was found. Whereas factors like accessibility, population density and income have been taken to be important in explaining market provision, regional specialization was found to be the key variable explaining the provision of marketing opportunities in livestock trade.

- From theoretical , practical (empirically) perspectives the above finding is quite valid and sound. Livestock marketing systems need an elaborate network of road transport if and only if the markets are spatio-temporally disorganized and if the destination are urban centres far from the source. This is not to disqualify and obviate the importance and the role of road transport but it is here concluded that regional specialization is a more important explanatory variable in market provision than is accessibility in Livestock Marketing. Livestock market locations are determined by the relevant resource potentialities of the overlying hinterlands. Equally important is the general framework of livestock production systems and the spatial patterns of agro-ecological resource variations. The resource possibilities of the hinterlands are thus a direct cause to the gross variances in market distribution

- **But.**

This is by no means a necessary and sufficient basis for the explanation of the spatiotemporal structure of livestock periodic Markets in Laikipia district. Such a spatiotemporal system is as a result of the interplay of social , political, economic , cultural and physical factors.

Marketing mechanisms which develop as a result of the spatial variations of physical and agro-ecological zonations are bound to prevail in the long-term but not so with socially and politically determined marketing systems. Despite the non-market orientation of the pastoral production system marketing systems play a big role in transforming regional production patterns into a cash economy. The basic structure of livestock marketing is thus a function of regional potentialities .

All the markets are infrastructurally the same albeit their locational differences in terms of the innately determined functional typologies. Infrastructural development of these markets ranges from minimal to non-existent and some are no more than open fields. That is, some markets are both exchange locale as well as administrative centres while others are purely livestock market nodes with little or no administrative function. More intrinsic to the market structure are the underlying trade patterns that prevail. For instance Ol Moran is a trans-boundary market located in an area of high livestock productivity (density); while

Gatirima is located in the heart of an area of high agricultural crop production. This underscores the importance of some of these markets as nodes for localized and inter-regional trading networks.

Improvements in the overall functional efficiency in livestock Marketing performance can be achieved in the presence of a comprehensive national/ local pricing policy framework, that recognizes the production realities of the local economy. For example improvement of the national transport network can boost market flows -, but with depressed prices the market would technically fail. Livestock Marketing is generally characterized by lack of adequate and accurate market information especially on prices and stock sources. It could be argued that individual price negotiation is inefficient encouraging speculation and yielding a high level of an 'unstable and fluid' market which works adversely against productivity and distribution. Parallel to this is the auction system which is unpopular with farmers due to its vulnerability of being hijacked by the auctioneer and a 'buyers' Cartel; with the unethical aim of depressing prices to deprive the sellers (farmers). However the buyers (traders) prefer it due to its security and ability to authenticate the market exchange transactions.

Because producers are also consumers in the district, not much of what is produced is necessarily marketed. Livestock owners being marginally market-oriented traditional views and attitudes towards holding wealth in cattle, are still

prevalent, and unless strong and well articulated market/economic incentives are provided, the urge to market stocks (sell off) may not be persuading enough. Marketing of livestock is characterized by a wide variation in prices and vagaries of weather and also under the regulatory mechanisms of the local authorities and the government and hence making it susceptible to natural shocks.

7.4 II Recommendations to Scholars and Researchers

There is need for a detailed study on livestock environment interactions in a specific set-up. Further research into the role played by market development as destocking outlets should be undertaken. It could be of interest to researchers to examine the environmental impact that grazing systems in the district have on their environment and appreciate more meaningfully whether they are responsible for any environmental degradation. The marketing of livestock and its de-stocking effects although hard to quantify should be undertaken on more practical approach using advanced mapping tools like Geographic Information Systems (GIS).

There is also urgent need for research to investigate in details the possibility of enhancing the highland-lowland interaction complex in the district .This should be done in an effort to turn environmentally destructive and economically costly manure generation into a viable, sustainable win-win scenario.

7.5 Contributions Made by the Study

The need to isolate and identify the specific contributions of this study with reference to the set objectives is imperative; these are summarised below:

(1) Determination of the spatial and temporal structure of livestock periodic markets in Laikipia district.

(2) Mapping the above spatiotemporal structure using an integrated methodology with the help of the Geographic Information system tool

(3) Provided a detailed coverage of periodic marketing in a typical arid/semi-rid set-up and with an inclination to a commodity specific profile - that of periodic livestock marketing.

(4) Identified a number of research gaps within the realm of the nexus of environment and sustainable development in the current spirit of undertaking comprehensive environment conscious research.

(5) Enriched the Laikipia Research Programme data bank by bringing in new findings on the physical-socio-economic and environmental aspects of Livestock marketing development.

(6) Lastly provided recommendations and guidelines on matters of policy in the areas of marketing development on livestock trade and its related environmental implications. This, it is hoped will go a long way in bringing about a totally comprehensive and balanced policy framework and evade the rather elusive and complex human-livestock-environment interactions.

BIBLIOGRAPHY

1. Aldington ,T.J. and Wilson ,F.A.(1968): "The marketing of Beef in Kenya".Occasional Paper 3.Institute of Development Studies,University of Nairobi.

2. Bakkes,J.A .(1994): "An overview of environmental indicators:state of the art and perspectives "UNEP ,Environmental Assessment Technical Reports.

3. Bekure, S .and Mc Donald ,I .(1984): Movement and Marketing systems of live animals in sub-Saharan Africa. Farnham Royal,Slough,UK.

4. Bekure, S. (1991): "An analysis of the livestock production system of Maasai pastoralists in eastern Kajiado District,Kenya." International Livestock Centre for Africa(ILCA).

5. Berry, B.J.L. and Garrison, K. (1958): "The functional bases of the central-place hierarchy" Economic Geography Vol 34, 145 - 54.

6. Berry, B.J.L. (1967): Geography of Market Centres and Retail Distribution. Englewood cliffs, New Jersey.

7. Blackburn,H.D. (1996) : Impact of Grazing on Watersheds ; A State of knowledge. Journal of Animal Science 73 : 302- 09

8. Bromley, R.J. (1971): "Markets in Developing Countries; a Review" Geography Vol 56. 124 - 32.

9. Bromley,R.J.(1973): "The Spatial and Temporal Synchronization of Periodic Markets". Swansea Geographer Vol 11, 15 - 25.

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10. Bromley,R.J.(1974):Interregional marketing and alternative reform strategies in Eucador.European Journal of Marketing Vol 8 pp 254-64.

11. Bromley,R.J. (1976):Contemporary Market Periodicity in Highland Ecuador. In Smith C.A (ed) Regional Analysis Vol 1 N.Y Academic Press.

12. Bromley,R.J. (1975): "The Rationale of Periodic Markets AAAG vol 65,530-7.

13. Brown, J.R. and Harvey, M.E .(1977): The concept of Market components and the spatial organization of periodic markets. Environment and Planning A9, 1259.

14. Carter,C.E.(1972):Case Studies in East African Geography. Johnston and Bacon London.

15. Chabari, F.N. (1986):The marketing of Sheep and Goats from two Pastoral Systems in Kenya:A comparison of market off take from Maasailand and Baringo. MSc thesis ,University of Nairobi,Kenya.

16. Christaller, W .(1966): Central Places in Southern Germany. Translated by C.W Baskin. Englewood Cliffs, New Jersey; Prentice Hall.

17. Crawford,I.M .(1997) :Agricultural and Food Marketing Management. FAO Rome Italy.

18. Eighmy, T.H. (1968): 'Rural Periodic Markets and the Extension of an Urban System: A Western Nigeria Example' Economic Geography, vol. 44, pp. 30-44.

19. Fagerlund, V.G. and Smith, R.H.T. (1970): A preliminary map of market periodicities in Ghana. Journal of Developing Areas 4. 333 - 47.

20· FAO (1980):Human influences in African pastureland Environments Rome,Italy 13.

21· FAO (1987):Economic Cooperation among Developing Countries in Agricultural Trade. FAO Economic and Social Development Paper No 70.

22· FAO (1990):Guidelines for Monitoring The Impact of Structural Adiustment Programmes on the Agricultural Sector. FAO Economic and Social Development Paper No 90.

23· FAO (1994):Methods of Micro-Level Analysis for Agricultural Programmes and Policies: A guidelines for Policy Analyst FAO Rome Italy 1994.

24· Friedman,J.R.(1981): "Urban Bias in Regional Development Policy"in R.P. Misra(ed);Humanising Development.Singapore: Mazuren.

25· Garnier,B.J. & Delobez, (1979): Geography of Marketing London Longman.

26· Gatere, K .and Dow,K. (1980): Improving Price Information Systems in Beef Marketing in Kenya.Division of Development Planning ,Ministry of Agriculture, Livestock Development and Marketing ,Nairobi,Kenya.

27. Gezann,G.A (1978): Itinarant Salemen and the Periodic Market system of Lushoto district of Tanzania. In R.H T Smith (ed) Marrket Place Trade;Vancouver University of Colombia,Centre for Transportation Studies.

28. Gilpin, A .(1996):Environmental Impact Assessment : Cutting edge for the twenty-first century. Cambridge University Press, Hong Kong.

29. Ghosh,A.(1990):Planning Techniques and Indian Plans Wheeler New Dheli.

30. Good,C.M. (1972a): "Periodic markets: a problem in Locational analysis" The Professional Geographer Vol 24, pp210 - 16.

31. Good,C.M. (1972b): Periodic Markets in Uganda and Travelling traders. The Geographical Review 65,49 - 7215.

32. Good,C.M. (1973): "Markets in Africa:a review of research themes and the question of market origins".Cashiers D'Etudes Africaines Vol 13,769-80.

33. Gormsen, E. (1978): "Weekly markets in Puebla Region of Mexico in R.H.T Smith (ed)Market place trade,Vancouver:University of British Columbia,Centre for Transportation Studies.

34. Hammond, R. and P.M. Mc Cullagh (1978): Quantitative techniques in Geography. Oxford - London.

35. Handwerker, W.P. (1978): "Viability, Location and Timing of Liberian Periodic Markets". In Smith, R.H.T. (edit). Marker-Place Trade, Vancouver:University of British Columbia. Centre for Transportation Studies.

36. Harper, M. and Kavura, R .(1982): The Private Marketing Entrepreneur and Rural Development. Technical Services Bulletin 51. Rome, Italy: Food and Agriculture Organization of the United Nations (FAO).

37. Harriss, B. (1980): Going against the grain, Pages 265 - 288 in proceedings of, International Workshop on Socio-Economic Constraints to Development to Semi-Arid Tropical Agriculture, 19 - 23 Feb 1979, Hyderabad, India. Patancheru, A.P 502 324, India: ICRISAT.

38. Hay, A.M. (1971): "Notes on the Economic basis for Periodic Marketing in Developing Countries", Geographical Analysis Vol. 3 393 - 401.

39. Hay, A.M. and Smith, R.H.T. (1980): The spatio – Temporal Synchronization of Periodic Market-Places : A re-examination. Canadian Geographer Vol 40 pp.100-120,.

40. Henkel,R. (1979):Central Places in Western Kenya ,Geographischen Instuts der Universitat Heidelberg.

41. Henning S. (1997) Livestock-Environment Interactions : Issues and Options. FAO ,Rome Italy.

42. Henning .S and G.De Haan (1997) :Livestock-Environment Interactions : Finding a Balance FAO, Rome Italy

43. Hill, P. and R.H.T. Smith(1972): "Spatial and Temporal Synchronization of Periodic Markets:Evidence from four Emirates in Northern Nigeria".Economic Geography Vol.48,pp.345 – 355.

44. Hodder,B.W. (1961): "Rural periodic markets in part of Yorubaland". TIBG Vol.29. pp 149 - 59.

45. Hirschman,A.(1958): The Strategy of Economic Development.New Haven, Connecticut: Yale University Press.

46. Hodder, B.W. (1962): "The Yoruba Rural Markets". In Bohannan P.E. and Dalton, G. (edits). Markets in Africa. Evanston: Northwestern University Press.

47. Hodder,B.W. (1965b): "Distribution of Markets in Yorubaland". Scottish Geographical Magazine Vol 81 pp48-58.

48. Holtzman, J.S 1982, A Socio-Economic Analysis of Stall-Fed Cattle Production and Marketing in the Mandara Mountains Region of Northern Cameroun. Ph.D thesis East Lansing, MI, USA: Michigan State University.

49. Irandu,E.M.(1982) : The Road Network in Mombasa Municipal Area : A Spatial Analysis of its effects on Land Values,Population Density and Travel Patterns. Unpublished M.A Thesis ,University of Nairobi.

50. Irandu, E.M. (1995) : "Air Transport in Kenya : An Analysis of Domestic and International Airline Networks. Unpublished Ph.D. Thesis, Department of Geography ,University of Nairobi.

51. Ishihara, H .(1971): "Contemporary periodical markets in Echigo Province, Japan" Journal of the Faculty of Literature of Nagoya University Vol.74, 169-85.

52. Jaetzold,R.and H.Schmidt (1983): "Farm Management Handbook of Kenya:Natural Conditions and farm Management Information Vol II/B" Ministry of Agriculture -Kenya.

53. Johnson, E.A.J. (1970): The Organization of Space in Developing Countries. Harvard University Press.

54. Johnston, R.J.(1978) "A study on Temporal and Spatial arrangement of Periodical Markets". Journal of the Faculty of Literature of Nagoya University Vol 74. 169 - 85.

55. Johnston, R.J. (1980): Multivariate Statistical Analysis In Geography. Longman.22.

56. Kenya, Republic of (1966): National Development Plan,1966-1970. Nairobi:Government Printer.

57. Kenya, Republic of (1969b): National Development Plan,1969-1973. Nairobi:Government Printer.

58. Kenya, Republic of (1974): National Development Plan,1974-1978. Nairobi:Government Printer.

59. Kenya, Republic of (1979b): National Development Plan,1979-1983. Nairobi:Government Printer.

60. Kenya, Republic of (1983): District Focus for Rural Development. Nairobi:Government Printer.

61. Kenya, Republic of (1984): National Development Plan,1984-1988. Nairobi:Government Printer.

62. Kenya, Republic of (1989): National Development Plan, 1989-1983. Nairobi:Government Printer.

63. Kenya, Republic of (1994): National Development Plan, 1994-1996. Nairobi:Government Printer.

64. Kenya, Republic of (1994): Laikipia District Development Plan, 1994-1996. (Ministry of Economic Planning and National Develpment). Nairobi:Government Printer.

65. Kenya, Republic of (1986): Sessional paper No.1 of 1986, Economic Management for Renewed Growth. Nairobi:Government Printer.

66. Kenya, Republic of (1996) Sessional paper No. 2 of 1996. "Industrial Transformation to the year 2020". Government Printer, Nairobi.

67. Koutsoyiannis. A. (1977): Theory of Econometrics. Macmillan, London.

68. King, L.J. (1969): Statistical Analysis in Geography. Prentice Hall, New York.

69. King, R.B. (1984):Remote Sensing Manual for Tanzania. Land Resource Development Center, Tanzania.

70. Kiteme, B.P.(1992): "The Performance of Small Scale Manufacturing Enterprises in West Laikipia (N'garua Division). Unpublished M.A Thesis (Planning) - D.U.R.P-University of Nairobi.

71. Lado, C. (1990): "Rural Periodic Markets: A case study from North Malakisi Location, Bungoma District, Kenya". Eastern and Southern Africa Geographical Journal Vol.2, No. 1, pp. 37 –35.

72. Laikipia District Development Plan 1994 - 1996. Government Printer, Nairobi

73. Laikipia Research Programme(1996): "Laikipia District Atlas."

74. Lele, U. (1981): Cooperatives and the Poor: A Comparative Perspective. World Development 9(1) 55 - 72.

75. Levin, R.I .and Rubin, D.S .(1994): Statistics for Management Prentice Hall.

76. Lindskog, P.A .(1979): " Periodic Market Exchange in Malawi',in Gormsen, E. and R.H.T.Smith (eds),Market place Exchange – Spatial Analysis and policy,Mainzer Geographische Studien Heft Vol 17 pp. 53–63.

77. Lloyd, P.E.and Dicken, P. (1972): Location in space. A theoretical approach to Economic Geography. Harper and Row, New York.

78. Losch, A. (1954): The Economics of Locations, Wiley &Sons New York.

79. Matthes, M.C .(1979): Livestock marketing in Kenya: Field draft document.FAO/UNDP Marketing Development Project ,Nairobi ,Kenya.

80. Mohabub,H.(1990):Credit For The Rural Poor: The Experience of The Grameer Bank in Bangladesh. Bangladesh Institute of Development Studies.

81. Raisuddin,A.and Mohabub,H.(1990): Development Impact of Rural Infrastructure in Bangladesh. International Food Policy Research Institute.

82. Muganzi,S.Z.(1975): "A Geographical Study of the Development of Periodic Markets in the Central Division of Kakamega District. Unpublished Bachelor of Arts Dissertation, Department of Geography,University of Nairobi.

83. Maucho,J.O.(1978): "A Market Area Analysis of Tabaka".Unpublished Bachelor of Arts Dissertation, Department of Geography,University of Nairobi.

84. Musyoki, A.K. (1986): "The Spatial Structure of Internal Trade in Staple Foodstuffs in Machakos district,Kenya. Unpublished Ph.D Dissertation Howard University,Washington D.C.

85. Nadine Gouzee (1995) : Indicators of Sustainable Development for Decision Making -Report of the Workshop of Ghent, Belgium submitted to the UN Commission on Sustainable Development Published by the Federal Planning office of Belgium 1995.

86. Ngau,P.M. and Gaile,G.L. (1995): "Identifying the Underserved of Kenya : Populations Without Acess to Small towns".Regional Development Dialogue Vol 16 No 2 Autumn 1995 pp100-118.

87. Ngau,P.M. and Gaile,G.L. (1988): "Choosing Locations for Small Town Development to enable Market and Labour Expansion:The Case of Kenya".Economic Geography Vol 4 No.3 of July:pp 242-254.

88. Norton, A. and Symanski, R. (1975): "The internal marketing systems of Jamaica". Geographical Review, 68, 461 - 75.

89. Obudho, R.A. and Waller,P.P. (1976): Periodic Markets, Urbanisation and Regional Planning. Greenwood Press, London.

90. Prewitt,K.(1974):Introductory Research Methodology : East African Applicatons University of Nairobi,Institute of Development studies Occasional paper No. 10.

91. Riddell, J.B. (1974): Periodic Markets in Sierra. AAAG 64, 541 - 48.

92. Ridley,R. Harold, M., and Weber,M.T. (1983). Marketing in Developing Countries. Chapter 16 in Future Frontiers in Agricultural Marketing Research (edited by., P.L Farris). Ames, Iowa, USA: Iowa University Press. Reprinted as Rural Development Working Paper No. 6 (1979), Department of Agricultural Economics, Michigan State University, East Lansing, MI, USA.

93. Shaffer, J.(1980) Food System Organization and Performance: toward a Conceptual Framework American Journal of Agricultural Economics 62(2) 310-1829.

94. Shaw, G. and Wheder,D. (1985): Statistical Techniques in Geographical Analysis, New York Wiley & Sons

95. Shrivastava, V.K. (1987): Geography of marketing and Rural development, New Delhi Mittal.

96. Schwimmer, B. (1976): "Periodic Markets and Urban Development in Southern Ghana". In Smith, C.A., (editor), Regional analysis volume 1, New York: Academic Press.

97.   Shrivastava, V.K. (1977): "Periodic markets and rural development: Bahraich District: A Case Study". National Geographer 12, 47- 55.

98.   Simpson,R.J (edit)1984 Livestock development in Sub-Saharan Africa. Westview press, Colorado USA.

97.   Skinner,G.W.(1964):Marketing and Social Structure in Rural China-1 Journal of Asian Studies Vol24 pp3-34.

98.   Smith,R.H.T.(1969): 'The Spatial Structure of Periodic Markets in West Africa Ghana. Year Book of American Philosophical Society 1969.

99.   Smith,R.H.T.(1971):West African Marekt Places: Temporal Periodicity and Locational Spacing ,in Meillassoux,C.(ed),The development of indigenous Trde and Markets in West Africa(Oxford),pp320-46.

100.   Smith,R.H.T.(1972): "The Synchronization of Periodic Markets".In Adams,W.P.and Helleiner,F.M.(edits) International Geography 1972 Vol 1.

101.   Smith,R.H.T.(1976): "Periodic market Places,and Travelling Traders in Developing Countries".In Rao,V.L.S The golden jubilee volume 1976 Indian Geographical Society.Madras India

102.   Smith,R.H.T.(1979): Periodic Market Places and Periodic Marketing: Review and Prospects-I .Progress in Human Geography Vol 3 pp 371-505.

103.   Smith,R.H.T. and Hay,A.M.(1969): "A Theory of the Spatial Structure of Internal Trade in Underdeveloped Countries".Geographical Analysis Vol 1,121-36.

104. Stine,.J.H.(1962):Temporal Aspects of Tertiary Production Elements in Korea. In Pitts,F.R.(edit),Urban System Systems and Economic Development, University of Oregon,School of Business Administration.

105. Thorpe,K.J.(1978): "Periodic Markets in the Caspian Lowlands of Iran" in R.H.T Smith (ed),Market Place Trade -Periodic Markets,Hawkers and Traders in Africa ,Asia and Latin America,Centre for Transportation Studies University of British Columbia,pp.81-89.

106. Tinkler,K.J.(1973): "The Topology of Rural Periodic Market Systems" Geografiska Annaler55B,121-133.

107. Ukwu,U.I.(1969): Markets in West Africa:Studies of Trade Markets and Trade among the Yoruba and the Igbo.Ibadan University Press.

108. UN,(1990): Post-Project Analysis in Environmental Impact Assessment , UN Environmental Series 3 New York.

109. UN,(1991): Policies and Systems of Environmental Impact Assessment UN Environmental Series 4 New York.

110. UN,(1992): Applications of Environmental Impact Assessment,Principles, Policies,Plans and Programmes UN Environmental Series 5 New York.

111. UN,(1992): Code of Practice for the Conservation of Threatened Animals and Plants. New York.

112. UN,(1994):Population. Environment and Development.New York.

113. UNCED, (1992):The Rio Declaration on Environment and Development:
    Rio De Janeiro.

114. UNEP,(1994) Trends in Environmental Impact Assessment of Energy
    Projects Geneva .

115. Wambugu, S.K. (1990): "Spatio-Temporal and Functional Characteristics of
    Market Places in Nyeri district, Kenya". Unpublished M.sc Thesis,
    Kenyatta University.

116. Wambugu, S.K. (1995): " A Spatial-Temporal Analysis of Periodic Markets
    in Nyeri District,Kenya".Eastern and Southern Africa Geographical
    Journal.Vol.6 No.1 1995 pp.60-73.

117. Wanmali, S. (1976): "Market Centres and Distribution of Consumer Goods in
    Rural India: A Case Study of Singibhum District, South Bihar"- In Gormsen, E.,
    (edit). Market Distribution Systems, Manzer Geographische Studien 10. Mainz:
    Geographisches Insitut der Johannes-Gutenberg-Universitat.

118. Webber,M.J. and Symanski,R.(1973): Periodic Marekts :An economic
    Locational Analysis.Ecnomic Geography Vol 49 pp 213-237.

119. Wiesmann,U.(1991): "Water Supply Systems in Small Scale Farms and
    Pastoralist Areas of Laikipia Districts ,Kenya-;Laikipia Research
    Programme ,Mount Kenya Papers.

120. Wiesmann,U.(1993): "Socio-Economic Viewpoints of Highland-Lowland Systems: A Case Study on the Northwest Side of Mt. Kenya. Laikipia Research Programme ,Mount Kenya Papers.

121. Winrock International Institute for Agricultural Development(1992): "Prospects for Agricultural Development in Sub-Saharan Africa."

122. Winrock International Livestock Research and Training Centre(1978): The Role of Ruminants in the Support of Man.

123. Wood, L.J (1972): "Rural Marketing Patterns in Kenya". Area Vol 4 P 267-

124. Wood, L.J.(1973): "The Temporal Efficiency of Rural Markets In Kenya", East African Geographical Review Vol II PP. 65 – 69.

125. Wood, L.J.(1974):"Spatial Interaction and Partition of Rural Market space" Tijdschrift Voor Economische en Sociale en Geographie Vol.65. pp. 23-83.

126. Wood, L. J. (1978): "Rural Markets in Kenya. In Smith, R.H.T., (edit), Market-Place Trade, Vancouver: University of British Columbia, Centre for Transportation Studies.

127. World Bank. (1981): Accelerated Development in Sub-Saharan Africa - An agenda for Action. Washington, D.C, USA: The World Bank.

128. World Bank. (1983). Managing Sate-Owned Enterprises. Pages 74-86 (Chapter 8) in World Development Report. Washington, D.C. USA; The World Bank

129. Yeong, Y. (1974) "Periodic Marketing: Comments on Spatio-Temporal Relationships". Professional Geographer Vol 26 147 - 51.

MARKET ATTENDANT QUESTIONNAIRE

No. ----------------------

Date: -------------------

Interviewer: ------------

Respondent: -------------

1.0 BACKGROUND INFORMATION

1.1 Name of market ----------------------

1.2 Market day   (A) MAIN (PRIMARY) DAY ----------------------

                   (B) OTHER (SECONDARY) DAY(S)----------,------------,-------------

1.3 Location----------------------------

1.4 Division---------------------------

1.5 Date established as a market centre (year)-----------

1.6 Date established as a periodic market (year)-----------

2.0 MEANS OF TRANSPORT

2.1 How do you rate the transport network (Roads) in this area?
        1. Very good
        2. Good
        3. Fair
        4. Poor
        5. Very poor
Why? Please explain--

2.2 In your opinion, does the road transport network affect this market?

      Yes ------- No ------

2.3 Give reasons for your answer in 2.2
    (a) --

    (b) --

    (c) --

    (d) --

2.4 What recommendations can you give in reference to 2.2 above?

(a) --

(b) --

(c) --

(d) --

3.0 MARKETING FACILITIES & CHARGES

3.1 What is the frequency of market meeting?
    1. Daily

    2. Twice a week (Days ------------ ------------)

    3. Once a week (Day ----------------)

    4. Others (Days ---------------------)

    5. Once in every two weeks (Day--------)

3.2 What market facilities are found in this market please list them

(1) --

(2) --

(3) --

(4) --

3.3 How does local council authorities control /regulate the use of the facilities

    please explain --

3.4 Do you charge any fee   Yes ------- No-------

3.5 Who pays the fee?
    1. The seller (farmers)

    2. The buyer (trader)

    3. Both

3.6 How is fee charged?
  1. Per trader (regardless of the sales/purchases)

  2. Per cow/goat/sheep

3.7 Would you please give the rates charged

  (a) Per seller Ksh----------

  (b) Per buyer Ksh---------

3.8 If the rates in 3.7 are different, please explain the reasons for the difference

_____

_____

_____

3.9 How is the fee utilised

  1 -------------------------------- 5) --------------------------------

  2 -------------------------------- 6) --------------------------------

  3 -------------------------------- 7) --------------------------------

  4 -------------------------------- 8) --------------------------------

3.10 Are there other trading activities carried out in this market ?
     please list them if any

  1)-------------------------------- 4)--------------------------------

  2)-------------------------------- 5)--------------------------------

  3)-------------------------------- 6)--------------------------------

3.11 How do these activities affect Livestock trade
     please explain --

_____

_____

_____

_____

3.12 How do you assess the degree of interdependence between these activities and livestock trade ?

_____

_____

_____

4.0 ENVIRONMENTAL IMPLICATIONS

4.1 What problems does the concentration of livestock cause around this market?

1)------------------------------------   4)-----------------------------------

2)------------------------------------   5)-----------------------------------

3)------------------------------------   6)-----------------------------------

4.2 What do you do with the waste generated in the market?

(a) ---

(b) ---

(c) ---

4.3 Does the local authority council allow grazing in the market neighbourhood? Yes/No-
Explain any effects this has on the vegetation around

4.4 What policy arrangements does the local authority have for restraining and dealing with UNSOLD
stock? Explain

4.5 Have the owners of the surrounding farms complained concerning the issue in 4.4? Yes ---- No -
Please explain the nature of the complains

4.6 Have you noticed any changes in the environment since the market was established please explain the
nature of the changes.

LIVESTOCK TRADER QUESTIONNAIRE

1.0 BACKGROUND INFORMATION

1.1 Name of trader   ---------------------

1.2 Age in yrs   ---------------------

1 3 Residential Location   ---------------------

1.4 Residential Division   ---------------------

1 5 Residential District   ---------------------

1.6 Name of Market   ---------------------

1.7 Highest level of education attained-------------------------

2.0 LIVESTOCK TRADE INFORMATION

2 1 What type of livestock do you trade in (tick appropriately)

      1. Cattle

      2. Goats

      3. Sheep

      4. All the three above

      5. Others (specify)   -------------------------------

2.2 Where do you SOURCE your "stocks"

      1. From other markets (Give name --------------------

      2. From homes of farmers -------------------------------

      3. From my herd ---

      4. From ranches (specify names) -----------------------

      5. Other sources (specify) ---------------------------------

2.3 Which market do you prefer/buying from --------------------

      Why? Explain--

2.4 Which markets do you prefer selling at? -------------------------Why explain-----------------

----

2.5 How many markets do you visit (I) per week ----------- (ii) Month ------------

2.6 Would you please identify the pattern in which you visit the markets

Market Day	Name of market visited	Purpose of visit	
		(To buy)	(To sell)
1. Monday	----------------------	---------	---------
2. Tuesday	----------------------	---------	---------
3. Wednesday	----------------------	---------	---------
4. Thursday	----------------------	---------	---------
5. Friday	----------------------	---------	---------
6. Saturday	----------------------	---------	---------
7. Sunday	----------------------	---------	---------

2.7 To whom do you sell your livestock - please tick appropriately

     1. To Butchers

     2. To farmers

     3. To other Traders

     4. Other (please specify) -------------

2.8 Do you like using the "Auction system" to buy your 'trading stocks'

     1. Yes ---

     2. No ---

Why? (Explain)--

2.9 Do you like selling your trading stock through the Auction system?

      1. Yes

      2. No

Why (Explain) ---

2.10 What factors do you think affect your business ?

(A) Negatively	(B) Positively
1) --	1)----------------------
2)--	2)----------------------
3)--	3)----------------------
4)--	4)----------------------

2 11 For how long have you been in this business (-----------yrs.)

2.12 On average how many stocks do you sell per month ?------------

2.13 Suppose you were to get additional financing would you consider expanding your bussiness ?----------

2.14 Why ?--

2.15 How would this affect the performance of your business ?--------------------------------

----

2.16 What factors did you consider in choosing livestock trade and not any other

(a)--

(b)--

(c)--

(d)--

(e)--

2 17 When you started this business did you receive assistance from anybody or relative ?-

----

2.18 Please would you state the nature of the asisstance you received

----

2 19 Are you engaged in any other business ? Please state the business-----------------------

----

2.20 Which of these bussinesses do you devote most of your time -----------------------------

----

2 21 Why that one ?--

2.22 Would you give your income per (a) Month Ksh -----------

(b) Year Ksh -----------

3.0   TRANSPORTATION INFORMATION

3.1 How do you transport your stocks to and from the market?

1. Driven on foot

2. Personal vehicle e.g. Truck(Pickup, Lorry)

3. Hired transport

4. Others (specify)

3.2 Would like to use vehicular transport or non-vehicular (on foot) transport.

1. Yes   2. No

Reason(s) (Please Explain---

3.3 What problems do you face in transporting your livestock from/to the market ?

    1 Poor roads

    2 Costly transport(Too expensive to hire vehicles)

    3. Government Restrictions e.g. quarantines

    4 Banditry/Raiders

    5 Others (specify) ---------------------------------

4.0 MARKET CHARGES

4.1 Do you pay any fee to the local Authority council ?

    Yes ----- No ------

    How much Ksh ---------

4.2 Are you required to have any licence(s)/Permit

    Yes ------ No-----

    From where do you get it?------------------------------------

4.3 How are the fees charges imposed?

    1. Per trader

    2. Per cow/goat/sheep sold

    3. Lumpsum (fixed charge) Please indicate length of period of validity -----------

    4. Other (specify) -----------

4.4 How do you rate these charges ?

    1 Too high

    2 Fair

    3 Adequate

    4 Too low

    5 Other

4.5 In your opinion, do you think the charges are prudently used Yes / No

    Pls explain ---

5.0 MARKET PROBLEMS

5.1 What problems do you face in this market ? Pls list

1)-- 4)--

2)-- 5)--

3)-- 6)--

5.2 How do you think these problems can be solved ?

1)--- 4)------------------------

2)--- 5)------------------------

3)--- 6)------------------------

5.3 What problems do you face in this business (Livestock trade) ?

1)--- 4)----------------------------------

2)--- 5)----------------------------------

3)--- 6)----------------------------------

5.4 How do you cope with problem(s) Pls state them.

THE END

THANK YOU