

W “RURAL TRANSPORTATION PROBLEMS: A CASE  
STUDY OF TEA ROADS IN THE SOUTHERN TEA  
GROWING REGION OF MERU-KENYA” 9

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Project paper Submitted in Partial Fulfilment of the requirements  
for a Degree of Master Arts in Transport Geography in the  
University of Nairobi.


2003


## DECLARATION

This Project paper is my original Work and has not been presented for a degree in any other University.

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## **ABSTRACT**

Rural transportation problems in the tea areas emanate from the poor conditions of tea roads which are not maintained to be all weather. Most of these roads are impassable during the rainy seasons and tea farmers incur heavy green leaf losses.

The objective of this study is to identify some of the causes of the rural transportation problems and tea losses, describe them and propose the way forward in reduction of the tea farmers losses.

A comprehensive literature review is attempted in this study with a purpose of extracting relevant and essential information from available secondary sources.

There are three hypothesis formulated and their validity tested using primary and secondary data collected. These are;

- (a) There is no significant relationship between the closure of buying centers and tea losses.
- (b) There is no significant relationship between poor road conditions and tea losses.
- (c) There is no significant relationship between the distance of tea buying centers from the factories and leaf losses.

Qualitative and quantitative analysis are used in this study to establish the significance of the relationships and test the hypothesis to enable conclusions to be drawn.

The major finding of the case study was that poor road conditions is the main cause of rural transportation problems and tea losses in general. Tea roads should be well maintained to eliminate losses.

The study recommends that all key players in the tea industry and precisely KTDA as the small-holder tea Managing Agency has a duty to ensure that the tea roads are well maintained in order to reduce rural transportation problems and tea losses.

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# CHAPTER ONE

## 1.0 INTRODUCTION

The economic development of any country requires a well-developed transportation network for efficient and economic exploitation of resources. Transportation is a significant factor in development of agriculture, industries, trade, promotion of health care, education facilities and for exchange of ideas.

Road transportation is an important mode of domestic transportation in many parts of the world. In Kenya, road transportation is the dominant mode of transport constituting about 80% of the country's total transport system. (Sources – Irandu 1995 - PHD Thesis).

In many less developed countries (LDCs), Kenya included, agriculture is the mainstay of the economy. They are mainly agricultural economies. Increased farm income in these LDCs raises the living standards of the people through improved rural road communication systems between farm holdings, markets, factories and produce processing centers. Some areas in these LDCs are completely inaccessible during the rainy season. Agricultural produce like tea is not collected from farms and it goes bad.

However in these LCDs like Kenya, the problems faced by small rural farmers in moving their produce and materials between farms, markets and processing centers are increased by poor rural road conditions.

The role of rural roads in development is to help induce greater agricultural production by avoiding losses, easier supply of agricultural inputs to the farms and faster delivery of produce to the markets and processing centers. Improvement in rural transportation systems leads to savings for producers and consumers because of reduced production and transportation costs.

The overriding objective of Kenya's regional development policies is to promote regional rural development in order to reduce rural-urban drift, reduce crime and eradicate poverty. It is estimated that 80% of the population in Kenya live in rural areas and the same proportion of this rural population is engaged in rural agricultural activities. In addition, 75% of the micro and small-scale enterprises are based in rural areas (Source 8<sup>th</sup> National Development Plan of Kenya 1997-2001).

Therefore, in order to achieve an equitable and sustainable rural development in Kenya, adequate rural road systems are necessary.



## 1.1 STATEMENT OF THE RESEARCH PROBLEM

Tea being one of the major foreign exchange earners in Kenya requires maximum attention both in its husbandry, transportation and processing to the final product for export and local consumption. From The Tea Board of Kenya facts sheet of 2002 it is recorded that during the year January – December 2001, Kenya Tea exports earned the country 34.4 billion Kenya shillings.

According to the Tea Board of Kenya Bulletin 2002, the tea industry in Kenya is one of the leading foreign exchange earners, contributing about 20% of the total foreign exchange earnings. As a labour-intensive industry, the sector employs more than 3 million persons directly and indirectly.

Tea growing and manufacture are carried out in the rural areas thereby contributing significantly to development of rural infrastructure as well as enhancing the economic well being of the rural community. The sector provides substantial investment opportunities in areas of tea growing, manufacturing, exporting and value adding.

This study of tea roads transportation problems in rural tea farming areas shows how poor road conditions contribute to tea losses. Improvements of rural roads transportation systems can reduce farm produce losses, leading to higher earnings and therefore better living standards for the rural people.

The rural minor roads serving smallholder tea-growing areas in Kenya have deteriorated drastically during the last two decades becoming very difficult and sometimes impassable when it rains. This condition leads to a lot of tea losses for the tea farmer which translates into major financial losses in their earnings.

The state of poor road conditions leads to tea losses on transit and also losses of the tea not collected from the centers due to inaccessibility by the tea carriers. Green leaf purchased by KTDA at farmers buying centers can experience losses in weight before it is delivered to the factory. Losses in transit are a direct financial loss to KTDA and detailed records for each individual factory are kept. This is because KTDA pays for green leaf, which never reached the factory. Tea spillages and red leaf are the functions of road conditions, but can also be determined by other factors.

According to the Government of Kenya and the ~~the~~ Ministry of Public Works tea roads rehabilitation study of March 1993 by Sir Alexander Gibb and Partners, it is indicated that there were numerous closures of tea buying centres as a result of poor road conditions during both the long and short rains of 1990/91 period. “Approximately half of the KTDA leaf bases had to close some buying centres for varying lengths of time for this reason in the 1990/91 season”. The reason was the poor road conditions.

In the same report it is indicated that the analysis undertaken for a similar 1988 phase 1 report showed that buying centre closures due to poor road conditions caused a decline in green leaf delivered at the nominated alternative buying centres compared to what would have been expected to be delivered had the buying centres remained open. This leads to major tea losses to KTDA. This study focuses on the Rural Tea Roads Transportation problems as pertains to tea losses to KTDA due to the poor road conditions and closure of buying centres due to the same.

In the same study of Sir Alexander Gibb and Partners on tea transit losses, it is indicated that delays at KTDA factory offloading of leaf carriers due to inadequate storage and processing capacity, can be a factor in increased losses particularly during the wet season when production is at its highest.

This study examines the relationship between road conditions and the tea losses due to the poor road conditions. Sir Alexander Gibb and Partners conclusion on the transit losses indicated and quote.... “It has not been possible to determine any meaningful relationship between tea losses and road conditions”. This is what this project study will address to investigate if there is any actual relationship between road conditions and tea losses.

The present study investigates the actual tea losses due to poor roads and closure of buying centres due to the same. Then quantify these losses into lost earnings to the farmers and the country as a whole. This study takes into consideration the un-plucked tea due to the closure of buying centres as rural roads become impassable. This is what Sir Alexander Gibb and Partners did not consider and they made the wrong conclusion that there was no meaningful relationship between tea losses and poor road conditions. (Tea roads Rehabilitation study Phase II March 1993 Sir Alexander Gibb and Partners ODA Study)

This study compares the previous research findings by Sir Alexander Gibb and Partners on the relationship between poor roads conditions and tea losses.

## LITERATURE REVIEW

In developing theories to explain the patterns of location, geographers have taken account of transport as a factor. This is clearly noticeable in Von Thunen's land use model of agricultural location activities, which consist of concentric rings of land use around the central isolated city (Von Thunen; 1826). In this model rings resulted from the increasing distance from the central city and therefore increasing transport costs.

Von Thunen in his theory postulated a flat plain isotropic condition with uniform soil conditions. He concluded that given all factors equal, any improvement in transportation facilities along any radial route on the concentric rings will reduce transport costs from any point on that radial route below those of any point at similar distance along any other radial. The applicability of Von Thunen's model is on the radial rural tea roads collection routes from buying centers to the factories and how distance and rural roads conditions increases or reduces tea transportation losses on transit.

Weber (1909) argues that industrial location is largely a matter of transport costs and that the best location is one which minimizes the total transport

costs without ignoring the production costs. Weber's argument is explored further in this study by verifying whether tea losses are due to location and road conditions.

Hoover (1948) developed Weber's argument and emphasized the role of transfer costs of which transport costs are a major element as being basis to industrial location theory.

In this study of rural tea roads transportation problems, an investigation of the location of tea buying centers and leaf collection routes planning and the KTDA initiative made in tea roads repair programmes.

In the early studies of Transportation Geography Ullman (1956) laid down a three factor typology model to explain the conditions that affect transportation development. The three factors identified by Ullman (1956) are complementarity, transferability and intervening opportunities. These three concepts are factors of spatial interaction.

Complementarity is a function of aerial differentiation in an interaction system where a demand in one place is satisfied by a supply at another place.

The supply and demand in this case must be complementary. Tea farming, plucking, collecting and delivering to the factory for processing forms a logistical chain of operations where the tea factory demands green tea leaf for processing and the tea farmer through the buying centers supply the tea. In this case, there is complementarity in the system of tea operations Process.

In the theory of transferability Ullman (1956) explains that in order for spatial interaction to occur between two places, the distance between them must be such that it can allow friction of distance to be overcome. When distance between demand and supply are too great to be overcome, no interaction will take place. The concept of transferability is often used to refer to distance between these two places.

In this study the concept of transferability is explained in terms of the distances from the farmer buying centers to the tea factory. During the rainy seasons when the tea rural roads become impassable, transferability will be very low and the effects of the friction of distance would be noticed in the delays in green leaf collection and in effect some tea losses on transit would occur. This is an area of concern in this study.

The concept of intervening opportunities is identified by Ullman (1956) as a base of spatial interaction between two complementary areas or regions. An intervening opportunity is that which can inhibit interaction between the two areas when demand is met by a third area. In the production chain of tea from farms to the factories, the flow is from the buying centers to the factories. If the factory is full to capacity then the other tea plucked and not collected can be diverted to other less capacity factories. If the other factories have some space to receive the tea from another area or region, then an element of intervening opportunity occurs.

The concept of intervening opportunity is explained in view of the tea losses in transit and at buying centers due to lack of intervening opportunities. When all KTDA factories are full and cannot take any more tea, then the theory of intervening opportunities cannot be applied because of lack of an alternative demand pole for the tea.

Smith (1959) carried out a study on the impact upon economic development of feeder roads in Western Nile district of Uganda between 1948-1956. The study was based in two regions with different road transport network characteristics. One region had good feeder roads and the other had no



feeder roads built. Smith study findings based on a 3 year data period indicated that income from cotton in those regions where feeder roads had been constructed and improved increased by between 10 – 400% relative to those regions without feeder roads.

To draw a parallel on the study by Smith (1959) the present case study investigates whether there has been any reduction in tea losses in the study area after road improvements. More significantly the case study aims to investigate whether there has been any significant reduction in tea losses on transportation from tea buying centers to the factories after two new factories of Kionyo and Weru were opened and roads were improved..

Owen (1964) writing on the strategy of increasing mobility indicated that transport is an ingredient of every aspect of social and economic development as it plays a role of getting land into agricultural production and making forests and mineral wealth accessible. In this present study an attempt is made to verify the reduction in leaf losses due to tea roads improvement. Also the nearness of the buying centers to the factories is assessed with the improvement of some of the rural tea roads in comparison to leaf losses.

A study by Ward (1967) in Papua New Guinea examined the socio-economic impact of a certain feeder road and observed that the improvement of the feeder roads stimulated village market gardening, new estate for production of rubber, small-scale poultry farming and cultivation of European vegetables.

In Ward's study, the feeder roads examined connected a potentially productive hinterland direct to the capital. This shows feeder roads improvement can stimulate other income earning activities in a region. The present study investigates if improvements are done on the tea roads connecting the five factories indicated earlier, can stimulate and attract other modes of transport in the region.

In the study of the impact of roads on agricultural development in Western Kenya by Birdsall (1968) it is indicated that agricultural production responded positively to improved road network. He maintained that farmers responded first to and benefited from lower transport costs after improvement of the roads. From the indication that KTDA experiences some high losses on transit, the study compares whether there is any meaningful reduction in losses when a sections of bad roads are improved.

iero (1978) on the role of feeder roads and access roads in agricultural production and planning in Busia District indicated that rural access feeder roads played an important role in rural development. The objective of this study is to assess the contribution of poor rural access roads to the tea losses.

Ogonda (1986) examined the impact of the road transport networks on the overall pattern of development. In this study Ogonda emphasized on the historical development and growth of the road transport networks to specific indicators of growth in the economy.

This was on a general macro analysis of the role of transport to economic development in Kenya. Agricultural growth, development and prosperity are some of the specific indicators of growth in an economy which Ogonda (1986) implied in his study.

The present study on tea roads transportation problems has an objective of investigating the causes of tea losses, then propose ways of arresting the factors that contribute to these losses. And in effect suggest measures of reducing the losses as this would increase farmers tea production leading to higher tea earnings for KTDA tea farmers.

Kimani (1990) also examined the impact of rural access roads program to agricultural development in Ol-Kalou division of Nyandarua district of Kenya and he found a positive influence of the roads on agricultural production. The present study assesses the contribution of poor rural access roads to the KTDA tea losses, and reduction of tea losses in areas with good rural tea roads.

In the Tea Roads Rehabilitation study Phase II Report by Sir Alexander Gibb and Partners in March 1993 under ODA assignment for the Government of Kenya (GOK), there are various reasons advanced as the causes of tea losses. The study groups admits that it is not possible to quantify separately the significance of the following causes of tea losses on transit:-

- (a) Natural withering of the leaf due to delayed delivery to factories.
- (b) Spillage in transit due to poor road conditions.
- (c) Rejection of spoiled (red leaf) at the factory due to delayed delivery or impassable roads.

(d) Unplucked leaf from the farms due to buying center closure.

All these factors which contribute to the total tea losses on transit, have a transportation bearing which is the main concern of this study.

The study intends to carry on from the notion of Sir Alexander Gibb's and partners conclusion that "it has not been possible to determine any meaningful relationship between tea losses and road conditions". The objective of this study is to investigate whether there is actually a relationship between tea losses and poor road conditions by carrying out a survey of tea losses on transit from the tea farmer point of view and apportion these losses to their actual causes.

Irando (1995) interprets the sectoral growth poles theory of Perroux (1971) in air transport studies..." In development, growth does not appear everywhere nor simultaneously. Rather it appears at points or development poles with varying intensities and spreads along diverse channels with varying terminal effects for the whole economy". This study will attempt to identify the emerging growth poles in area of study due to increased tea earnings when the losses in transit are reduced or eliminated after improving rural tea roads conditions.

Kariga (2000) investigated some economic impacts of feeder roads in rural areas in a case study of Thika District Kenya and found that rural feeder roads influences significantly the farm gate prices of agricultural commodities, horticultural land use and the locations of non-farm economic activities in the rural economy.

In this case study KTDA leaf losses are analysed and compared during the time of minimal tea roads repairs and the period when tea farmers and KTDA Management took onto themselves to collectively maintain tea roads. The key results of this case study are of vital importance in leaf losses management proposals.

The objective of this study of rural tea roads transportation problems is to quantify how poor road conditions affect the quantity of tea through leaf losses. The decrease in tea farmers income due to these tea losses contributed by poor road conditions is also assessed in order to fill the gap left by Sir Alexander Gibb's report on tea roads.

### 1.3 JUSTIFICATION OF THE CASE STUDY

This study focuses on rural tea roads transportation as a major mode of tea transport from the farmer buying centers to the factories, and the contribution to the tea losses on transit due to poor road conditions. This study will also investigate the management element in reduction of tea losses due to constant maintenance and repairs of rural tea roads.

Tea deteriorates rapidly after plucking and should be at the factory within 24 hours. The rural roads network currently serving small holdings tea farms (and of course other farmers in the area) are earth and gravel roads, which become difficult and sometimes impassable when it rains.

Maintenance of these rural roads by the local councils or the government is almost non-existent. Due to this state of poor tea roads KTDA tea transportation costs are rather too high and the level of green leaf losses is consequently unacceptable (Bob Hammond: 1995) "On the road in Rural Africa" article in the Chartered Institute of Transport Developing World periodical – under Sir Alexander Gibb and Partners (Africa) on "Tea roads in Kenya".

During the rainy seasons KTDA registers high tea losses either due to impassable rural roads leading to closure of buying centers or loss on transit due to spillages and red-leaf. Also farmers experience losses due to leaf not plucked in the farms when buying centers are closed.

In the 1997/98 internal records of KTDA leaf losses/variance summary as at June 1998, it is indicated that Kinoro leaf base (which is one of the areas of this case study) registered a loss of (-9.6%) having a field Receipt Weight of 19,532,590 kgs and a Factory Receipt Weight of 14,944,813 kgs (KTDA Internal Leaf Losses/variance unadjusted summary report for June 1998).

This shows that between what was bought from the tea farmers and what was received in the Factory there was a loss of 1,587,777 kgs. If in this year, tea farmers were paid an initial monthly payment of Kshs 4.00 per kg and a final bonus payment of Kshs 13.00 per kg, then the 1,587,777 kgs loss at Kinoro would amount to a total loss of Kshs  $(17.00 \times 1,587,777) = \text{Kshs. } 26,992,209.00$  in that year. This is a big loss for just one tea factory. It is the aim of this study to investigate the root causes of these tea losses and then suggests ways of minimizing them in-order to increase earnings of the small-scale rural tea farmers.



This study investigates KTDA tea losses due to poor road conditions, quantify these losses, make conclusions and propose the way forward to reduce these unacceptable losses in order to increase tea production and tea earning overall to tea farmers.

There is need for a clear understanding of the main factors that influences or contributes to tea losses and what implications these losses have on the factory performance and in effect the farmer's earnings. The study will show whether KTDA can actually minimize or eliminate tea losses in transit. From these considerations it would appear that the factors that contribute to tea losses on transit either geographical or logistical can be analysed, identified, classified and controlled in order to increase tea production. Hence the reasons for the choice of this case study of rural tea road transportation problems and tea losses.

Agriculture is the main economic activity in the rural areas of Kenya where the greatest need is to raise farmers' income. The ingredients of raising farmers income in the agricultural sector (tea farming inclusive) is by ensuring high output/production by minimizing losses and ensuring fair prices on the produce.

Minimization of produce losses will raise income to the farmers and thereby help to alleviate poverty. In order to achieve these objectives tea transportation losses should be minimized, tea quality be improved by faster delivery to the factories and ensure good and stable tea prices.

The objective of this study is to isolate rural tea roads transportation problems and suggest ways of dealing with the problems in order to alleviate tea farmer's losses due to the poor rural road conditions.

The factor of high tea prices in the international world market is influenced by the local factory quality controls. Therefore, the factors which can be influenced locally for higher tea prices is the minimization of tea losses on transit and faster delivery to the factories for better quality tea. This is a major concern of this study in establishing how poor road conditions influences the quantity of tea production negatively through losses.

The driving interest in this study especially the aspects pertaining to the influence and impact of impassable rural roads during the rainy season on tea losses on transit has been inspired by the author's own external observations of KTDA leaf collection operations.

There is observed lack of uniformity in rural road patterns, leaf collections planning and management in leaf collection operations. These are some of the key areas that contribute to leaf losses, and this case study will address rural tea roads and tea losses.

It is indicated in the Eighth National Development plan of Kenya (1997-2001) that, as at 1994, about 42% of Kenya's rural population lived below the poverty line. The development plans projected that this figure would increase tremendously during the plan period and this has increased currently in excess of 50%. The main problem facing our Kenya's rural population is increasing poverty.

It is evident from the tea farms observations that the average acreage of smallholder tea farms is about 1.5 acres which are economically small acreages producing little tea crop. Since tea farmers produce quite little tea crop, which again is subjected to unnecessary losses on transit, it is quite evident that the problem of tea transportation is of paramount importance to tea production. The results of this study will pinpoint the key elements of tea losses on transit and propose tea roads repair designs that would make them all weather in order to eliminate leaf losses on transit.

In the higher altitude rural areas of Central and Eastern Kenya, the main cash crop income in the 1970's and early 1980's was from coffee and tea farming. Today coffee farming was and is completely down in these areas leaving tea farming as the major cash crop for the farmers. This study of tea roads transportation problems suggests ways of increasing tea production for rural tea farmers in order to safeguard the only cash crop after coffee farming reduced drastically. The greatest need today in rural Kenya is in raising income to farmers in order to alleviate poverty, reduce rural income inequality, increase employment and slow down rural-urban migration. All these positive farmer developments will empower them and afford rural basic health and education requirements.

The findings and recommendation in a study done by Kirigia (1985): *Planning for Rural Health Services; A case study of South Imenti Division – Meru District* (MA thesis UON) indicates that “ a well functioning transportation system is an absolute pre-requisite for the delivery of health services. The roads network should be improved as a matter of urgency in order to enable accessibility and travel by health staff to perform duties in the community especially outside the hospital and dispensaries.

According to Kirigia B.N (1985), this will also ease delivery of medicine, other deliveries and also for referral of patients and ambulance services. It is important to note that efforts to develop an effective system for health care requires the problem of the whole transport system to be tackled. Traveling distances would be reduced by introducing faster and efficient methods of transportation”.

Kirigia B.N (1985) continued to recommend that Kiangua-Kionyo road needed to be upgraded to gravel state in order to serve the population and the dispensaries along the road. The fact that during the rainy season the road is impassable calls for urgent attention. This road recommended by Kirigia (1985) for improvement is a section of the major tea roads corridor to being studied in this case study.

The present case study will go further to investigate the income losses which emanate from tea losses due to poor road conditions and imminent transportation problems. The findings of this case study recommends ways of reducing these rural tea roads transportation problems and leaf losses.

Rural roads have an impressively positive impact on improving the living standards of rural masses. A study on socio-economic impact of rural roads was carried out in the early 1980's in a few districts of India. The analysis of data at village level and household level revealed that accessibility to roads definitely has a positive effect on higher literacy levels, higher intensity of crop growing, higher standards of living (ownership of fixed and movable assets), better health care facilities, more educational opportunities and higher levels of family income (Kamlesh Kumar-National Highways Authority of India article in New World Transport Journal 1997 page 43 titled "Rural Roads in India: An Anti-Poverty tool")

This Indian study clearly shows that by improving rural roads, accessibility is improved, rural transportation problems are reduced; and in effect socio-economic position of the people improves greatly.

This current study assesses the rural tea roads transportation problems in general concerning KTDA farmers leaf losses. Then suggest ways of reducing these transportation problems in order to improve the socio-economic welfare of the tea farmers.

In the past most rural transport studies neglected “on farm” and “from farm” transportation needs of rural farmers. As Transport Geography Scholars we need to know the impact of rural roads on agriculture production through case studies, impact surveys and from the opinions of the affected farmers concerning the actual causes of rural tea roads transportation problems. Hence the research urge for this case study.

The main justification of this study is to formulate ways of tackling rural tea roads transportation problems in-order to safeguard the little tea produce of rural tea farmers by reducing losses on transit for better farm income; thus reducing poverty levels.

This project was undertaken to verify tea losses as a transportation problem of tea farmers. This project study will also propose ways of reducing these transportation problem for higher tea earnings.

## 1.4 OBJECTIVES OF THE CASE STUDY

In the Government of Kenya National Development plan 1997-2001 the following are the formulated transport policies on roads and non-motorised transport (NMT) infrastructure;

### (a) Roads:

- Priority to maintenance, with dedication of all the levy fund to maintenance.
- At least 50% of the fuel levy to be used on unclassified roads.
- Increase in the levy rate to maintain the classified network “in the long run”, but seeking of donor funds to cover any interim shortfall.
- Establishment of an Executive Roads Board to manage the levy fund and maintenance, the Roads Board to include stakeholders from private and public sectors.
- Finalisation of the strategic plan.
- Encouragement of labour-based methods where cost-effective.

### (b) Non-motorised transport (NMT) Infrastructure:

- Increasing rural mobility and accessibility through the use of appropriate technology.



One of the objectives of this study is to make field observations on whether these policies on roads are actually implemented and whether there is any encouragement on the use of Non-motorised transport systems to increase rural mobility and accessibility in the study area.

The overall objective of this study is to identify the actual causes of tea losses from the farmers to the KTDA factories. The specific objectives of the study are: -

- (a) To assess the contribution of poor road conditions to the tea losses on transit.
- (b) To determine the magnitude of tea losses to farmers and KTDA because of the closure of buying centers due to impassable tea roads.
- (c) To assess KTDA and GOK initiative on tea roads maintenance and policy.

This study further attempts to examine the relationship between rural tea roads repairs/maintenance by farmers, KTDA, Local Government, and GOK on tea production. The study will also describe the impact of rural tea roads repairs and accessibility for other economic activities in the study area.

The study therefore attempts to address the following broad questions on rural transportation problems in the tea growing region:-

1. What is the impact of rural tea roads on tea production or tea losses and does accessibility of buying centers from the factories reduce tea losses and operating period?
2. To what extent does improved rural tea roads induce other modes of transport and accessibility in the tea growing regions?
3. what is the impact of rural tea roads in increasing mobility of tea farmers through increased use of non-motorised transport?

Using the 2001 figures Kenya had a planted area of about 130,000 hectares which increased from about 125,000 hectares in the year 2000. The area under study part of Meru region had 3,773 hectares planted in the year 2001 and Tharaka/Nithi (New Meru South region) had 2,555 hectares in the year 2001 compared to 4,861 hectares and 1,554 hectares in the year 2000 respectively (Source: Tea Board of Kenya Facts Sheet 2002).

This shows that the extreme southern region tea hectareage is growing fast. The present study assesses the impact of improved rural tea roads on the increase in hectareage of tea. The question to be answered is whether the areas with better rural roads have higher hectareage of tea.

Using the same year comparisons, Kenya had a production of 294.6 million Kgs in the year 2001 compared to 236.2 million Kgs in the year 2000 production by District. The greater Meru region had a production of 13.6 million Kgs in the year 2001 compared to 9.3 million Kgs in the year 2000. This excludes Nyambene region which had a production of 6.6 million Kgs in 2001 and 5.3 million Kgs in 2000(Source; Tea Board of Kenya Facts Sheet 2002).

This study investigates the impact of rural tea roads on the overall tea production in the area. The study assesses whether rural roads conditions have any impact on tea production through reduction of tea losses and faster delivery to the factories after plucking. The faster delivery of green leaf to the factories relieves tea farmers the agony of staying long in the buying centers, thereby allowing them to rest and pluck more leaf the next days of the week. This increases farmers' tea crop in the year.

This enormous production is transported from tea farms to the farmer's buying centers and to the factories through rural tea roads, which in most cases are in very poor conditions.

This study aims to assess the contribution of rural tea roads to the tea production in this Southern tea growing region of Meru-Kenya. The results obtained can be used to determine ways of improving rural tea roads for higher tea production after leaf losses are eliminated.

## 1.5 RESEARCH HYPOTHESIS.

The following five (3) null hypotheses have been formulated and their validity will be tested using the primary and secondary data to be obtained from the tea farmers, KTDA Leaf Bases and Factories in the study area. The rejection of this hypothesis will lead to the acceptance of the alternative hypothesis:

(a)  $H_0$  : There is no significant relationship between the  
Closure of buying centers and the tea losses.

$H_1$  : The alternative

(b)  $H_0$  : There is no significant relationship between  
poor road conditions and tea losses.

$H_1$  : The alternative.

(c)  $H_0$  : There is no significant relationship between  
the distance of tea buying centers from the  
factories and tea losses.

$H_1$ : The alternative.

## **1.6.0 CONCEPTUAL AND THEORETICAL FRAMEWORK**

### **1.6.1 OPERATIONAL DEFINITIONS**

#### **(a) TRANSPORTATION**

This term used in this study refer to the art of moving goods/produce from farms to the buying centers and to the tea factories.

#### **(b) BUYING CENTERS**

This term as used in this report refers to the points where farmers deliver their plucked tea leaf for sorting and weighing by KTDA leaf collection officers.

#### **(c) GREEN LEAF**

This is the plucked tea from tea bushes ready to be bought by KTDA for onward transportation to the factories for processing.

#### **(d) RURAL TEA ROADS**

In the context of this study rural tea roads are the small rural feeder roads that connects to the access roads leading to the tea factories from the buying centres. Most of these rural roads are un-classified.

#### **(e) GREEN LEAF COLLECTION**

This refers to the process and arrangements of buying tea leaf from farmers at the buying centers and delivering the same to KTDA factories for processing.

The mode of delivery of green tea leaf is by leaf carriers.

**(f) LEAF CARRIERS**

This refers to the lorry trucks specifically designed to carry green tea leaf from the buying centers. The leaf carriers have specially designed carriage space with special hooks to hang aerated sisal tea bags in which green leaf is carried.

**(g) TEA LOSSES**

This term in this study refers to the differences between receipt weight - RWT (what the tea clerk actually bought from the tea farmer at the buying center) and the factory weight FWT (what was received at the factory). In between these two procedures there is the delivery weight -DWT (what the leaf carrier crew collected from the buying center clerk). Between these stages there occurs some losses and in some areas the figures would be rather too high and unacceptable.

**(h) TEA SPILLAGE IN TRANSIT**

This refers to the losses of tea at the buying centers when loading tea sisal bags onto the leaf carriers and the losses from the bags when on delivery to the factory.

## **1.6.2 TRANSPORTATION CONCEPTUAL FRAMEWORK**

This concept refers to the operational movement of people and goods along the transport networks. Along the network there are flows from one area to another and in this case from tea farms to the buying centers and to the factories.

### **(a) ROAD TRANSPORT SYSTEM**

The road transport system includes the network, the flows and the model system that provides transport services. This study will look into rural tea roads systems.

### **(b) THE NETWORK**

Networks refer to the structures and route systems, the location of these routes and their intersections, nodes terminals, density, the length of routes and the relative accessibility of the individual points on the network and other points.



**(c) THE FLOWS**

This refers to the movement of goods, services, ideas and messages from one region to another along transport networks. This study will look at timely flows of leaf carriers from field to factories and quantify the actual average turn around times.

**(d) MODAL SYSTEM**

This refers to the movement of goods, services, ideas and messages from one region to another such as vehicles. This study will look at the KTDA mode of ferrying tea leaf from the buying centers to the factory through rural tea roads systems.

**(e) SYSTEM OPERATIONS**

This function includes routing, scheduling, pricing, costing, the types of services, and the availability of the new equipment.

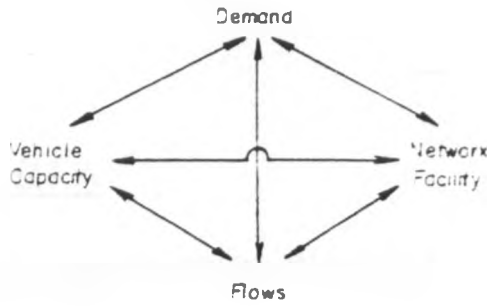
### 1.6.3 CONCEPTUAL AND THEORETICAL FRAMEWORK

The conceptual (theoretical) framework of this study is a “systems framework”. It describes the mechanisms of road transport systems and shows the relationship between road transport and development.

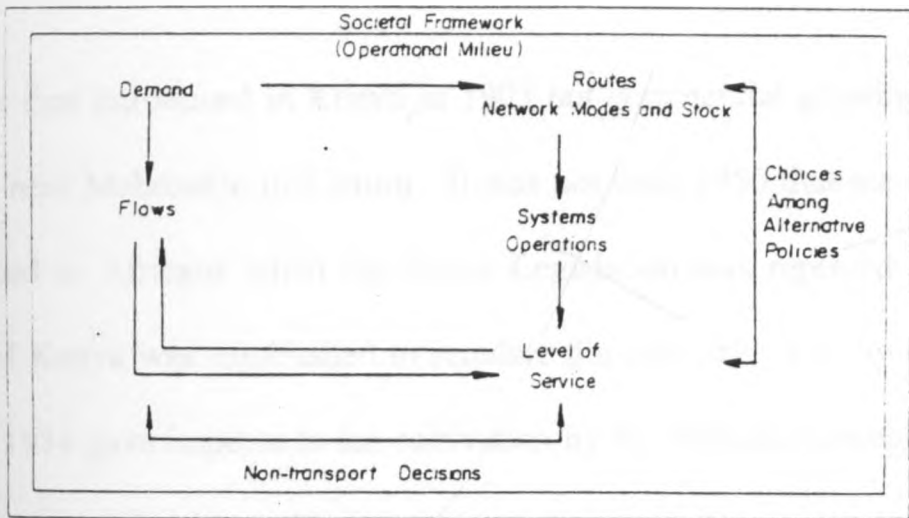
The conceptual framework used in this study is based on the model developed by Hay (1973) and Hurst (1973) where they favours the analysis of inter connections between transport system and it's related Socio-economic conditions (Figure 1.6 a and b)

Hay's (1973) model consists of four components; the demand, network, flows and vehicle capacity. As indicated in figure 1.6 a, there is a spatial pattern of transportation flows with a circular causation between phenomena. But the model ignores the impact of transportation on the societal system.

Hurst's (1973) model devised a “functional system framework” that encompasses the socio-political setting in addition to the economic aspects of transportation ((Figure 1.6 b). This model of Hurst 1973 provided this study with the basis of probing the interrelationship between rural transportation and the societal factors in rural tea roads systems.



a. Hay 1973



b. Eliot Hurst 1973

**Figure 1.6 DIFFERENT CONCEPTUAL FRAMEWORKS FOR STUDYING TRANSPORT GEOGRAPHY**

A research framework based on quantitative – qualitative approach as in the model developed by Hay (1973) and Hurst (1973) can produce comprehensive findings. This study is guided by such a framework.

## CHAPTER TWO

### 2.0 THE STUDY AREA

#### 2.1 BACKGROUND OF TEA PRODUCTION IN KENYA

##### (a) Tea Farming in Kenya.

Tea was first introduced in Kenya in 1903 but commercial growing started in 1924 near Mabroukie in Limuru. It was not until 1950 that tea was first introduced to Africans when the Racist Legislation was repealed and Tea Board of Kenya was established to regulate the Industry. The Swynnerton Plan of 1954 gave impetus to tea cultivation by the Africans through setting of targets on production and hectarage.

The Government started experiments with smallholder tea growing in the African areas by starting the two Provincial Tea Marketing Boards, one serving Central Province and the other serving Nyanza and Rift Valley Provinces. The two boards financed the establishment of tea nurseries in Kabianga, Kaimosi, Kangaita and Kagochi to address the issues. In the meantime the first African tea factory was established at Ragati.

The Special Crop Development Authority (SCDA) was formed in 1960 to promote the development of cash crops by indigenous smallholders.

Special emphasis was put on tea but by 1963 the performance was dismal.

Tea growing in Kenya expanded greatly and its currently grown in Eastern, central, Rift valley ,Nyanza and Western provinces of Kenya as shown in figure 1 (Map of Kenya showing the Tea growing areas and the Road network. Source-Tea board of Kenya and the National Atlas of Kenya).

#### **(b)Small-Holder Tea Management**

The Kenya Tea Development Agency Limited (KTDA Ltd) is the successor to the Kenya Tea Development Authority (KTDA), a state Corporation which was formed under the Agriculture Act (Cap318) Section 191 of the laws of Kenya and enacted through Legal Notice No.42 of 1964. It was charged with the statutory responsibility of fostering the development of tea amongst the smallholder tea sub-sector. Since inception in 1964, the smallholder tea sub-sector under aegis of KTDA has experienced phenomenal growth.

During the year 1996/97, and in line with the Government policy on

liberalization of the tea sector and the economy in general, KTDA was exempted from the state corporations Act and the KTDA order was amended. KTDA is therefore incorporated under the amended KTDA order but control by the Government has been relinquished for specific areas of ministerial policy and guidance to the small-holder tea sub-sector through the KTDA and other tea sector institutions.

KTDA has over the years managed efficiently the Kenyan small-holder tea sub-sector. The number of farmers has increased from 19,775 in 1964 to over 360,000 in the year 2002. Hectares under tea have risen from 4,700 in 1964 to over 86,000 presently. Green leaf production has risen from 2.8 million Kgs to a record of over 750 million Kgs in the year 2002.

Similarly, the number of tea factories has increased from one at the time of inception to the present forty five(45) in year 2002. It is expected that the number of factories managed by the Agency will increase to fifty four(54) upon the successful completion of the nine (9) newly constructed tea factories in order to meet the ever increasing production of tea.

## 2.2 THE ROLE OF TEA IN ECONOMIC DEVELOPMENT.

Tea in Kenya is largely grown by smallholder farmers, large multinational companies, large scale individual farmers and a Government of Kenya corporation.

Of the planted area, the large-scale sector accounts for 29.4% while the smallholder accounts for 67.9% and the Nyayo Tea Zone Development Corporation (NTZDC) 2.6%. Conversely, the large-scale estates account for 41% of the total tea produced in Kenya, the smallholder 58% and the state run (NTZDC) about 1%.

Overall, tea accounts for 20% of the total foreign exchange earnings for the country. The sector contributes about 4% to the GDP of which 60% can be attributed to KTDA. More than 3 million people derive their livelihood directly or indirectly from the tea industry, majority of who are in the rural areas.

Since inception, KTDA has played a very great role in putting Kenya high on the world tea trade scene. Subsequently, Kenya is the third largest

producer of black tea after India and Sri Lanka and in terms of export Kenya is the second largest exporter of tea in the world having overtaken India in 1993.

On the international scene, the Agency is the largest most successful small holder tea organization in the world and it is highly rated and ranked as the single largest producer and exporter of high quality premium teas in the world. Indeed, KTDA teas are used as a benchmark for quality, and are used to fix tea prices in other parts of the world.

KTDA's teas are renowned the world over and are used to blend other poor quality teas. These are definitely very impressive records of achievements that the Agency through its predecessor KTDA has attained against a background of serious constraints and operational bottlenecks.



### 2.3 TEA PRODUCTION OPERATIONAL BOTTLENECKS

The smallholder tea sub-sector has survived under very difficult conditions.

Some of the major bottlenecks experienced by this sector are:-

- (i) Widespread tea growing areas over difficult topography e.g the upper areas of the greater Muranga District landslides during the El nino rains of of year 2001/2.
- (ii) Poor state of tea roads that are impassable during the wet and rainy season e.g Mt Kenya and Arbedare regions.
- (iii) Long haulage distances to the processing units.
- (iv) Lack of roads in some areas
- (v) High processing costs occasioned by high maintenance costs of the leaf collection fleet.
- (vi) Congestion at the existing factories due to rapid increase in tea production.

(vii) Lack of rural electrification, which hampers operations at the leaf collection centers and factories.

(viii) Inadequate funds to maintain and rehabilitate tea roads..

(ix) Tea losses due to leaf collection problems related to poor road conditions mentioned in (ii) above.

This last bottleneck is the area of concern in this study.

Despite the serious bottlenecks mentioned above, the smallholder sector under KTDA has experienced remarkable growth, and had an impressive record of achievements within the short period of nearly four decades of existence as compared to the large-scale sector of nearly eight decades.

## 2.4 STUDY AREA LOCATION.

Administratively in KTDA, the study area fall in Zone vii which is one of the significant tea growing areas covering Meru south, Meru central, and Nyambene districts. The area under study is in Central and Southern districts as shown in Figure 2.4 a (Map showing Tea growing areas of Meru District , Road Network and Urban centres ; Source: compiled from The Tea Board of Kenya map).

The research study area is based on the southern tea growing region of greater Meru region covering Central (Imenti) and South (Nithi) areas. Imenti region has four (4) factories, i.e. Githongo, Imenti, Kionyo and Kinoro while Nithi region has one(1) factory i.e Weru.

The area of study will be the old Githongo, imenti and Kinoro leaf bases/Factory. The new Kionyo and Weru bases/Factories will be studied in isolation for comparisons of improved network.





Figure 2.4a Map of Kenya showing Tea growing areas and Road Network.  
 Source: The Tea Board of Kenya and National Atlas of Kenya.

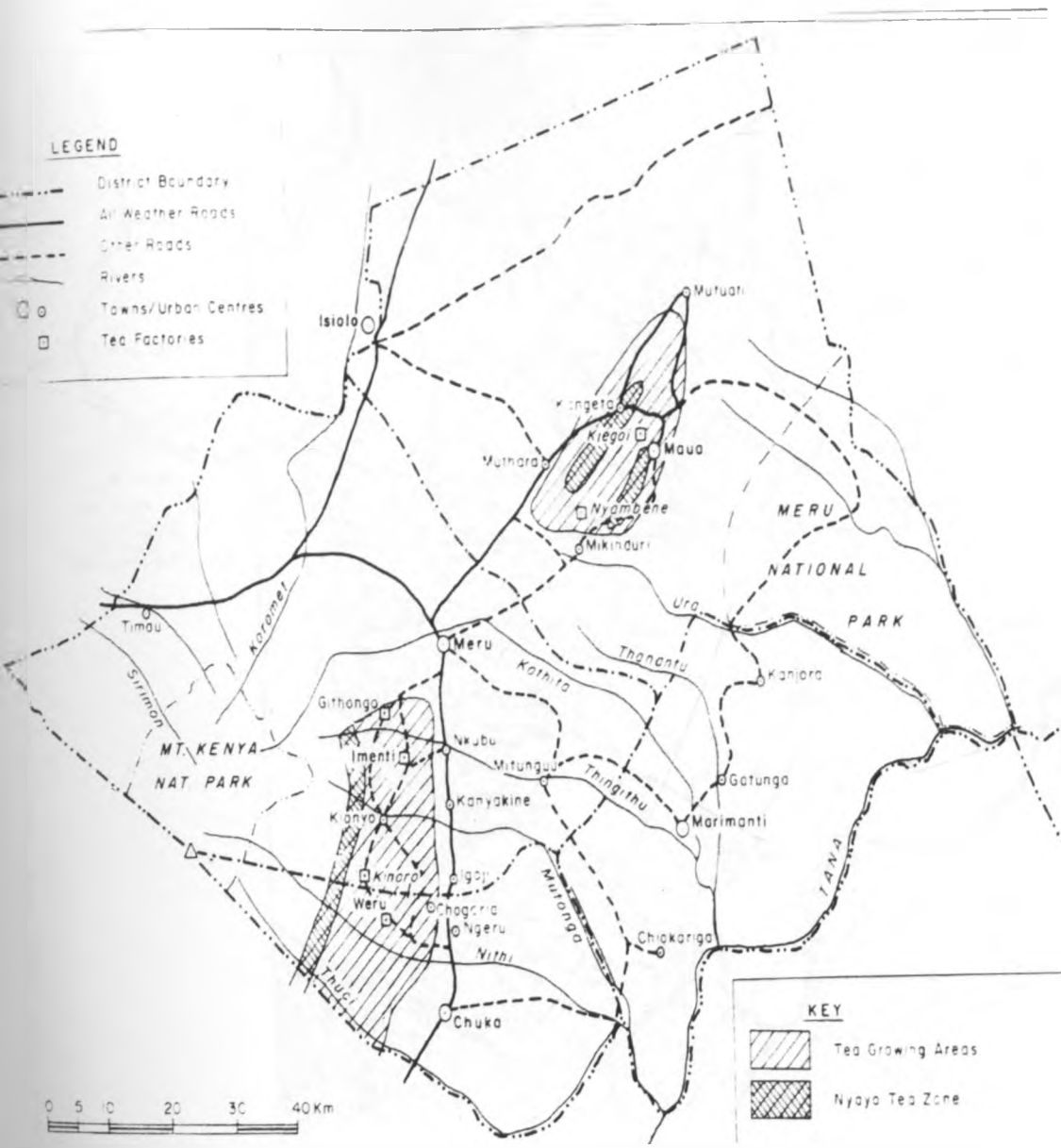


Figure 2.4 b Tea growing areas of Meru District, Road Network and Urban Centre.

Source: Compiled from The Tea Board of Kenya map.

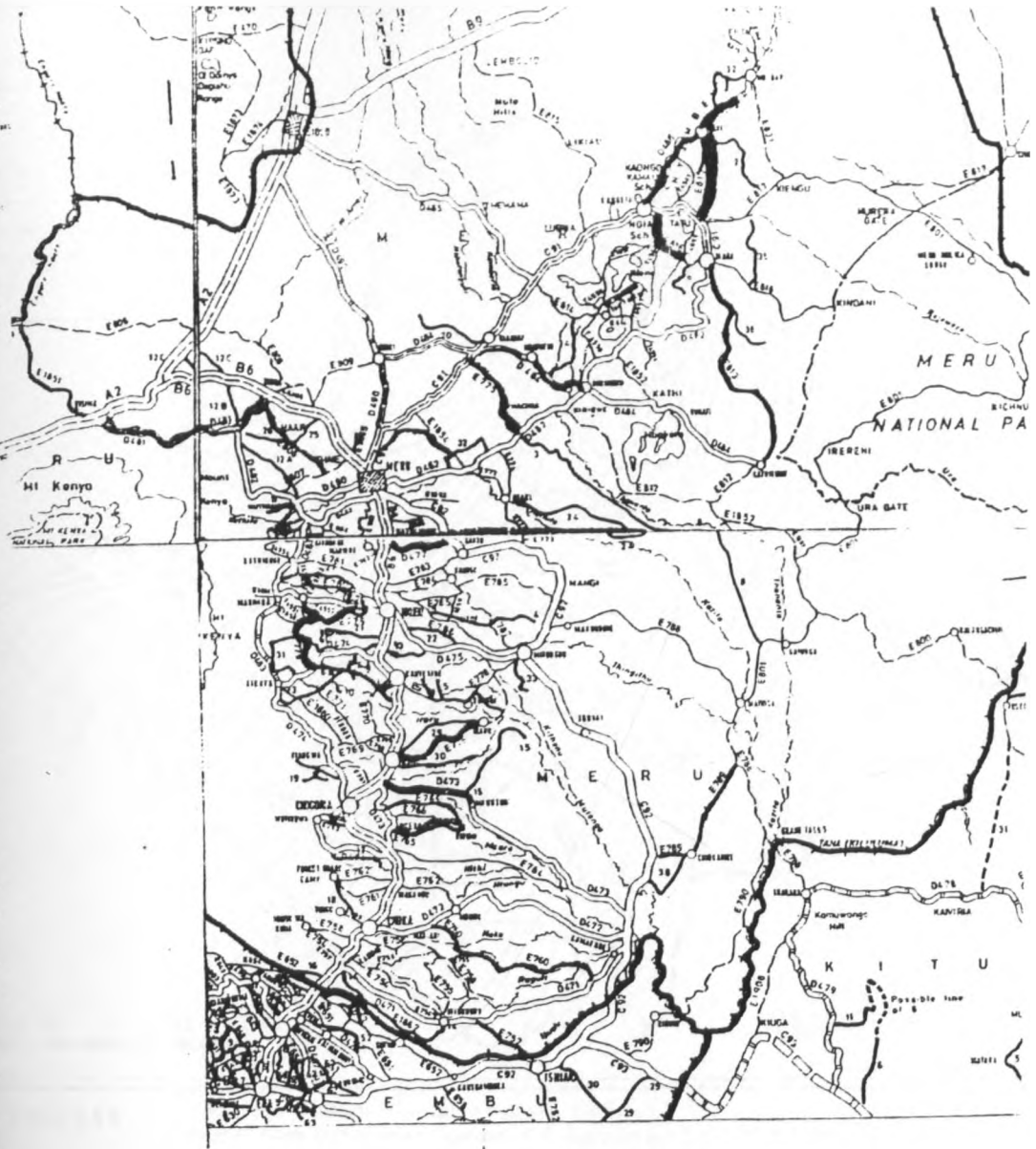


Figure 2.4 c

MINOR ROADS PROGRAMME  
MERU DISTRICT

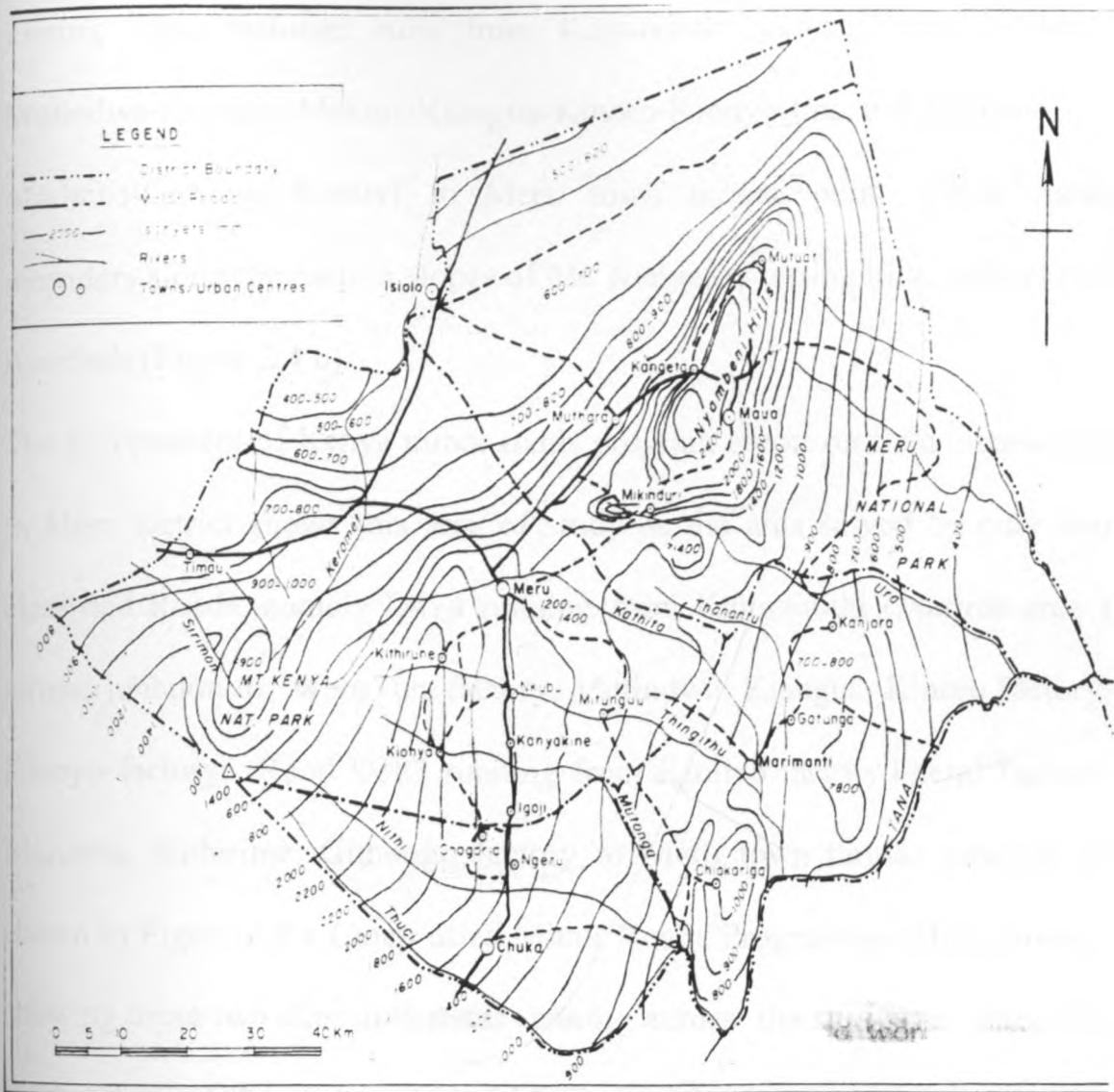


Figure 2.4 d Average Annual Rainfall of Meru District.  
 Source: Farm Management Handbook, R Jaetzold & H Schmidt, 1983

The study area is situated on the Eastern slopes of mount Kenya in the southern tea growing region of greater Meru District. The area of study will be between Nithi River and Thingithu river upper tea growing region.

The selected area of study is the one between the five KTDA factories namely Weru, Kinoro, Kionyo, Imenti and Githongo. The earth roads



joining these factories runs from Kajiunduthi tarmac point to weru-Mutindwa-Kianjagi-Makuri-Kiangua-Kinoro-Kionyo-Imenti-Kathera-Marimba-Githongo-Katheri to Meru town tarmac point. These roads meanders along the eastern slopes of Mt. Kenya traversing hills, valleys and riverbeds (Figure 2.4 b).

The Government of Kenya minor roads program report on field inspections in Meru district shows this area of study as the area served by only two classified Roads, namely D474 running from Kajiunduthi (Marima area ) tarmac junction to Weru tea factory, Mutindwa, Kiangua, Kinoro factory, Kionyo factory; Road D483 running from Kionyo factory,Imenti factory, Marimba, Kithirune, Githongo factory to Meru town tarmac junction as shown in Figure 2.4 c ( map titled Minor Roads Programme- Meru District showing these two classified roads running across the study area along the lower slopes of the eastern side of Mt Kenya- Source: MOPW Minor roads report).

## 2.5 GEOGRAPHICAL CONDITIONS OF THE STUDY AREA.

### (i) TOPOGRAPHY

The topography of the study area varies on the eastern slopes of Mount Kenya from about 1640 MTS above the sea level and then slopes gently

eastwards with Major river curving deep incisions in its bedrocks. The southern region of this study area is mainly agro-ecological zone following altitudinal flows.

## (ii) DRAINAGE

The drainage of study area is determined by the slopes of Mt Kenya flowing from the west to the east with valleys traversing the hills downwards forming sloppy landscape. The drainage on the slopes of Mt. Kenya forms a typical radial pattern as depicted by Nithi, Mutonga and Thingithu rivers in the study area.

Due to this drainage pattern, cultivation in most parts is therefore difficult and some places impossible in upper courses.

On the down slopes it is possible and is frequently practiced as the slopes are more gentle.

This geographical feature shows that rural transportation problems are rampant in these areas where even opening farms is rather difficult due to the poor terrain. Therefore, one of the contributors of rural transportation problems is the terrain of the area.

## 2.6 CLIMATIC AND ECOLOGICAL CONDITIONS.

The weather pattern of the study area varies in seasons and in years. These weather variations have some influence in tea amounts in different seasons of the year and in the annual amounts of each year.

From KTDA rainfall recordings, it is indicated that from January to June 2002/2003 an average of 925.57mm of rain was recorded in 59 wet days with 122 days being dry while the same period of the previous year January-June 2001/2002 recorded 1,148.09 mm of rain in 70 wet days with 111 dry days. This shows that January-June 2002/2003 rainfall recorded was 19.38% lower than the rainfall recorded from January-June 2001/02( source KTDA zones 1-12 records of rainfall from January-June 2001/02).

The study area is located in KTDA zone 7 where rainfall recorded is from January – June 2001/02 was an average of 1,620.38 mm with 48 wet days and 133 dry days while from January-June 2002/03 the zone recorded an average 843.71 mm of rainfall with 42 wet days and 139 dry days. This Shows that the study area part of zone 7 had the greatest variation of rainfall in 2002 and 2003.

The study area receives rainfall ranging from 1250-2250 mm annually.

Figure 2.4 d (Map Showing the Average Annual Rainfall of The Greater

Meru Region, source: Farm Management Handbook, R Jaetzold &

H .Schmidt, 1983). From the isohyets (MM) average rainfall measurements,

it is noticeable that the larger part of the study area fall between between

1800-2200mm of rainfall.

The physical topography of the study area has a critical influence on the

climate and consequently on agricultural potential. The highland masses

lessen the effect of high temperatures and rates of evaporation and also force

rain bearing winds upwards and cause them to loose a much greater amount

of moisture than over low-lying areas.

The area receives rains in 2 seasons. The short rains between March – May

and long rains between October – December annually. The study area is

mainly an agro-ecological zone where a mixed range of crops can grow.

The tea zones ranges from 5500 – 7500 ft above sea level. The other crops,

which are grown, are coffee, potatoes, maize and beans. There is also dairy

farming, which is mainly zero grazing due to land scarcity.

Due to heavy rains in the study area, the roads are severely affected and bridges and culverts are sometimes washed away.

## 2.7 BACKGROUND OF TEA ROADS IN KENYA

The initial small-scale tea establishment projects in Kenya included the reconstruction of roads to be used in collecting and transporting green leaf to the factories. These programmes were started in 1950s financed by Commonwealth development corporation (CDC) and Federal Republic of Germany. The projects consisted of the design, construction or reconstruction of 1,300 km of tea collection roads and of 150 km of factory access roads, as well as the establishment of fifteen small teams within KTDA for road maintenance.

KTDA road network is made up of mainly secondary roads, minor roads, special purpose roads and other unclassified roads. The whole KTDA network is about 5086 kms or which 83.3% (4237) km fall under the classified category and the rest 849 kms make up the unclassified category. The roads serve all transportation activities in the areas they are situated, including tea collection. The special purpose roads designated as “tea roads”

were constructed in the late 1960's and early 1970's and financed by the World Bank. There are only 300-400 km of roads in this class.

The construction and upgrading of roads in the areas covered by the KTDA tea factories have been carried out in three phases. Phase I commenced in 1965, and was financed by a credit from the International Development Agency (IDA). Phase II was carried out between 1968 and 1970 covering areas in all six of the existing tea zones east and West of the Rift Valley. Phase III was planned in 1970-71 and the work carried out between 1974 and 1978.

The three phases of Tea Roads covered tea planting projected to about 1978. It is not known what the total road length was at the end of this period. Phase I covered 290 km of tea collection roads and 150 Km of factory access roads, and phase III covered some 975 km of green leaf collection roads. It is believed that phase II covered a similar length. Unfortunately, the details of Phase II of the project are not known; nor is there any information concerning policy and outcome of the KTDA maintenance units, which were transferred to MoPW&H (then the Ministry of Transport and communication).

It is of importance to note that during phase III some 229 km of road on steep grades (over 12% were recommended for bitumenisation. No reliable information is available on the final length bituminised but from observations made by the study team during inspection of the collection routes it would seem that most (if not all) were completed.

In many places where the roads were bituminised the present condition is remarkably good and leads to the conclusion that bitumenization, though expensive, gives a long lasting, relatively maintenance-free solution. As the inventoried network has grown to approximately 4,500 km of roads, many of the roads now used for tea collection are new routes created since Phase III, either through construction or adoption of existing roads into leaf base networks.

In addition, some 570 km of existing classified roads are used for tea collection (these have not been inventoried by the consultants under the Tea Roads Rehabilitation study).

The number of KTDA factories and consequently the requirements for roads has grown steadily since the inception of the scheme in the 1950's. The geographical areas covered by smallholder tea have not increased greatly – with the notable

exception of the Kakamega, Nandi and Kitale areas – but the area of planted tea has, so new factories have been built between the original ones to keep pace with the increased volume of green leaf. In addition, capacity of most of the factories is being enhanced, to a greater volume of green leaf.

The tea roads programmes were Kenya's first significant projects connected specifically with special purpose roads. It is important to note the conclusions underlying the project concept which shaped the current situation. The following section is quoted from a World Bank publication concerning project case studies:

No rehabilitation work and very little maintenance carried out on the collection network since the end of phase III some years ago when responsibility for road maintenance was transferred to MoPW&H”

## 2.8 RURAL TEA ROADS PROGRAMMES

### 2.8.1 THE LOCAL GOVERNMENT TEA CESS ACT.

The Local Government (Agricultural produce Cess) (Adoptive By-Laws) order, 1988 was gazetted on 20<sup>th</sup> May, 1988 under the Local Government Act and the Agriculture Act (Kenya Gazette supplement No.23 (legislative Supplement No.20) and empowered various organizations to collect and remit a 1% cess on the gross producer price of coffee, wheat, maize cashewnuts, pyrethrum, sisal, sugar cane, cotton, tobacco, barley and tea.



By this order and Legal Notice 199 of 1989, KTDA was appointed the authorized agent to collect the produce cess levied on tea. The cess was remitted to the Tea Board, and was intended to finance the activities of local authorities, including road maintenance. KTDA calculated the cess due from each district on the basis of the number of buying centers for each leaf base lying within the district. It should be noted that this bears little relation to the length of tea roads to be maintained.

The order did not state what the municipal, town or county councils were required to undertake with the produce cess funds, but the KTDA assumed that it would enable the county councils to better attend to road maintenance, one of their main tasks and already a major issue in tea growing areas.

Little of the produce cess collection on tea was being devoted to tea road maintenance, and the KTDA complained bitterly to the Tea Board and its parent Ministry, Ministry of Agriculture. The issue was taken up at Ministerial and Cabinet level. It should be noted that during this time a substantial equipment inventory had already been purchased by the county councils from tea cess revenues.

This pressure resulted in the cess being temporarily (from March, 1990 to October 1990) diverted from the County Councils and remitted to the MOPW&H for road maintenance works; it was then returned directly to county councils, and later redirected to the District Commissioners because of an uproar over mis-allocation of cess funds and a legal struggle between the Ministry of Agriculture, Tea Board and KTDA on one hand, and the Ministry of Local Government on the other.

One of the major problems was that the legal text establishing the Agricultural produce cess did not specifically mention that its proceeds should be used for road maintenance. KTDA initially had no legal basis for complaining directly about the cess not being used for road maintenance, and could only complain about the fact that the county councils are not fulfilling their duties with regard to road maintenance.

However, a circular letter from the Office of the President (Ref/F 178/99/2 Vol.1101 of 6<sup>th</sup> September 1990) directed that 80% of tea cess money was to be used solely for tea roads maintenance as directed by district development committees and the remaining 20% was to go to the relevant local authority as part of its revenue.

The District Commissioners were to chair the implementing committees and oversee proper utilization of the funds. This system too had operational bottlenecks and some funds were not used for the intended purposes.

### **2.8.2 TEA ROADS CESS UTILISATION.**

Despite the Government of Kenya (GOK) directive of 80 % and 20% tea cess funds sharing between tea roads and councils, tea farmers continued to put pressure on the GOK through KTDA to release the whole tea cess funds for tea roads maintenance.

During the 1994 Annual Tea Growers Conference held on 27<sup>th</sup> September, 1994 the following were the pertinent questions presented by the Zonal Tea Committee Members concerning tea roads cess;

- (a) The growers would like to get the cess money per Factory basis instead of the District pool.
- (b) The cess money should be handled by Growers representatives instead of Administration.
- (c) The cess money should be sent direct instead of through the Tea Board to avoid delay.
- (c) K.T.D.A. should establish its own Road Maintenance Unit to avoid

Public Works misusing the money on repair of their Machinery. Each zone should buy a grader.

(e) The tea cess deductions should be increased to 2%.

After deliberations by KTDA Management and the GOK representative in answering the tea growers questions, the following were appended on the way forward on tea cess and tea roads programmes;

- (a) KTDA Board to discuss with Tea Board of Kenya on Tea cess per factory instead of District pool.
- (b) KTDA Board to recommend to the GOK on tea cess handling by Growers representatives instead of Administration.
- (c) KTDA Board to discuss with GOK on Zonal tea roads maintenance.
- (d) A separate KTDA cess account to be opened.

The occurrences during this Tea Growers conference of September 1994, was a clear indication that tea farmers were concerned with the situation of poor tea roads which led to high tea losses between 1979-1990 as shown in the Tea losses Analysis "Table A". Tea farmers basis of the argument was on the fact that they were contributing to a tea cess fund which was meant to repair tea roads, but the cess was not utilised for the intended purpose. Both at Zonal and National level KTDA continuously articulated to the GOK the

concern of the tea farmers on the proper management of tea cess on tea roads maintenance.

### **2.8.3 TEA CESS COMMITTEES AND ROADS REHABILITATION**

In 1996, the tea farmers wanted to oversee utilization of the tea cess funds themselves. The government mandated the respective farmers' organizations to manage the cess funds, leading to the formation of Zonal Tea Cess Committees in 1997. Since then, significant improvements have been made in the maintenance of tea roads.

However, due to the backlog of rehabilitation, maintenance work had fallen far short of expectations. It has also been acknowledged that the funds collected were grossly inadequate to undertake any meaningful maintenance or rehabilitation works considering the demands by the wide tea roads network and their poor conditions due to the long-term effect of neglect.

Subsequent to the formation of the Zonal Tea Committees, each factory constituted a Tea Cess Committee to address the hue and cry on the state of neglect of the tea roads by the county councils. Since the formation of the Tea Cess Committees, most of the factories have been receiving and

utilizing their share of the cess funds. The committees identify, rank and prioritise roads and sections of roads that are to be rehabilitated first according to the state and importance of each road.

These committees have done an exemplary job in a very short period of time. For instance most of them have acquired a tipper for the exclusive use on the tea roads. But the tea cess funds are awfully inadequate due to the many years of neglect. There is need therefore to supplement these funds in order to clear the backlog.

There are twenty-eight tea-growing districts in Kenya's five tea growing-provinces namely: Central, Eastern, Rift-Valley, Nyanza and Western. The tea roads network in these provinces is about 4792 kilometres out of these, about 2558 kilometres or 60% require rehabilitation.

The roads requiring rehabilitation have constantly impacted negatively on delivery of tea to the processing factories thus occasioning huge losses to both the farmers and the Nation at large.

According to Sir Alexander Gibbs Report of 1993 on the study of tea roads; opening of new factories or buying centres does not significantly increase the need for more roads as those facilities are normally along existing road network.

According to a KTDA internal report of tea roads funding, the requirement to upgrade all tea roads is about Kshs. 740 M. Though the need for tea roads funds is 740 million, the cess funds realised for roads rehabilitation is only Ksh.136 million based on the 1999/2000 crop. This leaves a deficit of about Ksh.605 million to be financed from other sources-mostly from Donors, GOK or Stabex arrangements.

#### **2.8.4 THE KTDA TEA ROADS PROGRAMMES**

Over the years various projects have been initiated to improve or address the poor state of tea roads. The KTDA road network is made up of mainly secondary roads, minor roads, special purpose roads and other unclassified roads. The roads serve all transportation activities in the areas they are situated, including tea collection.

The construction and upgrading of roads in the areas covered by the KTDA tea factories have been carried out in three phases. Phase 1 commenced in 1965, and was financed by a credit from the International Development

Agency (IDA).Phase 2 was carried out between 1968 and 1970 covering areas in all of the then existing six Tea Zones East and West of the Rift-Valley. Phase 3 was planned in 1970-1971 and the work carried out between 1974 and 1978.

### **2.8.5 KTDA TEA ROADS REHABILITATIONS**

#### **REQUIREMENTS IN THE STUDY AREA**

Eastern Province tea growing Districts consist of Embu, Meru south, Meru central and Nyambene Districts. The tea road network in the province is about 530 kms. Out of this 408 kms require rehabilitation while 9.7 kms require re-shaping. The study area is in Meru south and Meru central tea growing region.

It is obvious with the current expansion of the existing tea factories and coming up of new proposed factories in the province the road network has increased due to some new buying centres being constructed along non-tea roads which would be included in tea



roads network; but this increase is not very significant because most of the new factories are sited along the existing tea roads network.

However, the exercise that was carried out in 1992, by Sir Alexander Gibbs reports reveals that by that time there were 408 kms that required rehabilitation and were estimated to cost about ksh 36.8 million, while 9.7 kms that required re-shaping were estimated to cost Kes. 77,628. The total requirements for the province were estimated to be about ksh 36.9 million. At that time, the exchange rate was about ksh 32.2 to the dollar.

Basing the current rehabilitation cost to the current dollar exchange rates of about ksh 54, the entire Eastern Province would now require an estimated total cost of ksh 61.9 million.

During the financial year, 1995/1996, the province produced about 104.8 million kilogrammes of green leaf. This represented about

17.2% of all green leaf delivered to all KTDA managed factories.

The cess funds realised for roads rehabilitation that year was about ksh 12.4 million giving a deficit gap of about kshs 49.5 millions.

This is approximately the amount that KTDA would require to top Tea Cess Funds in order to effectively maintain tea roads in the country.

Although the level of production this year is anticipated to be slightly lower than it was the previous year, because of the effects of the recent drought, it will be expected that the all time record of over 600 million kilogrammes total for KTDA will be maintained hereafter.

To collect this enormous tea crop from the tea farmers, tea roads will require to be continuously repaired and maintained to all weather to avoid leaf losses.

## 2.9 THE GOK POLICY ON RURAL ROADS

The Government Of Kenya (GOK) recognizes the transport sector's role in the Kenyan economy. The Ministry Of Transport and Communications (MOTC) appreciates that inadequate transport infrastructure is a major constraint on aggregate agricultural productivity, and that improvements in transport often lowers agricultural input prices and hence the costs of production. If rural transport infrastructure is improved, rural small scale farmers would receive high returns from crop production and in effect raise their living standards and facilitate poverty reduction. It is also noted and accepted by the GOK through MOTC in the Integrated National Transport Policy May 2003, that there are serious deficiencies in the transport planning approach followed by different agencies, with very little or no cognisance of other stakeholders views. The planning is largely sectoral in approach with little coordination amongst the relevant institutions and no clear policy framework regarding to the transport sector of the economy.

With this recognition the GOK has undertaken in the National Transport Policy to review the existing transport sub-sector policies, adequacy, operations, laws and institutions. In this policy there will be a review of the Urban and Rural transport system by the GOK in conjunction with the private and other stakeholders of which KTDA should be one of the major players.

### 2.9.1 GOK MINOR ROADS PROGRAMMES

The Minor Roads Programme (MRP) initiated by the GOK in the late 1980s with external donors had the original objective of improving a significant proportion of the priority class D and E rural roads by labour based repair methods.

This objective was achieved as confirmed in a MRP Donors Annual Review and Evaluation in November 1991 where all the donors indicated their willingness to consider continued support to Kenya's road program provided there was a significant shift from road improvement to maintenance.

A labour based road maintenance strategy to run 1992-2002 was discussed in June of 1991 in a workshop in Nairobi to explore the potentials of the MRP to develop a sustainable approach to road maintenance which could eventually be fully institutionalised in the then Ministry of Public Works (MoPW) maintenance organisation.

In the follow ups on labour- based road maintenance strategy the MoPW highlighted the development of the MRP and its predecessor RARP(Rural Access Roads Programmes) in the light of Kenya's economic development.

It was stressed that the maintenance of smaller roads in rural areas be done by labour intensive methods. This reflected very well the priority elements of the economic policy of the country in both agriculture and transport development, creation of additional employment and the emphasis on maintenance culture rather than new investment.

### 2.9.2 PROJECT ROADS 2000

The MoPW policy framework proposed a transition of the MRP in a perspective of the overall long-term maintenance strategy in the Ministry. The Ministry aimed at a new integrated maintenance system for all the roads applying a "three tier" approach of purely labour-based ("MRP-method"), machine-based ("traditional maintenance-branch approach") and a mixed method ("labour-based with tractor tractor -towed- graders").

The application of labour-based methods was to be determined by type and condition of the roads, and availability of labour force.

The project Roads 2000 identified the potentials for labour-based methods of road maintenance system and methods as well as the organisational set-up were used in the projects.

There was an interface between the MRP and Roads 2000 which according to the MoPW strategy, the MRP after switching from

improvement to maintenance of its network was to gradually adopt maintenance for other classified roads.

It was further adduced that during this transition the MRP would cease to be "MRP" and rather become "THE" labour-based maintenance system of Department of Roads in the districts as a maintenance branch of the Ministry. This proposal is essentially a rural based system which can go along way in the improvement of rural roads for the benefit of rural farmers and in these study, tea farmers.

### **2.9.3 THE KENYA ROADS BOARD (KRB)**

Kenya Roads Board (KRB) was enacted through Kenya Roads Board Act, 1999 charged with the responsibility to the management of the entire road network in Kenya. The objective and purpose for which the Board is established is to oversee the road network in Kenya and thereby coordinate its development, rehabilitation and maintenance and to be the principal advisor to the Government on all matters related thereto.

The KRB is also mandated by the GOK to manage the "Road Maintenance Levy Fund"(RMLF) which was established by section 7 of the Road Maintenance Levy Fund Act, 1993. This was in accordance with the road maintenance fuel levy imposed by GOK under section 3 of the Road Maintenance levy Act,1993.

The source of funding for the maintenance of roads has since 1993/1994 financial year been mainly the revenue accruing from the road maintenance levy fund by the Kenya Road Board.

During the last two financial years, this revenue has amounted to approximately ksh.8 billion per annum. The KRB is responsible for distributing these maintenance funds for all road agencies.

Currently the KRB funds are distributed as follows:

Roads Department for class A,B and C.	57%
KRB for operations.	03%
Districts equitably for class D,E and other roads.	24%
Constituencies equally for class D,E and other roads.	16%
<b>TOTALS</b>	<b>100%</b>

Source: E.A. Standard 4th, April 2003



The mission of the KRB is to ensure provision of safe, efficient, environmentally friendly and sustainable road-network, through sourcing and optimal utilization of resources to the satisfaction of stake holders.

One of the key mandates of the Board is the allocation of RMLF. In the last two financial years 2001/2002 and 2002/2003 of its effective life, the Board has disbursed about ksh.16 billion from the RMLF to Road agencies.

The designated Road Agencies are KRB, MoRPW&H, District Roads committees, Ministry of Local Government-Urban Roads, Kenya Wildlife Services (KWS)-Park Roads, and District Road Committees (DRCs) Constituency roads.

In the last financial year 2002/2003, a portion of this money was used to rehabilitate/reseal about 170 km of bitumen roads and to gravel approximately 280 km of unpaved roads. It is questionable how many KMS of tea roads were graveled this time.

Due to major roads maintenance requirements, there is a big gap between the financial needs of the road network and available resources. This leads to high over-commitments in the roads project threatening the entire management of service delivery.

It is therefore necessary to embark on identification of new sources of funding for road repairs and maintenance.

There are other KRB challenges in roads funds management which requires considerations. These include; Completion of roads sector reforms, Institutionalization of a road network with stratified levels of service commensurate with the socio-economic returns expected from each type of road and ring fencing road maintenance funds for each type of road and developing a prioritization criteria for each type.

KRB is working with road agencies to ensure adherence to the existing prioritization criteria for road maintenance.

For major roads, the maintenance criteria should be economic returns while for minor/access roads like tea roads, local social considerations could be overriding. This is where KTDA case of tea roads repairs comes handy.

The Road Maintenance Levy Fund (RMLF) collected during the first half of this financial year ended 31 December amounted to ksh.4.081 billion exceeding budget estimate by ksh.80 million.

This was a significant improvement compared to the same period last year in which a total of ksh.3.638 billion was collected.

During the same period Kenya Roads Board released a total of ksh.3.716 billion of the RMLF to its Road Agencies for implementation of the approved Road Works Programs for the FY2003/2004 { Half year results of (July-Dec) financial year 2003/2004 KRB Report in Daily Nation of February 11,2004}.

## CHAPTER THREE

### 3.0 METHODOLOGY

#### 3.1 INTRODUCTION

In geographical studies field observations and investigations can encompass very large areas having wide varieties of spatial phenomena. In most cases it would be too costly and time consuming to observe or investigate all potential phenomena in the chosen study area.

In order to reduce this problem small proportions or samples were obtained from the southern tea growing region of Meru with particular reference to the five tea factories in this region namely Githongo, Imenti, Kionyo, Kinoro and Weru KTDA managed tea farmers' factories.

The technique of data collection used in this study was determined by the objectives of the study, the study area coverage and the comparative economic variables which affect tea transportation in the selected factories of study.

Quantitative and qualitative analysis were used in the study to establish facts, perform hypothesis tests and make relevant conclusions from the data collected through questionnaires administered to tea farmers in the study area.

### 3.2 RESEARCH DESIGN

There was a variety of data required for this study in order to test the formulated hypothesis. The sources of the data was obtained from the existing KTDA records of green leaf losses in each factory and the researcher's field observations.

In the study sampling was conducted using relevant KTDA documented secondary data of the study area. This secondary data was obtained from the KTDA leaf base records of the buying centers from where green leaf is bought from farmers and delivered to the factories. It is at the buying center level where farmer's plucked green leaf is weighed and recorded individually and these records form the basis of monthly tea payments to all tea farmers.

The tea weighed at the buying center is again weighed at the factories and

comparisons are done. The difference between the receipt weight and factory weight forms the basis of tea losses which is a major area of tea transportation problems being carried out in this study. Samples for the buying centers for the study of leaf losses reasons were obtained from the list of all buying centers in each individual factory.

Field observations were also made by the researcher in the study area to gather information relevant to the objectives of the study. In the field, physical transportation problems observations were made on bad road conditions, tea farmers head loadings and use of non-motorized transport systems. Field physical observations were also made on the government initiative on rural tea roads and the KTDA initiative on rural tea roads.

These physical observations were made/recorded in photographs to be used in description and analysis. The area of study covered five KTDA tea factories of Githongo, Imenti, Kionyo, Kinoro and Weru. This is where samples of buying centers were drawn from using random sampling techniques.

### 3.3 SAMPLING PROCEDURES.

Each KTDA factory has buying centers from its tea growing catchment area. The buying centers are connected to the factories through minor rural tea roads of which KTDA tea collection vehicles are the main road users.

From the list of buying centers serving each of the five factories, samples for the study of leaf losses were determined within the radius of the factories.

Sampled points in form of buying centers were selected within the framework of 10 buying centers in each factory and 5 respondents in each buying center, thus the actual respondents in each factory were randomly selected with 50 respondents being selected in each factory catchment area.

Thus a total of 250 tea farmers respondents were interviewed in this study on the impact of poor road conditions to leaf losses and closure of tea buying centers during the rainy season.

To study further addresses the influence of poor rural roads on tea losses and closure of buying centers as a tea transportation problems, agricultural tea extension officers were selected for interviews in order to gauge any

correlation with the tea farmers interviews. In this study 5 agricultural tea extension officers were interviewed in each of the five factories giving a total of 25 respondents selected for the study.

### 3.4 SOURCES OF DATA

In order to obtain adequate data for this study it was necessary to consult several sources. The adequacy of the data collected was of vital importance to test the hypothesis formulated in this study. This study utilized both Primary and Secondary data.

#### (a) Primary Data

This refers to the data collected first hand in the field and compiled by the researcher. This type of data was collected direct through field observations and questionnaires. The survey was conducted on tea farmers to collect the primary data on the various reasons of tea losses from the farmers point of view, and the KTDA agricultural extension officers point of view.

The primary data was used to verify the causes of tea losses.



The primary data in this study was obtained from field survey conducted by the researcher with the help of 5 research assistants, one from each of the five factories in the study area. For this study, questionnaires were administered. One was a tea farmer's questionnaire on tea losses survey in relation to poor road conditions and closure of buying (Appendix I), and the other was a survey opinion on what influences tea losses from the Tea extension officer's experience point of view (appendix II). The primary data on road conditions, closure of buying centers and leaf losses were relevant in testing the set hypothesis of this study.

In the field study open-ended and closed ended questionnaires were used simultaneously and then compiled for computer analysis. The questions were subjected stata soft wave data clean up and analysis in testing the hypothesis.

(b) **Secondary Data**

This is the data, which is obtained from already existing records published by others and not the researcher. This data was obtained from KTDA publications, Tea Board of Kenya records, Ministry of Roads and Public Works, the Economic Surveys and the Ministry of Agriculture.

The data collected for this study was from the records of KTDA Leaf base green leaf losses as compared to factory receipts. The buying center closures and the leaf carriers trips data.

The data analysed was from a period of ten (12) years from 1990 to 2002.

The data on tea losses was obtained from KTDA leaf losses summaries compiled at Head Office.

### 3.5 TECHNIQUES OF DATA COLLECTION

Data on tea plucking days during the rainy and dry seasons was obtained.

Questionnaires with both open ended and closed ended questions were administered to tea farmers randomly selected from each of the five factories. Due to the extensiveness of the study area, ten buying centers were selected from each of the five factories of Githongo, Imenti, Kionyo, Kinoro and Weru and five respondents were interviewed in each buying center.

A range of operations data was obtained from the interview of the tea farmers on the average weekly tea plucking days during the rainy season and

on comparison during the dry season. The questionnaires were administered as indicated earlier.

Seasonal weekly data on buying Center closures was obtained. The data on seasonal buying center closures during the rainy and dry season was obtained from the interview of tea farmers through the questionnaires. The farmers through the questionnaire interview gave the average tea buying center closures during the rainy season and during the dry season.

### **3.5.1. COLLECTION OF DATA ON LEAF LOSSES/BUYING CENTRE CLOSURES FROM FARMER'S POINT OF VIEW.**

#### **(i) Collection of Tea Losses data due to closure of buying centers during rainy seasons.**

From the tea farmers questionnaire interview, data was obtained on each interviewed farmer estimated un-plucked tea losses due to the closure of their particular buying centers. The data on plucked tea is determined and estimated on the tea plucking cycles which is weekly. In most cases if a tea farmer jumps at least on plucking cycle to the next cycle, there is a loss because the un-plucked leaf over shoots and cannot be plucked as tea but is

cut and the larger stalk is thrown away. Thus the un-plucked leaf is the loss in the jumped tea plucking cycle.

(ii) Collection of Data on tea farmers perceived reasons of buying Center closures.

In the tea farmer's questionnaire data was obtained on the farmer's perceived reasons of buying center closures. One of the reasons was impassable roads or poor road conditions.

The other was KTDA transport problems or inadequate transport. In this questionnaire the research assistants were keenly monitored and requested not to influence the tea farmers answers and were to make the respondents as free as possible to give their responses from experience.

**3.5.2 COLLECTION OF DATA ON DISTANCE OF THE BUYING CENTRES FROM THE FACTORIES**

Data relating to the distances of buying centers from the factories was obtained through the questionnaires where farmers estimated the buying centers distances from the factories. This data was compiled for the average comparison of the five factories distances of buying centers from the factories.

### **3.5.3. COLLECTION OF DATA ON THE TEA FARMER'S OPINIONS ON THE WAYS OF REDUCING TEA LOSSES.**

The tea farmers' questionnaire used to collect data was also used to solicit the tea farmers' opinions on ways of reducing tea losses. The farmers' opinions were in three forms; factory expansion opinion, more vehicles opinion and continuous road repairs/maintenance opinion.

The questionnaires were administered as initially indicated.

### **3.6 TECHNIQUES OF DATA COLLECTION – TEA EXTENSION OFFICERS QUESTIONNAIRES**

A questionnaire was designed and used to collect data and opinions from the KTDA extension officers on various aspects which affect tea transportation from the tea buying centers to the tea factories. The tea extension officers closely work with tea farmers in tea husbandry, tea plucking and tea quality to the factories.

The questionnaire was administered to five tea extension officers from each factory noting that each factory had at least five extension officers. The following data was obtained from the tea extension officer's questionnaire interview:-

- (a) The average days/weeks closure of buying centres in Factories during the rainy seasons and dry seasons
- (b) The tea extension officers perceived reasons that lead to closure of buying centers from a choice of three (3) set reasons
- (c) The data on type of tea roads in each extension officer's tea extension area either loose surface or gravel type choice on questionnaire
- (d) The data on the condition of tea roads during the rainy season either passable or impassable by lorries choices on questionnaire
- (e) Data on the tea extension officers' opinion through experience on reduction of tea losses with 3 set choices opinion of factory expansion, repair of roads or more KTDA vehicles.

# CHAPTER FOUR

## 4.0 TECHNIQUES OF DATA ANALYSIS

### 4.1 DATA ANALYSIS

This study used linear multiple correlation and regression analysis to establish the significance of the relationships of the independent variables mainly total tea losses (tloss0 and estimated tea losses (un-plucked) due to closures of buying centers (losscls).

The general multiple regression model is of the form;

$$Y_j = \alpha + \beta_1 X_{1j} + \beta_2 X_{2j} + \beta_3 X_{3j} + \dots + \beta_k X_{kj} + \epsilon_j$$
$$= \alpha + \sum_{i=1}^k \beta_i X_{ij} + \epsilon_j$$

Where  $\alpha$  = constant  
 $\beta$  = coefficients of explanatory variables  
 $\epsilon$  = Error term

The assumptions of this model are: ]

- (i) All the variables are measured at the interval level and without error
- (ii) For each set of variables for the k-independent variables, the mean of the error term is 0
- (iii) The variance of the error term for the k-independent is constant
- (iv) The error terms for each set of values for the k-independent variables are normally distributed
- (v) There is no perfect colinearity in the independent variables
- (vi) There is no autocorrelation, that is, the error terms are uncorrelated.

Multiple Analysis of Variance (MANOVA) was used to test the significance of the linearity between  $X_{ij}$ s and  $Y_j$ , the independent variables and the dependent variable.

In this study, it is assumed that the magnitude of tea losses is closely associated with road conditions, closures of buying centres, distance from the factories, land under tea and the number of tea bushes being plucked.

The general MANOVA table is shown as below;

SOURCE	DF	SS	MS
Model	k	$\sum (\hat{y}_j - \bar{y})^2$	$\sum (\hat{y}_j - \bar{y})^2 / k$
Residual	n-2	$\sum (y_j - \hat{y})^2$	$\sum (y_j - \hat{y})^2 / n - 2$
Total	n-2+k	$\sum (y_j - \bar{y})^2$	

where k – degrees of freedom  
n – number of variables

The analysis of variance was subjected to a test of significance of the linear regression using F-statistic with k and n-2 degrees of freedom at 0.05 significance level where

$$F(k, n - 2, 0.05) = \frac{\sum (\hat{y}_j - \bar{y})^2 / k}{\sum (y_j - \hat{y})^2 / n - 2}$$

was used in testing the stated null hypothesis.

The multiple coefficient of determination ( $R^2$ ) was also obtained from the MANOVA table as follows;

$$R^2 = \frac{\sum (\hat{y}_j - \bar{y})^2}{\sum (y_j - \bar{y})^2}$$

$R^2$  varies between 0 and 1 and is interpreted as the proportion of the original variance in the dependent variable that is accounted for by the independent variables in the regression analysis.

## 4.2 THE DATA :

Primary data was utilized for the study. A cross-section was constructed based on five various tea leaf bases in the southern tea growing region of Meru. The five tea leaf bases are Imenti, Weru, Githongo, Kionyo and Kinoro.

“STATA” software was used to clean and analyze the data.



### 4.3 MULTIPLE REGRESSION:

For all the functions specified, Ordinary Least Squares (OLS) was used for regression.

Variables for multiple regression are defined as below;

Table 4.1

<b>Variable name</b>	<b>Variable label</b>
<b>Sex</b>	sex of respondent
<b>Lando</b>	total land owned
<b>Landt</b>	land under tea
<b>Tbushes</b>	Number of tea bushes being plucked
<b>Plkrain</b>	Average plucking days in the rainy season
<b>Qplkrain</b>	Average quantity plucked in the rainy season
<b>Plkdry</b>	Average plucking days in the dry season
<b>Qplkdry</b>	Average quantity plucked in the dry season
<b>Qmonthly</b>	estimated monthly production
<b>Clsrain</b>	number of closures of buying centre in the rainy season
<b>Clsdry</b>	number of closures of buying centre in the dry season
<b>Losscls</b>	estimated tea losses(unplucked) due to closures
<b>Lossclxn</b>	estimated tea losses due non collection
<b>Rescls</b>	reason for closure
<b>Distfabc</b>	distance of farm form buying centre
<b>Distbfac</b>	distance of buying centre from factory
<b>Tloss</b>	Total tea losses
<b>Zone1</b>	Dummy for distance
<b>Zone2</b>	Dummy for distance
<b>Zone3</b>	Dummy for distance
<b>Zone4</b>	Dummy for distance

Descriptive statistics

Table 4.2

Variable	Obs	Mean	Std. Dev.	Min	Max
Sex	133	0.7969925	0.4037588		
Lando	129	3.381318	4.586133	0	30
Landt	133	1.097165	1.481698	0.001	10
Tbushes	133	4863.977	7159.971	140	42000
Plkrain	110	5.445455	9.449612	1	100
Oplkrain	116	561.3621	1899.651	5	16000
Plkdry	107	4.233645	7.722278	1	80
Oplkdry	117	214.1709	550.4553	5	4500
qmonthly	132	730.2402	1062.222	0	8000
clsrain	129	1.178295	1.913968	0	12
Clsdry	124	1.153226	1.385431	0	6
Lossels	130	107.9846	331.0721	0	3000
lossclxn	130	151.1154	641.3839	0	5000
Rescls	100	1.13	.3379977		
distfab	133	1.24812	.4831402	1	3
distbcfac	133	2.541353	1.124866	1	4
zone1	135	.762963	.426849		
zone2	135	.2	.4014898		
zone3	135	.0222222	.1479545		
zone4	135	0	0		
Tloss	130	259.1	894.4986	0	8000

## 4.4 HYPOTHESIS TESTING

a) **H0: There is no significant relationship between the closure of buying centers due to impassable road conditions and the tea losses.**

**H1: The alternative.**

The following functional form is specified. This is a linear function which is regressed using Ordinary Least Squares (OLS).

$$\text{losscls} = \alpha + \beta_0 \text{landt} + \beta_1 \text{tbushes} + \beta_2 \text{qplkrain} + \beta_3 \text{qmonthly} + \beta_4 \text{clsrain}$$

The following regression results are obtained

Table 4.3

reg losscls landt tbushes qplkrain qmonthly clsrain						
Source	SS	df	MS	Number of obs = 110		
Model	6245555.34	5	1249111.07	F( 5, 104) = 17.30		
Residual	7508223.71	104	72194.4588	Prob > F = 0.0000		
				R-squared = 0.4541		
				Adj R-squared = 0.4279		
Total	13753779.1	109	126181.459	Root MSE = 268.69		

losscls	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
landt	132.7262	37.87133	3.50	0.001	57.6259	207.8264
tbushes	-.0262273	.0092345	-2.84	0.005	-.0445397	-.007915
qplkrain	-.0263807	.0177236	-1.49	0.140	-.0615274	.0087659
qmonthly	.2056669	.03834	5.36	0.000	.1296371	.2816966
clsrain	38.15381	12.97281	<b>2.94</b>	0.004	12.42825	63.87937
_cons	-83.04892	36.52071	-2.27	0.025	-155.4709	-10.62698

The estimated function therefore is:

$$\text{Losscls} = -83.04892 + 132.7262 \text{ landt} - 0.0262273 \text{ tbushes} - 0.0263807 \text{ qplkrain} + 0.2056669 \text{ qmonthly} + 38.15381 \text{ clsrain}$$

(36.52071) (37.87133) (0.0092345) (0.01772360) (0.03834) (12.97281)

(standard errors are in parentheses)

t – statistic characteristic if  $|t| > 2$  significant  $< 2$  insignificant

**Inference of results:**

We do not accept the null hypothesis. There exists significant positive relationship between the closure of buying centers in the rainy season and the resultant tea losses. This is at the 95% percent significance level.

(Reason: the t-value of the variable clsrain is 2.94 which means it is significant since it is greater than 2).

**b) H0: There is no significant relationship between poor road conditions and tea losses in transit.**

**H1: The alternative**

The following functional form is specified.

$$\text{totloss} = \alpha + \beta_0 \text{landt} + \beta_1 \text{tbushes} + \beta_2 \text{qplkrain} + \beta_3 \text{qmonthly} + \beta_4 \text{clsrain}$$

The following regression results are obtained

**Table 4.4.**

reg tloss landt tbushes qplkrain qmonthly clsrain

Source	SS	df	MS	Number of obs = 110
Model	36733265.0	5	7346652.99	F( 5, 104) = 11.75
Residual	65000611.4	104	625005.879	Prob > F = 0.0000
				R-squared = 0.3611
				Adj R-squared = 0.3304
Total	101733876	109	933338.315	Root MSE = 790.57

tloss	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]
landt	374.6205	111.4296	3.36	0.001	153.6514 595.5897
tbushes	-.069409	.0271709	-2.55	0.012	-.1232899 -.0155281
qplkrain	-.0647259	.0521487	-1.24	0.217	-.1681387 .0386869
qmonthly	.4766685	.1128087	4.23	0.000	.2529646 .7003724
clsrain	70.32647	38.17017	2.84	0.068	-5.366405 146.0193
_cons	-174.5977	107.4557	-1.62	0.107	-387.6863 38.49099

**The estimated function therefore is:**

$$\text{tloss} = -174.5977 + 374.6205 \text{ landt} - 0.069409 \text{ tbushes} - 0.0647259 \text{ qplkrain} + 0.4766685 \text{ qmonthly} + 70.32647 \text{ clsrain}$$

(107.4557) (111.4296) (0.0271709) (0.0521487)

(0.1128087) (38.17017)

(standard errors are in parentheses)

t – statistic characteristic      if  $|t| > 2$  significant < 2 insignificant

### Inference of results

We do not accept the null hypothesis. There do exist significant relationship between poor road conditions and tea losses in transit. This is at the 95% percent significance level.

(Reason: the t-value of the variable clsrain is 2.84 which means it is significant since it is greater than 2)

c) **H0:** There is no significant relationship between the distance of tea buying centers and the factory and tea losses.

**H1:** The alternative.

The following functional form is specified.

Table 4.5

$$\text{totloss} = \alpha + \beta_0 \text{landt} + \beta_1 \text{qmonthly} + \beta_2 \text{zone2} + \beta_3 \text{zone3} + \beta_4 \text{zone4}$$

The following regression results are obtained

reg tloss landt qmonthly zone2 zone3 zone4

Source	SS	df	MS	Number of obs = 129
-----				F( 4, 124) = 9.80
Model	24784231.3	4	6196057.84	Prob > F = 0.0000
Residual	78364589.1	124	631972.493	R-squared = 0.2403
-----				Adj R-squared = 0.2158
Total	103148820	128	805850.16	Root MSE = 794.97

tloss	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]
landt	71.30584	64.31791	1.11	0.270	-55.99731 198.609
qmonthly	.3358627	.0896583	3.75	0.000	.1584038 .5133215
zone2	-37.2808	173.4113	-0.21	0.830	-380.5103 305.9487
zone3	4.171136	467.8111	0.01	0.993	-921.7581 930.1004
zone4	(dropped)				
_cons	-59.90402	99.89094	-0.60	0.550	-257.6162 137.8081

The estimated function therefore is:

$$\text{tloss} = -59.90402 + 71.30584 \text{ landt} - 0.3358627 \text{ qmonthly} - 37.2808 \text{ zone2} - 4.171136 \text{ zone3}$$

(99.89094)      (64.31791)      (0.0896583)      (173.4113)      (467.8111)

(standard errors are in parentheses)

**t – statistic characteristic      if  $|t| > 2$  significant  $< 2$  insignificant**

### **Inference of results**

**We accept the null hypothesis. There is no significant relationship between the distance of tea buying centers and the factory losses. This is at the 95% percent significance level.**

**(Reason: the t-value of the zones are (-0.21, 0.01,-0.60 less than 2 which means that the variables are not significant)**

## **4.6 DISCUSSION OF RESULTS**

In this section the results of the tested hypothesis are compared with KTDA global tea losses and the area of study tea losses are analysed to ascertain if improvement if rural tea roads conditions leads to reduction of losses.

### **4.6.1 KTDA GREEN LEAF LOSS**

During the financial year ended 30<sup>th</sup> June 1990, the Authority (as it was named then) collected 488.9m kgs of green leaf as compared to 428.3m kgs collected in the year 1988/89. This was an increase of about 60.56m kgs equivalent to a 14.14%.

During the same period green leaf losses in transit due to normal loss in moisture, actual loss occasioned by poor roads, vehicle breakdowns and inadequate factory processing capacity amounted to 4.49m kgs representing 0.92% (Table 4.6) as compared to 2.28m kgs in the year 1988/89 representing 0.67% loss.

TABLE 4.6

## GREEN LEAF LOSS IN TRANSIT IN MILLION KGS 1978/79-1989/90

FINANCIAL YEARS	GREEN LEAF (MILLION KGS)	% LOSS IN TRANSIT
1978/79	172.09	-1.98
1979/80	137.99	-0.99
1980/81	145.22	-0.89
1981/82	159.96	-0.31
1982/83	206.18	-0.38
1983/84	211.76	-0.28
1984/85	283.20	-0.52
1985/86	292.26	-0.53
1986/87	333.19	-0.56
1987/88	338.21	-0.66
1988/89	428.34	-0.67
1989/90	488.90	-0.92

Source: Abstracted and modified by the author from KTDA Annual reports records from 1978/79-1989/90 financial Years.

As shown in Table 4.6 above the loss in transit had declined considerably from -1.98 % loss in the financial year 1978/79 to as low as -0.28% in 1983/84 year. This was a record reduction of losses on transit which had a bearing on tea roads repair programs by the GOK financed by a credit from International Development Agency (IDA) as phase III of the projects in 1978. These tea roads repairs had improved their conditions and hence better roads culminating into reduced tea losses in transit. During this time there were ample tea roads repair programs supported by external funding leading to better tea roads.

The positive results of better and improved tea roads are noticed in the continuous annual reduction of leaf losses from 1978/79 financial year -1.98%, 1979/80 -0.99%, 1980/81 -0.89%, 1981/82 -0.31%, 1982/83 -0.38% and 1983/84 -0.28% loss.



Then the loss in transit increased steadily from -0.52% in 1984/85, -0.53% in 1985/86, -0.56% in 1986/87, -0.66% in 1987/88, -0.67% in 1988/89 and the loss of -0.92% 1989/90 financial year was excessively high and unacceptable. As will be explained later there was no or very minimal tea roads rehabilitation work from the mid 1980's to late 1980's making these tea roads very poor and impassable during the rainy seasons, thus the high tea losses in transit realized during the period 1984/85-1989/90 financial years.

The International Development Agency (IDA) had funded tea roads repair programs in phases I, II, III. Phase III of the tea roads rehabilitation program ended in 1978 and the responsibility of tea roads maintenance was transferred to the GOK Ministry of Public works and housing (MOPW&H). It is in record that there were very minimal tea roads repairs by MOPW&H during the period KTDA registered very high leaf losses in transit.

Green leaf collection comparisons indicate that during the financial year ended 30<sup>th</sup> June 1991, the Authority again collected 466.34m kgs as compared to 488.90m kgs in the year 1989/90 representing a decrease of 22.55m kgs equivalent to 4.84%.

TABLE 4.7

GREEN LEAF LOSS IN TRANSIT IN MILLION KGS 1990/91-2001/02

FINANCIAL YEARS	GREEN LEAF (MILLION KGS)	% LOSS IN TRANSIT
1990/91	466.36	-0.20
1991/92	440.28	-0.01
1992/93	481.70	-0.29
1993/94	429.38	+0.016
1994/95	604.83	+0.03
1995/96	615.56	+0.31
1996/97	527.36	+0.59
1997/98	750.78	-1.00
1998/99	644.50	+0.48
1999/00	603.11	+0.80
2000/01	722.09	+0.59
2001/02	726.32	+0.61

Source: Abstracted and modified by the author from KTDA leaf losses/variance monthly records from 1990/91-2001/02 financial years.

In this financial year 1990/91 green leaf loss in transit due to similar reasons explained earlier was  $-0.20\%$  as compared to a loss of  $-0.92\%$  the previous financial year 1989/90.

This was an all time leaf collection performance recorded that time which KTDA management from the available reports attributed to less rains and improved factory capacities.

These explanations can be debated as not the only ones that reduced green leaf loss in transit as there were other factors in play.

From observations of KTDA leaf collection operations that time (1990/91/92), the question of “less rains and improved factory capacities” are not the only factors that facilitated reduction of leaf losses in transit. There were other logistical factors in play like “higher caliber leaf collection management staff” that comprised the largest number of university graduates recruited that time, more robust leaf carriers trucks, and the fact that tea farmers had taken onto themselves to collectively repair bad and impassable sections of tea roads manually under the guidance of the leaf base managers and buying center committee members.

Further case studies are recommended in this area in order to come out with concrete empirical evidence {if any} on the contribution of “Improved leaf base management” in reducing leaf losses in KTDA operations as this is not covered in this case study.

The green leaf losses in transit comparisons on Table 4.7 above show that loss on transit reduced from  $-0.20\%$  in 1990/91 financial year to  $-0.01\%$  in 1991/92 year, but increased slightly to  $-0.29\%$  in 1992/93 financial year. From 1993/94 to 1996/97 financial years KTDA registered leaf gains instead of leaf losses. The gains ranged from  $+0.016\%$  in 1993/94,  $+0.03\%$  in 1994/95,  $+0.31\%$  in 1995/96 and then  $+0.59\%$  in 1996/97 financial year. These were impressive gains and this seemed to be the turning point in KTDA to eradicate leaf losses on transit overall.

As indicated in Table 4.7 above, during the financial year 1997/98 KTDA recorded green leaf crop amounting to 750.78 M kgs an increase of 40% from the previous year 1996/97. But in terms of leaf losses a loss on transit amounting to 7.50 M kgs representing  $-1.00\%$  loss in transit that year.

The green leaf receipted during the year 1997/98 was the highest record ever in the history of the organization and a comparative loss of  $-1.00\%$  for this crop (750.78 M kgs) to the loss of  $-1.95\%$  in

the financial year 1978/79 for a crop of only 172.09 M Kgs talks for itself. There was a great improvement in KTDA operations from the early 1990's and tea farmer's participation through the buying center committee members enhanced logistical planning and management of leaf collection systems.

It is worth noting that the year 1997/98 was the period when the country experienced the great El-Nino rains which was the major reason for the high crop. The El-Nino destroyed many tea roads making them impassable leading closure of many buying centers. This aggravated leaf collection problems and thus the higher loss in transit in that year. Although we can blame the El-Nino rains on the high leaf losses, the condition of poor un-maintained rural tea roads cannot escape the blame for these leaf losses to tea farmers.

From the financial year 1998/99 to 2001/02 there was a remarkable KTDA improvement in control of green leaf losses in transit. In KTDA overall there were registered gains of +0.48% in 1998/99, +0.80% in 1999/00, +0.59% in 2000/01 and +0.61% in 2001/02 financial years (see table 4.7 above).

The KTDA set objective of eliminating tea losses on transit had shown positive signs and was achieved. Nationally, no losses were recorded in the final year of study 2001/02. However, few stations recorded minimal losses on transit. One of the stations that recorded losses during this period fall in the area of this study and this is Kinoro leaf base/factory which recorded -0.46% loss as at June end of 2001/02 financial year.

#### 4.6.2 AREA OF STUDY STATIONS' LEAF LOSS ANALYSIS.

The area of study stations are Githongo, Imenti, Kionyo, Kinoro and Weru leaf bases and factories. The following is an analysis of their leaf losses from 1990/91 to 2002/03 financial years.

**TABLE 4.8**  
**LEAF LOSSES/VARIANCE ANALYSIS 1990/91-2002/03**

<b>FINANCIAL YEARS</b>	<b>GITHONGO GL%LOSS</b>	<b>IMENTI GL%LOSS</b>	<b>KIONYO GL%LOSS</b>	<b>KINORO GL%LOSS</b>	<b>WERU GL%LOSS</b>
1990/91	+0.21%	+0.06%	-	+0.48%	-
1991/92	+0.84%	+1.15%	-	+1.01%	-
1992/93	+0.84%	+0.72%	-	+0.55%	-
1993/94	+0.59%	+0.88%	-	+0.49%	-
1994/95	+0.38%	+0.34%	-	+0.29%	-
1995/96	+0.43%	+0.05%	-	+0.19%	-
1996/97	+0.15%	+1.25%	-	+1.00%	-
1997/98	-1.11%	-3.42%	-	-9.60%	-
1998/99	+0.37%	+0.52%	-	+0.42%	-
1999/00	+0.37%	+0.64%	-	+0.78%	-
2000/01	+0.39%	+0.35%	-	+0.50%	-
2001/02	+0.27%	+0.13%	-	-0.46%	-
2002/03	+1.24%	-0.13%	-2.06%	-0.02%	-0.06%

**Source: Abstracted and modified by the author from KTDA monthly leaf losses/variances records.**

As Table 4.8 above indicates, from 1990/91 to 1996/97 financial years all stations recorded substantial leaf gains with no losses. Some stations like Imenti and Kinoro registered very high leaf gains during this period; +1.15% in 1991/92 and +1.25% in 1996/97 for Imenti; +1.01% in 1991/92 and +1.00% in 1996/97 for Kinoro.

Comparing this position to the KTDA global leaf loss analysis in Table 4.7 above, a similar scenario is noticed where leaf losses declined considerably from  $-0.20\%$  in 1990/91,  $-0.01\%$  in 1991/92,  $-0.29\%$  in 1992/93 and then recorded gains thereafter  $+0.016\%$  in 1993/94,  $+0.03\%$  in 1994/95,  $+0.31\%$  in 1996/96 and  $+0.59\%$  in 1996/97.

There is a myriad of reasons for the magnificent achievement of these KTDA stations in eliminating leaf losses for the farmer's benefit. These reasons ranges from efficient leaf collection logistical systems, dedicated staff, better road conditions and the tea farmers support was also of paramount importance.

From the author's experience in KTDA leaf collection operations when he worked as a Leaf Officer in 1991-1992 at Imenti leaf base, it's evident that good rural tea roads attained through continuous repairs by the concerned parties makes leaf collection easy thereby reducing or eliminating leaf losses completely.

Without much ado or praises, it's worth noting that the author registered substantial gains  $+0.06\%$  and  $+1.15\%$  (Table 4.8) between 1991- 1992 when he worked then as Leaf Officer at Imenti station. Continuous road repairs and maintenance of tea roads is the key factor of reducing leaf losses.

The research findings through tested hypothesis, that there is a significant relationship between poor road conditions and leaf losses is applicable in this case.

KTDA initiative in the roads programs as already been discussed in chapter two.

#### 4.6.3 THE IMPACT OF BUYING CENTER CLOSURE ON GL LOSSES DUE TO POOR ROAD CONDITIONS

The closure of buying centers as a result of poor road conditions in both the long and short rains is not uncommon in the small scale tea industry. From a study carried out by Sir Alexander Gibb & Partners on a "Tea roads rehabilitation study phase II" in 1993 under assignment of Overseas Development Administration (ODA), it was observed that approximately half of KTDA leaf bases had to close some buying centers for varying lengths of time in 1990/91 financial year due to poor road conditions. In such situations of buying center closures tea farmers are inconvenienced as they struggle to deliver their crop in the alternative buying centers which are sometimes very far.

Analysis carried out by the same company in the "Tea roads rehabilitation study phase I report" in 1988 showed that buying center closures caused a decline in green leaf delivered at the alternative centers compared to what would have been expected had the buying center remained open. The scale of this decline was believed to be related to the additional distance that had to be walked to deliver green leaf to KTDA: extra time spent in delivering green leaf to alternative buying center would be time lost for plucking. These are some of the rural transportation problems experienced by tea farmers.

Field survey observations and evidence gained from this case study bears witness to the importance tea growers attach to keeping their buying centers open. It was observed that at certain leaf bases, growers, with the support of KTDA, have invested their own resources in improving roads to make them passable in all seasons.

This investment involved the purchase and application of gravel to particularly poor sections of roads often using KTDA tractors and trailers to transport the materials.

These arrangements were well taken in Kinoro and Imenti leaf bases from 1991 who had even improvised open semi-trailers to ferry quarry chips to the poor road sections with the assistance of tea farmers who had formed buying center groups for road repairs. Clearly for these tea growers, the cost of investment in improved roads were considered to be worthwhile to reduce tea losses in green leaf output which they were having to sustain. This is a major tea farmer's initiative through the support of KTDA to improve tea roads and reduce the transportation problems.

These initiatives bore fruit as noticed in Table 4.8 above when Kinoro and Imenti leaf bases recorded very high leaf gains in 1991/92 the period that tea farmers and KTDA leaf collection management instituted collective tea roads repairs by use of local resources both material and labour.

As the research findings indicated, the closure of buying centers is due to poor road conditions. Therefore leaf losses is a factor of poor road conditions. From the analysis of leaf losses in the study area, it is noticed that the factories that continuously maintained their tea roads experienced minimal leaf losses or recorded gains. Thus tea roads should be improved to reduce rural transportation problems which lead to leaf losses and reduction in tea farmer earnings.



## CHAPTER FIVE

### SUMMARY OF RESEARCH FINDINGS, RECOMMENDATIONS AND CONCLUSIONS

#### 5.0 INTRODUCTION

This chapter presents a summary of findings, conclusions, some proposals and recommendations based on the study undertaken; leaf collection observations both in the field and abstracted data and information from records. The operational implications of this study are presented with a view of relating them to KTDA leaf collection operations and the co-ordination of tea roads repairs and maintenance by KTDA, Local councils and MoPW together with the GOK policy on rural roads.

#### 5.1 RESEARCH FINDINGS

The following are some of the research findings and observations which form the basis of the view that tea roads are important in the development of the tea industry:

### **5.1.1 TEA LOSSES AND BUYING CENTRE CLOSURES**

This study focused partly on the impact of buying center closures due to poor road conditions on the tea farmer's crop. From the results of the study it was found that poor road conditions increased the incidences of buying center closures, leaf losses and in effect reduced tea farmers earnings.

From the results of this study, we can conclude that non-closure of buying centers can significantly influence tea farmer's crop and eventually increase their earnings. Therefore it is imperative that KTDA should deal with all the factors that contribute to the closure of buying centers. If the problems of buying center closures are addressed critically, some of the tea losses would be reduced or eliminated completely.

### **5.1.2 RURAL TEA ROADS AND TEA LOSSES**

This case study was mainly concerned with rural transportation problems experienced by tea farmers. As indicated earlier, one of the major problems experienced by small-scale tea farmers is the closure of their tea buying centers during the rainy seasons leading to rampant green leaf losses. The tea farmers are also inconvenienced during buying center closures as they travel far distances to an alternative tea buying center to weigh their crop.

The results of this study clearly indicate that poor roads condition is the greatest contributor to the tea farmer's rural transportation problems in form of green leaf losses. The finding that green leaf losses can be influenced positively by improvement of rural tea roads is significant to KTDA and the GOK due to the concerted aim of raising agriculture production for better farmer's income which would contribute greatly to our poverty reduction strategy in the rural areas. This is important because raising the income levels of the rural population is a priority and a major objective among our development goals.

The implication of the research findings is that , in order to eliminate tea losses, there is need for KTDA to adequately address improvement of rural tea roads through constant maintenance and repairs all year round.

This is important because it is because of poor road conditions that buying centers are closed and leaf carriers get bogged down in operation, all leading to tea losses on transit. If all rural roads linking tea farmers buying centers to the tea factories are improved, buying centers would remain open throughout the year and leaf losses would be eliminated completely in KTDA operations.

It was interesting to note from the research findings that the distances from the buying centers to the tea factories had no significant influence on tea losses. The implications here is that farmers do not perceive distances from their buying centers to the factories as a contributor to green leaf losses, and by extension poor road conditions are deemed to the greatest contributors to rural transportation problems and tea losses.

### **5.1.3 TEA ROADS MAINTENANCE AND TEA LOSSES.**

As detailed in chapter two and four, KTDA has a major role to play in rural tea roads rehabilitation and maintenance in order to eliminate leaf losses completely. KTDA as the leader in small holder tea industry has an obligation to ensure that farmers attain higher tea crop of high quality for better earnings. This can only be achieved by good tea husbandry and reduction of un-necessary tea losses on transit.

From the case study, it was evident that leaf losses were greatly due to poor road conditions which lead to closure of farmers' buying centers, leaf losses on transit through spillage, as lorries bog down on the poor roads.

In the late 1980s and early 1990s the then KTDA Management was seriously

concerned with the tea roads conditions to the extent that individual regions had taken onto themselves with the support of tea farmers to collectively repair bad sections of their tea roads in the study area.

The fruits of this collective responsibility can be appreciated by the reduction of tea leaf losses from as high as (-0.92%) in 1989/90 year to as low as (-0.29%) in 1992/93 financial year (see leaf losses analysis in Table 4.7 and 4.8 in chapter four).

From early 1990s KTDA through the Board, had initiated major lobbying with the GOK and the Local councils for the Tea cess money to be used exclusively for the repairs and maintenance of tea roads which were neglected by the MoPW road repair programs.

The GOK extended a major support to KTDA on Tea cess utilisation where it was directed that a large portion (80%) of it was to be solely used for tea roads maintenance as explained in chapter six. The positive results of this KTDA initiative on tea roads to the tea farmers was realized from the early 1990s when leaf losses were drastically reduced to as low as (-0.01%) in 1991/92 year and completely eliminated overall towards the end of 1990s

and started registering gains as high as (+0.59%) in 1996/97 financial year ( see Table 4.7 on leaf losses analysis chapter four).

This study clearly shows that when KTDA as the smallholder tea Managing Agency makes a concerted effort for and together with the tea farmers to maintain tea roads; the tea roads becomes better, the farmers buying centers are not closed, tea lorries are not bogged down, spillage on transit is reduced and finally leaf losses are eliminated. This increases farmers' tea crop and earnings for the growth of the economy.

Therefore KTDA as the Managing Agency of the small-holder tea sub-sector factories in conjunction with the GOK has a role to play in the rural tea roads repairs and maintenance in all tea growing areas. Continuous repair and maintenance of tea roads will reduce en-route green leaf losses due good tea roads, improve and encourage uninterrupted plucking by growers due to non-closure of tea buying centers.

#### **5.1.4 TEA ROADS CESS MANAGEMENT AND PROCEDURES**

The Tea Board of Kenya (TBK) deducts 1% from the KTDA total crop payment to farmers as the tea cess fund. As indicated earlier 80% of this deduction is channeled to KTDA for tea roads maintenance and 20% is forwarded to the Local councils as revenue.

From the 80% cess allocation to KTDA, each Zone gets a share depending on the actual tea crop realised in that particular period. The cess funds are channeled to the KTDA Zonal offices where an account is held for roads cess fund. Each KTDA Zone has a Zonal Technical Committee that meet and distributes the cess fund to individual factory Units depending on the crop and need. The KTDA Zonal Managers co-ordinates the zonal tea cess utilization.

Each KTDA Factory Unit has a Factory Board that deliberates and decides on the expenditure of tea cess funds depending on priorities on the region tea roads. Each KTDA Factory Unit has a Unit Manager who co-ordinates the unit functions of tea extension, leaf collection logistics and tea processing. The actual supervision of tea roads repair and maintenance is done by the Unit Logistics Officer in conjunction with the Tea Extension Officer and at-least one Factory Board director representative.

### 5.1.5 TEA ROADS MAINTENANCE FUNDING

As detailed in chapter two, tea cess funds are inadequate to repair all the tea roads under KTDA. From the quoted KTDA tea roads rehabilitation STABEX funding proposal there was a need of about Kes.740M to rehabilitate about 2,558 kms (only 60%) out of 4,792kms tea road network. Out of this requirement the cess funds available was about Kes.136M (18.4% only) leaving a shortfall of Kes.605M (81.6%) which could be financed from other sources. This is a pathetic situation for KTDA in their struggle to rehabilitate the tea roads with such a large deficit.

In such a scenario KTDA would require a lot of GOK and Donor support to realise the goal of rehabilitating a good proportion of tea roads . KTDA would also require to put a very strong case to the GOK on the need for further funding of tea roads repair programs given the magnitude and contribution of the industry to the economy.



## **5.2 RECOMMEDATIONS**

### **5.2.0 TEA ROADS FUNDING AND MAINTENANCE PROPOSALS.**

From the study it is noted that there was very minimal tea roads repairs by GOK through the then MoPW&H for the last two decades. The only funds available for tea roads repair were from tea cess recovered by the Tea Board of Kenya which is again shared between Local Authorities and tea roads maintenance programs. This makes KTDA experience a lot of problems in tea roads rehabilitation programs due to inadequacy of funds. Other sources of tea roads funds should be explored and followed.

Some proposals are hereby appended by the researcher for consideration in tea roads management;

#### **5.2.1 TEA CESS ENHANCEMENT PROPOSAL**

As indicated in chapter two on tea cess utilisation, tea farmers are deducted 1% of their crop as tea cess. Of this tea cess 80% is allocated to KTDA for tea roads repairs and maintenance while 20% goes to Local councils.

It was also noted that during the 1994 Annual Tea Growers

Conference held on 27th September, the Zonal Tea committee Members had presented in their queries and proposed that tea cess deductions be increased from 1% to 2%. This is the period when tea roads repairs by GOK were negligible and tea farmers were seriously concerned with tea cess utilisation.

It is with this background that the researcher proposes to KTDA to assess the view of enhancing tea cess to 2% as proposed by the farmers' representatives in 1994.

This is a very sensitive proposal bearing in mind that the tea farmers in most cases repair the bad sections of tea roads themselves despite the tea cess deductions. However the farmers proposed themselves thus KTDA can revive this proposal and carry on in order to increase the tea roads maintenance funds.

## **5.2.2 TEA CESS SHARING AND DISTRIBUTION PROPOSAL.**

In chapter two of this study, Local Government tea cess Act and By-laws

are covered detailing tea cess funds utilisation procedures and management. The utilisation of tea cess funds was that 80% be utilised on tea roads while 20% is utilised by Local authorities. KTDA should taken up these tea cess utilisation proportions and argue their case for a 90% / 10% tea cess sharing given the fact that Local councils receive other road funds from the KRB.

The initial basis of produce cess collection was because Local councils were repairing rural roads and operated market centers for the local agricultural produce. This is done at the local setup.

From KTDA operational observations it is noticed that tea farmers construct and operate their own buying centers as markets with no assistance from the local councils. Therefore it would be justifiable to reduce the tea cess to Local Authorities to 10% and leave 90% for tea roads maintenance under KTDA Management. This is a proposal KTDA can follow with the relevant authorities in order to realise more funds for tea roads maintenance .

### 5.2.3 KENYA ROADS BOARD (KRB) PETITION PROPOSAL

As detailed in chapter two, KRB collects Road Maintenance Levy Fund (RMLF) from fuel sales and distributes these funds to all Road agencies for roads maintenance and repairs. From the KRB list of road agencies it is noticed that Kenya Wildlife Services (KWS)-Park Roads is included as a Roads Agency for the purpose of receiving RMLF funds to repair and maintain park roads.

During the half year (Jul-Dec) financial year 2003/2004 KWS as a Road Agency was allocated Kshs 24,544,700.00 for park-roads maintenance.

According to a KTDA report of 6th August 2001 on tea roads rehabilitation funding , the total tea roads network in Kenya's five tea-growing provinces is about 4,792 Kms. The implication here is that KTDA operates along this large number of Kms to serve tea farmers by collecting their tea crop on very poor road conditions as observed in the research findings.

To cover these Kms KTDA incurs very high expenditure on fuel in their operating fleet. In most cases KTDA buys fuel in bulk from the dealers and fuel levy is included in the payments.

The following is a tabulation of 6 years KTDA fuel expenditure from 1998-2003;

**KTDA FUEL EXPENDITURE FOR 6 YEARS**

<u>FINANCIAL YEAR</u>	<u>FUEL EXP.(IN KSHS)</u>
1997/98	115,887,569.95
1998/99	117,340,002.55
1999/00	129,492,759.25
2000/01	170,946,091.35
2001/02	176,087,530.65
2002/03	178,295,140.45

Source: Abstracted by the researcher from KTDA monthly reports.

The KTDA fuel expenditure figures above shows a very high expenditure on fuel without even considering the expenditure on lubricants. Through this fuel expenditure it is clear that KTDA contributes a lot to the RMLF which is deducted directly on fuel consumption.

It is with this kind of expenditure that the researcher proposes to KTDA Management to petition KRB to be considered in the same light as "KWS-Park Roads Agency and be regarded as a "KTDA- Tea Roads Agency".

If KTDA convinces KRB on their proposal to be regarded as a Roads Agency through facts and figures , then it would receive more road funds to be used in maintenance of tea roads to very good standards just like KWS Park roads are maintained.

#### **5.2.4 KTDA TEA ROADS MAINTENANCE UNIT PROPOSAL**

As explained in chapter eight on pictorial observations of KTDA operations, it was noticed that the Tea Agency has invested heavily on a modern transportation fleet for leaf collection and modern trucks also for road repairs and maintenance.

The Zonal management of factory units is a core function of KTDA operations strategy where factories in one geographical region (Zone) are grouped and managed together in order to benefit from economies of scale on resources.

It is in this view that the researcher proposes to KTDA to establish a full fledged “Tea Roads Maintenance Unit”(TRMU) which will undertake all tea roads functions. This proposed unit would carry out tea roads functions such as; tea roads survey, tea cess management, external sourcing of tea roads

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funds, lobbying for KRB fuel levy funds for tea roads repairs, petitioning the GOK on tea roads funding and arranging for the field repairs of all tea roads collectively. In this case, labour-intensive road repairs and maintenance method is highly recommended.

The proposed "Tea Roads Maintenance Unit" would have a Head office control center and the actual road repairs are managed at the Zonal offices. This would require KTDA to obtain at least one roads grader for each Zone which would be used systematically in all the Zonal factory units for continuous tea roads repairs before the rainy seasons.

The sharing of the Zonal grader would be arranged by the Zonal Manager's technical committees in liaison with the individual Factory units. A tea roads maintenance unit under KTDA would go along way to ensure that all tea roads are well maintained in order to reduce rural green leaf transportation problems and tea losses. The overall benefit would go down to the tea farmers who have been incurring heavy leaf losses and tea earnings due to poor tea road conditions.

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### 5.3 FUTURE RESEARCH PROPOSALS.

This study focused mainly on rural tea roads transportation problems with particular reference to KTDA green leaf losses due to poor rural road conditions. The research findings related poor rural road conditions to the tea losses incurred by tea farmers in KTDA leaf collection operations.

The researcher suggests the following future research areas in the tea industry:

- (i) Since this study focused on leaf losses only, there is need for a further research on the contribution of poor rural tea roads to the KTDA expenditure on transport costs due to vehicle breakdowns on poor roads.
- (ii) This study focused mainly on the impact of poor tea roads on the closure of farmers' tea buying centers and leaf losses. It is therefore appropriate to conduct an empirical study to examine how the general welfare in the rural area can be influenced by improvement of rural roads.
- (iii) Tea leaf collection and factory operations under KTDA have



some environmental impacts both in their locations and operating areas. Therefore it would be vital for studies to be carried out such as environmental impact assessment of factories to their surrounding areas, assessment of KTDA factories waste water management, an assessment of the environmental pollution by KTDA trucks and workshop operations and a comparative analysis of energy consumption by KTDA factories on wood fuel and oils.

- (iv) A study can be undertaken to examine the criteria of used in siting and constructing new factories, and if rural tea roads become all weather would there be any need for new factories or the current ones would be expanded as tea roads are improved and leaf collection becomes easier?
- (v) In KTDA leaf collection operations it cannot be ruled out whether Logistics Management systems contribute to leaf losses. This case study did not cover the Management factor as a contributor or a reducer of leaf losses. A study can be carried out to assess KTDA leaf collection management patterns to examine whether the style of leaf collection management has any contributing factor in leaf losses.

## 5.4 CONCLUSIONS .

The agriculture sector is the mainstay of Kenyan economy and it accounts for about one third of the Gross Domestic product (GDP). This sector employs more than two thirds of Kenya's labour force and accounting for approximately 70% of the export earnings in Kenya. This is a big contribution to the economy by the agricultural sector.

As indicated earlier, tea is one of the leading foreign exchange earners in Kenya, contributing about 30% of the total export earnings in the country.

Noting from above where the whole agricultural sector in Kenya contributes about 70% of the country's total export earnings, the importance of the tea industry to the economy that contributing 30% of this needs no much emphasis.

The tea industry is mostly labour-intensive and it is in record that more than 3 million people in Kenya directly and indirectly derive their livelihood from tea related activities. Tea growing and manufacture are carried out in the rural areas contributing significantly to development of rural infrastructure

as well as enhancing the economic well-being of rural communities.

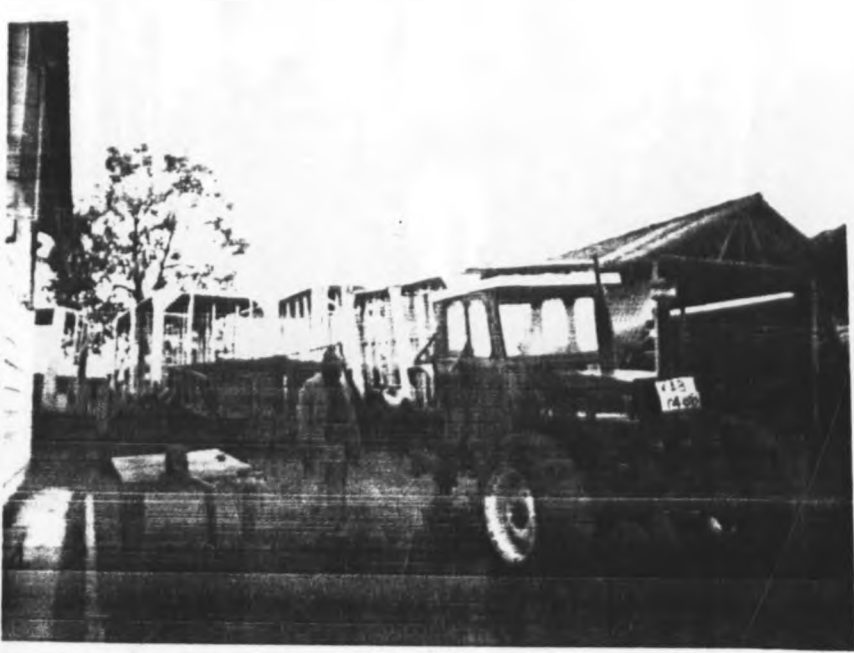
The tea sector also provides substantial investment opportunities in areas of tea growing, manufacturing, exporting and value adding. With all these attributes, the tea industry should be highly regarded by the GOK and its infrastructure especially tea roads catered for well.

The main agricultural function of rural access roads, and precisely rural tea roads is to allow passage by motor vehicles at critical periods in the agricultural cycles to deliver in time delicate green leaf crop to the factories after plucking. Failure to pluck green leaf, non-collection from buying centers and spillages on transit, all due to poor rural road conditions leads to losses which are bluntly borne by tea farmers. This position is not acceptable by tea farmers considering that they pay roads cess and other GOK taxes for services.

Considering the contribution of the tea industry to the economy and the role of KTDA to the economic development of Kenya, the small-holder tea sector requires assistance from the GOK for the repairs and maintenance of tea roads which is a major bottleneck in tea collection operational constraints.

One of the major priorities of KTDA is on tea roads improvements of which if attained would reduce KTDA operating costs, reduce or eliminate leaf losses thereby improving farmers earning potentials. This is why through the results of this study it is highly recommended that the GOK, and KTDA as the smallholder tea sector Managing Agency takes collective measures to maintain tea roads to all weather conditions for the benefit of rural tea farmers and the economy at large.

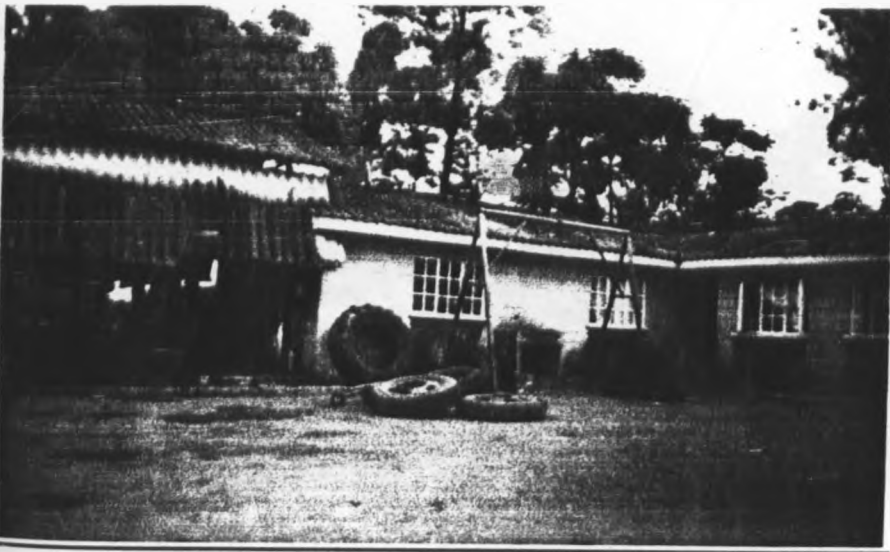
## PICTORIAL OBSERVATIONS



**Plate 1:** Broken down/grounded –3 lorries, 1 tractor and one open trailer assessed by the researcher at Imenti leaf base, December 2003



**Plate 2:** Grounded – 2 lorries 1 tractor and 1 semi trailer on assessment by the researcher and Logistics manager Mr. Mara at Kinoro leaf base.



**Plate 3:** High waste on destroyed tyres due poor road conditions assessed by the researcher at Kinoro leaf base.



**Plate 4:** Observed problem of transporting KTDA staff to work in open trailers which is unsafe and does not conform to road safety regulations.



**Plate 5:** Inadequate rural transport leads to overloading which is a common feature of rural transportation problems as observed on this photograph by the researcher.



**Plate 6:** Banana and avocado produce deteriorating in quality due to lack of transport to markets observed near Weru tea factory.



**Plate 7:** Delayed tea planting after seedlings have been sold- awaiting transport.





**Plate 8:** Tea seedlings being transported to tea farmers by use of tractors due to poor roads.



**Plate 9:** KTDA invested in modern trucks to be used in carrying materials for roads maintenance by Logistics Managers as observed on this Weru factory lorry.



**Plate 10:** KTDA uses waste quarry chips to repair tea roads as observed in this photograph on Weru factory road.



**Plate 11:** KTDA Logistics Managers makes arrangements for the repairs of the bad sections of tea roads using manual labour.



**Plate 12:** A well repaired and maintained tea road as observed by the researcher on Kinoro Factory road.



**Plate 13**

School children alighting from a school transport bus at KTDA Imenti factory gate after school. This road was accessible due to KTDA repairs and maintenance.



Plate 14: A lorry driver tightening tyre chains as the green was offloaded as observed by the researcher at Imenti KTDA factory.



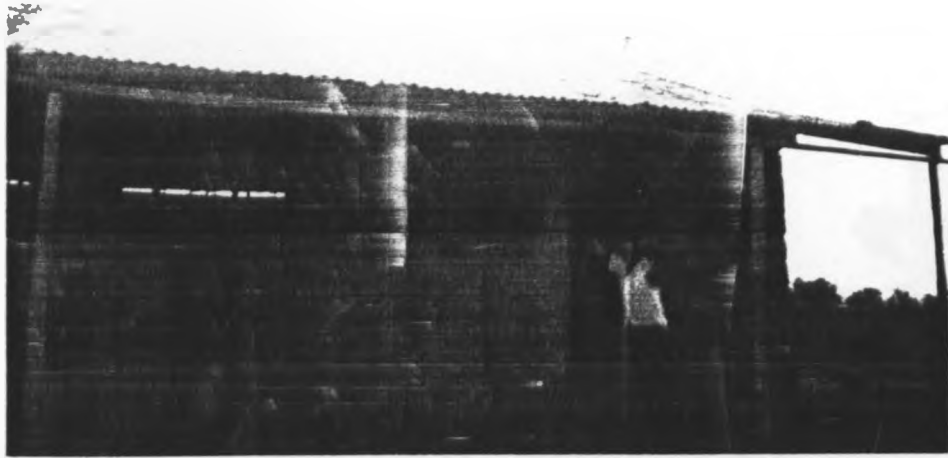
Plate 15: Imenti tea factory modern leaf carrier.



**Plate 16:** The researcher interviewing the KTDA Imenti Unit Manager Miss G. Mwachira on the performance of the modern leaf carriers in leaf collection.



**Plate 17:** KTDA Imenti area Tea Extension officer Mr Muthungu assessing leaf collection with leaf collection staff.



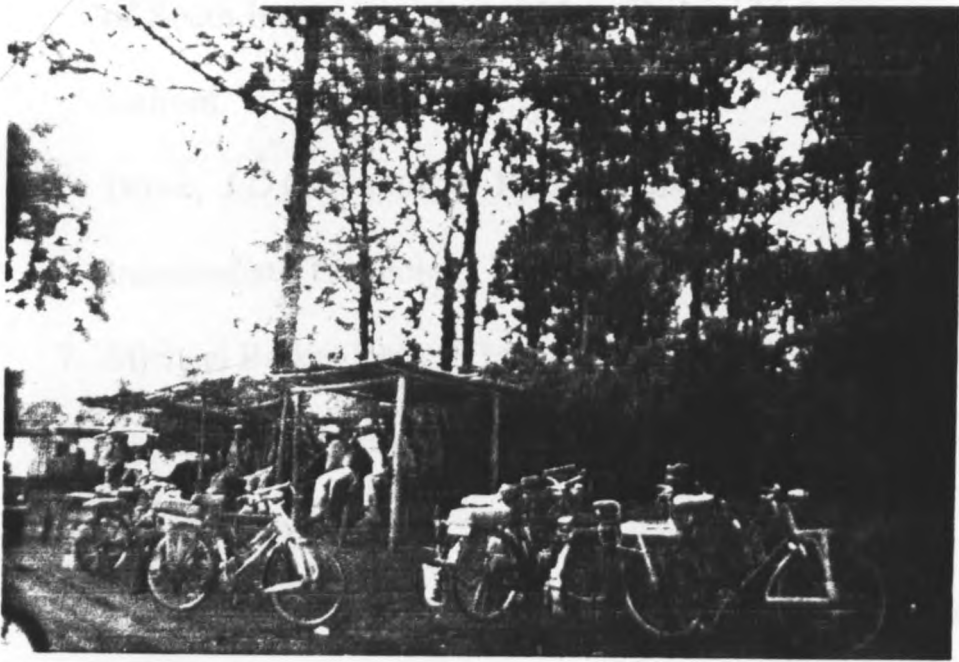
**Plate 18:** Shoulder loading of tea baskets as a means of transporting green leaf to the buying centers.



**Plate 19:** Use of non-motorised means of transport in form of bicycles being assessed by the researcher at Kinoro farmers buying center.



**Plate 20:** Use of bicycles is the most common means of transport in the rural tea growing areas **and** more so in the study area.



**Plate 21:** Passenger transport bicycles waiting for passengers near Katharaka tea buying center tarmac focal point and bus stop.

## REFERENCES

1. Birdsall (1968) -“The role of transport and agricultural development in Western Kenya”. PHD Thesis.
2. Hay,A (1973) -Transportation for the space Economy, Macmillan, London
3. Hurst, E (1973) “Transportation and Societal framework” in economic Geography, vol. 49 pages 163-80
4. Jaetzold R (1983)- Farm Management Hand book of Kenya Vol.II Part C East Kenya (Eastern and Coast Provinces)
5. Kirigia B.N (1985); Planning for Rural Health Services; A case study of South Imenti Division of Meru District,M.A. Thesis, University of Nairobi.
6. Howe, J.D.(Ed) (1985): Rural Transport in Developing Countries, Intermediate Technology Publications, London.
7. Michael Barke (1986) “Transport and Trade”
8. Hoyle, B.S. (1988): Transport and Development in Tropical Africa, John Murray.
9. Gaviria J. (1991) – Rural Transport and Agriculture in Sub-saharan Africa. A 6 country study SSAT.
10. Riverson, J. Gaviria, J. Thriscutt, s.(1991) – Rural Roads in Sub-



saharan Africa. Lessons from World Bank experience, World Bank Technical paper no. 141.

11. Sir Alexander Gibb and Partners (1993): "Tea Roads Rehabilitation study phase II – An DA assignment for the Government of Kenya, Ministry of Works
12. Ongaro S.A.L (1995) "Transportation as a medium for spatial interaction: A case study of Kenya's Railways Network, M.A. Thesis, University of Nairobi.
13. "Why are Rural Roads Important? Assessing the benefits" Article by Mary Anderson (IT Transport Limited) in the New World Transport 1995 publication; Grosvenor Press International
14. Irandu E.M (1995)- "Air transport in Kenya "Analysis of Domestic and International Airline networks", PHD Thesis, University of Nairobi.
15. Irandu E.M (1996)- "Rural Road Transport infrastructure and sustainable development in Kenya: Proceedings of the 6<sup>th</sup> annual conference on sustainable development and social concern in E.A.
16. Njenga P (1996) – Rural Transport Planning and Policy: some pertinent issues of Kenya; Discussion paper no. 2. A paper presented in a seminar for Rural Transport and Development in Kenya at

Fairview Hotel in July 1996.

17. "Rural Roads in India: An anti-poverty tool" Article by Kamlesh Kumar (National Highways Authority of India) in the New World Transport 1997 publication

18. Kenya Gazette Supplement No.3 (Acts No. 1) 14 January ,2000

The Tea (Amendment Act), 1999

The Kenya Roads Board Act, 1999

19. Kariga J.N (2000) "An investigation of some economic impacts of feeder roads in rural areas; case study of Thika District, M.A Thesis, University of Nairobi.

20. KTDA publications and annual returns 1990 – 2001

21. MoR, PW&H Danida Roads 2000 reports. June 2003

22. The Tea Board of Kenya: "Fact Sheet on Kenya Tea" publication 2002

23. The Tea Board of Kenya: "The Tea Industry in Kenya" publication.

UNIVERSITY OF NAIROBI  
 DEPARTMENT OF GEOGRAPHY  
 TEA FARMERS QUESTIONNAIRE  
TEA LOSSES SURVEY IN RELATION TO THE CLOSURE  
OF BUYING CENTRES AND POOR ROAD CONDITIONS

1. Name of Respondent ..... Male Female
2. (i) Buying Center (i).....(ii) Leafbase Name .....
3. (i) Land owned ..... Hectares (ii) Land under tea ..... Hectares
4. Number of tea bushes being plucked .....
5. Average plucking days per week and amount plucked
  - (a) Rainy season ..... days week - Amount.....Kgs wk
  - (b) Dry seasons ..... days week - Amount.....Kgs wk
6. Estimate your monthly production of tea ..... Kgs/month
7. Estimate the times of your buying center closures per week
  - (a) Rainy season ..... days/week
  - (b) Dry season ..... days week
8. What is the estimate of tea losses (unplucked) you incur by closure of your buying centers per month ..... Kgs month
9. What is the estimate amount of tea losses you incur at the buying center when KTDA lorries fail to pick your plucked tea and it goes bad ..... Kgs per month
10. Which of the reasons below you think is the major reason of your buying center closures?
  - (a) impassable roads or poor road conditions
  - (b) KTDA transport problems or inadequate transport
11. How far is your farm from the buying center ..... Kms
 

0-1 Km s     1-3 Km s     3-5 Kms     over 5 Kms.
12. How far is your buying center from the factory?
 

1-3 Kms     3-5 Kms     5-10 Kms     over 10 Kms
13. Which of the following ways in your opinion would reduce tea losses?
 

Factory expansion     More vehicles to collect and deliver tea leaf

continuous repair and maintenance of roads

UNIVERSITY OF NAIROBI

DEPARTMENT OF GEOGRAPHY

KTDA TEA EXTENSION OFFICERS QUESTIONNAIRE  
SURVEY OF WHAT INFLUENCE TEA LOSSES

1. Name of Respondent ..... Male/Female .....
2. Working factory/Leaf Base area .....
3. Estimate average weekly closure of buying centers in your area
  - (a) Rainy season ..... days/Week
  - (b) Dry season ..... days/week
6. Which of the following reasons in your experience leads to closure of tea buying centers?
  - Factory capacity       leaf collection operational problems
  - Poor/impassable road conditions    lack of road repairs and maintenance.
7. How are the tea roads conditions in your working area?
  - Loose surface (dirt) weather road    loose surface/gravel road
8. How are the roads in your working area during the rainy season?
  - Passable by lorries       Impassable by lorries
9. In what ways in your experience can tealeaf losses be reduced/eliminated?
  - Factory Expansion
  - Continuous repair and maintenance of tea roads
  - More KTDA transport vehicles