INFLUENCE OF SELECTED FACTORS ON THE EXTENT OF ADOPTION OF RECOMMENDED TEA PRUNING AND PLUCKING TECHNOLOGIES IN SMALLHOLDER TEA SUB-SECTOR OF GUCHA DISTRICT, KENYA

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A Research Project Report Submitted to the Postgraduate School in Partial Fulfilment of the Requirement for the Award of the Masters of Science Degree in Agricultural Extension of Egerton University

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This research project report has been submitted for examination with my approval as university supervisor:

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DEDICATION

This work is dedicated to my wife, Jane Nyaboke Abere and my children, Beatrice, Nelson, Brian, Ian and Kaizer for their never ending support, prayers and encouragement during this study.

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ACKNOWLEDGEMENT

This study and the ultimate report is the product of the collective effort of many experts guided by my objectives aimed at achieving solutions to the stated problem.

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To you all, I say may God pour abundance blessings on your path.

ABSTRACT

The adoption of recommended tea plucking and pruning technologies has varied in different tea growing areas and amongst farmers in the smallholder sub-sector in Kenya. In Gucha District, there are reports of low adoption of these technologies but no clear documentation of factors causing this which is also suspected to be causing low tea production. Incidences of poor pruning have been high and production per bush over years has been low compared to other tea growing areas in Kenya. This project sought to study selected factors to determine the extent of their cause in low adoption of the recommended tea plucking and tea pruning technologies in smallholder' tea sub-sector of Gucha District. The research design used was descriptive survey using structured questionnaire to collect data. This was administered by the researcher soliciting for feedback from the selected farmers on key aspects concerning personal characteristics, socio-economic and cultural factors as well as institutional factors and the extent to which they affect recommended plucking and pruning technologies. The target population and sample size for this study was 60,059 and 110 smallholder tea farmers respectively. Using SPSS version 11.5 package, collected data was analysed and interpreted using descriptive statistics. The main findings from this study indicated that most of the recommended plucking and pruning technologies are not fully adopted due to various selected factors analysed which affect the adoption of the two technologies differently. It was evident that farmers mainly acquire tea plucking and tea pruning technologies on their own incentive, that females are the majority of the farm workers whereas males are the ones who go for payments, that cultural beliefs and practices such as burial rites and circumcision affect adoption of these technologies and that delayed provision of inputs and services are major constraints. This has resulted into low production per bush for majority of the farmers (below 1 kg/bush/year). The extent of the factors identified will be addressed in order to develop strategies aimed at improving the adoption that will ultimately increase farmers' income and hence improve livelihood. Recommendations made to policy makers, extension implementers, farmers and other relevant stakeholders are meant to enhance effective adoption of these technologies amongst smallholder tea farmers in Gucha District.

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ACRONYMS AND ABBREVIATIONS

AHP	African Highlands Produce
CBS	Central Bureau of Statistics
ERS	Economic Recovery Strategies
FAO	Food and Agricultural Organization
GAP	Good Agricultural Practices
GDP	Gross Domestic Product
IFAD	International Fund for Agricultural Development
KTDA	Kenya Tea Development Agency Limited
ROK	Republic of Kenya
TBK	Tea Board of Kenya
TRFK	Tea Research Foundation of Kenya
TRIEA	Tea Research Institute of East Africa
Kg mt/ha/year	Kilogrammes made tea per hectare per year

CHAPTER ONE

INTRODUCTION

1.1 Background information of the Study

The tea yield levels for Gucha District have been on average below 3000 kg/ha/year of green leaf, hence serious concern to determine ways of overcoming the constraints (Kenya Tea Development Agency, Annual Reports 2003, 2004 and 2005). This production translates to less than 0.7 kg/bush/year of green leaf for the year 2003 compared to national average of 1.25 kg/bush/year and that of Imenti in Meru of 1.75 kg/bush/year for the same year (KTDA Annual Report, 2003).

Records available at the two Gucha factories (Nyamache Tea Factory Annual Reports 2003, 2004 and 2005; Ogembo Tea Factory annual Reports 2003, 2004 and 2005) indicate that most growers pluck twice per month (2 rounds) as opposed to the recommended three to four times per month (3-4 rounds). Factory offloading reports also indicates that tippings are received all the year round, hence suggesting off-season pruning. There is rampant cut-across method of pruning. Leaf count percentage which is used as a measure of leaf quality and frequent plucking rounds indicates that amongst KTDA factories, Imenti tea factory in Meru had the highest leaf count percentage (75%) whereas Gucha (Nyamache and Ogembo) had the lowest (73%) during the financial year 2005/2006. They had out-turn levels of 25.88% and 24.55 respectively (KTDA Annual Report, 2006). All these anomalies are possible factors for low yields in smallholders sub-sector compared to large estates;2200 kg of mt/ha/year and over 2500 kg mt/ha/year respectively (TBK , 2003). This is unlike in Sri-Lanka where the smallholders produce more compared to the Estates sector. Presently Sri-Lanka smallholders occupy 45% of the total area under tea but account for 54% of the national tea production (Sivaram, 2001). The production levels in smallholders sub sector has not been increasing despite release of recommended plucking and pruning technologies meant to increase productivity. There is need to identify selected factors influencing adoption of pruning and plucking technologies so that remedial measures are taken to increase yield and quality (Anon, 2004).

Research has shown that adoption of recommended plucking and pruning technologies results in improved health of the tea plants and hence increased production per unit area or per tea bush.

Low adoption of recommended pruning technologies has been found to have resulted in high incidences of diseases due to incorrect pruning practices such as low pruning heights and use of un-recommended implements in all tea growing areas; Low adoption of recommended plucking technologies results in reduced yields and low quality made teas. This leads to reduced returns to the farmers. This improper plucking includes irregular plucking rounds of average 2 times in a month instead of recommended 4, uneven plucking table due to non use of the plucking wand hence affecting the photosynthetic capacity of the tea plants especially in mixed clones farms (KTDA, 2005; Tea Research Foundation of Kenya Annual Report, 2006).

A problem which has received little attention but faces most researchers and development agencies is how to improve the speed of adoption of developed technological packages even when the technologies have immediate obvious and proven advantages. Expectations are that adoption of improved technology would lead to increased farm productivity. However, experience shows that immediate and uniform adoptions of innovations in agriculture are quite rare. Some innovations have been well received while other improvements have been adopted by only a very small group of farms. Improved productivity in the agricultural sector is more difficult when one is dealing with traditional oriented smallholders (Mwaura, Nyabundi and muku, 2005; Kamau, 2008). However, farmers who have recognized that their traditional farming techniques and present level of knowledge impose a limitation on farm enterprise seem to be on the road to success. In the long run, farmers can improve productivity through adopting and using more efficient husbandry technologies which are made available through development of sufficient technological and organizational innovativeness.

Increased agricultural productivity will come about through revolution in the pattern and methods of production on the individual farm units. These changes may result from adoption of new technologies or due to reallocation of the inputs already available at existing prices and must occur by gradual diffusion of ideas or a radical and rapid transformation. The changes may be the result of the decisions of the many individuals, indigenous producers or direct government intervention. Over the past three decades the Kenyan farming community has in general understood the benefits of adopting recommended technologies and farming practices provided that the cost/return relationships are perceived as favourable. However, a closer look at the

transfer and adoption of technological advancement and improved farming practices show that it is the Kenyan large-scale tea farmers/estates that have benefited from the use of these technologies (Othieno 1981; Othieno, 1992; Othieno, 1994). The small-scale farmers who account for the bulk of agricultural production have lagged behind in adoption of improved practices. Pandey and Anderson (1990) remarked that a new technology is generally useful only if farmers adopt it. Hence an assessment of effects at the farm level is at the heart of any evaluation process. The impact at the farm level and the probability of adoption depend on how well the requirements of the technology fit the particular niche in which a farmer operates, hence the need for investigating the influence of selected factor affecting adoption of recommended technologies in different areas.

The smallholders' tea industry in Kenya is facing a mysterious predicament in transfer and adoption of pruning and plucking technologies and improved practices. At the moment many tea growers may know as much about tea pruning and plucking as extension workers but their yields are still well below potential probably because their techniques of production are inferior to the estates' (Othieno, 1992; Othieno, 1994; TRFK, 2006). Smallholder growers tea therefore need high level technical sophistication particularly research linked questions like the standards and frequency of plucking, the pruning standards as well as the seasons of pruning in order to optimize on production. It has been observed that achievement of these needs better qualified staff, improved farmer: extension worker ratio as well as identifying unproductive farmers. But smallholder tea productivity remains low probably due to low adoptability of developed technological packages and under plucking in the sub sector as a result of labour shortage (Republic of Kenya, 2007). Although hired labour is necessary in smallholder tea production, cost of hired labour remains high (RoK, 2007) and this may be a contributory factor to low productivity and technology adoption. Gender relations also affect smallholder tea production negatively and lead to low adoption of technologies and neglected tea fields (Bulow and Sorensen, 1988). Tensions arise as a result of conflicts over the control of proceeds of tea sales, as the smallholder controls the labour of the household members only to the extent that they also benefit from production. As women make up large part of the labour force in smallholder tea schemes, it is vital to consider gender in relation to extension service, transfer of skills, choice of technology, effects of subsistence crops (Lamb and Muller, 1982; Bulow and Sorensen, 1990). It

is not established whether women are effectively integrated in education and training, especially extension service (Anon, 2002).

The factors that contribute to stagnating tea productivity need to be identified and understood to facilitate appropriate decision making at all levels. In this study, the selected factors that influence adoption of recommended pruning and plucking technologies in smallholders' farms in Gucha district are to be investigated and appropriate recommendations given.

1.2 The Statement of the Problem

Tea Research Foundation of Kenya has developed, approved and disseminated several tea production and processing technologies for use by tea growers for increased yields and quality. However this has been received and adopted differently by the smallholders and the large estates as evidenced from the different production levels reported. The average production per bush for Gucha has been low e.g. in 2004/2005, the district produced 41,374,699 kg of green leaf from 52,330,040 mature tea bushes which translates to 0.8 kg/bush/year compared to national average of 1.25 for the same period. The average research achievement stands at 3.6 kg green leaf/bush/year. It is not clear why tea pruning and plucking technologies have been received and adopted differently by the farmers in Gucha District. This study sought to identify and document the influence of selected factors in the adoption of recommended plucking and pruning technologies amongst the tea smallholders in Gucha District. These two technologies are the main attributes to the level of tea production.

1.3 Purpose of the Study

The Purpose of this study was to determine the extent to which selected factors were influencing adoption of recommended tea pruning and tea plucking technologies amongst smallholder tea farmers in Gucha District in order to suggest possible remedial measures of reducing their negative influences with the ultimate aim of increasing productivity of tea in this among the farmers.

1.4 Objectives of the Study.

The broad objective of this study was to determine the influence of selected factors on the extent of adoption of recommended pruning and plucking technologies by smallholder tea farmers in Gucha District.

The specific objectives were:-

1. To determine the current level of adoption of recommended pruning and plucking technologies by smallholder tea farmers in Gucha District.
2. The influence of personal characteristics on the extent of adoption of tea pruning and plucking technologies.
3. The influence of socio-cultural values on the extent of adoption of tea pruning and plucking technologies.
4. The influence of Institutional factors on the extent of adoption of tea pruning and plucking technologies.

1.5 Research Questions.

The following are the research questions that were used in this study

i. What is the current level of adoption of recommended pruning and recommended plucking technologies among Gucha District tea farmers?
ii. What is the extent of adoption of recommended pruning and plucking technologies according to personal characteristics of smallholder tea farmers in Gucha District?
iii. What is the extent of adoption of recommended pruning and plucking technologies according to socio-cultural values of smallholder tea farmers in Gucha District?
iv. What is the extent of adoption of recommended pruning and plucking technologies according to institutional factors by smallholder tea farmers in Gucha District?

1.6 Significance of the Study

This study identified the extent to which selected factors determine adoption of pruning and plucking technologies and propose possible ways of minimizing their influence in Gucha District and other similar areas to increase tea production. The generated information was used to identify pruning and plucking technology transfer extension gaps. This may be used to develop training modules for extension staff in the tea industry as well as guide in policy issues such as production

processing capacities and revenue collection for investors, tea factories and the Government in order to plan for more investments and construction or expansion of processing units. Increased tea production may leads to improved farmer's income and hence improved livelihood for the farmers. There may be reduced production costs as a result of increased volumes and effective use of inputs by the producers. Increased yields, quality and employment may contribute greatly to the realization of the Government Policy on economic recovery process for wealth and employment creation (ERS); namely by creation of employment and reduced poverty in. The resultant increased adoption may contribute to the nation's agriculture objective of transforming Kenya's agricultural sector into a profitable and commercially sector with provision of high quality gainful employment for Kenyans (RoK, 2004).

1.7 Assumptions of the Study.

i. That the data obtained from the factories and farmers was accurate and up to date.
ii. That the smallholder farmers in Gucha District are homogeneous with respect to the opportunity of exposure to tea pruning and tea plucking technologies.
iii. The respondents responded freely and were sincere and honest in their responses.

1.8 Limitations of the Study.

i. The findings in this study, though useful, are limited in that the farmers interviewed hardly keep any records. Most of the answers to questions were based on the farmer recalling. Occasional memory lapses especially by aged farmers may have resulted in inaccurate answers.
ii. The findings are based on the farmers' perception of the technologies at that particular time of the study.

1.9 The Scope of the Study

The study was done in West of Rift Valley, Gucha District, Nyanza province within Nyamache and Ogembo factories catchments. It focused on farmers' characteristics; socio-economics/cultural and institutional factors determining the adoption of recommended tea pruning and plucking technologies amongst tea smallholders

1.10 Definition of Terms.

Adoption: This refers to the decision to make full use of an idea, practice or technology (FAO, 2003; Adams, 1984). In this study it will imply tea smallholders' utilization of various recommended plucking and pruning technologies.

Farmer characteristics: This refers to various criteria used to describe the attributes of the farmer. In this study it refers to the age, gender, educational level, household income and off-farm activities of the farmer.

Institutional factors: This refers to factors that are beyond the farmer's control and which are likely to affect his production. In this study this refers to frequency of extension visits, availability of pruning and plucking tools and equipments, availability and usage of credit facilities, training of staff, response to mode of payments and presence of credit facilities as well as distance to the buying centres and to the factory.

Plucking Rounds: Refers to the number of plucking done per month from a given area.

Plucking Wand: This refers to a slender and straight stick about 12 feet long and light in weight used to guide the plucker in maintaining the plucking table.

Selected factors influencing the adoption: In this study the selected factors refers to farmer characteristics, social cultural values, institutional factors and technological characteristics.

Smallholder Farmers: These are farmers whose acreage in production is under a certain limit. In this study refers to all tea farmers in Gucha District with less than 10 acres of land.

Socio-cultural values: Refers to community's social and cultural binding beliefs and values. In this study it refers to the respondent's circumcision ceremonies, burial ceremonies and religion or day of resting.

Tea Plucking Technologies: In this study it will refer to the intervals of plucking, the equipment used, the types of shoots plucked as well as the handling of plucked leaf.

Tea Pruning Technologies: In this study it refers to the types of pruning, the season of pruning, the equipment used as well as post pruning treatments of the pruned teas.

Technology: This refers to the combination of knowledge, inputs and management practices which are deployed with productive resources to produce a desired output (Reinjtes et al, 1995). In this study it will refer to the various components of pruning and plucking practices that are recommended as good tea management practices.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter summarizes various literature related to dissemination of technologies and their adoption in the agricultural industry and more so in the smallholders tea sub sector. Various factors affecting adoption of recommended agricultural technologies in different regions of the world are reviewed. This is later narrowed down to the situation as it is in Kenya particularly in tea production. It also outlines the conceptual framework that illustrates the relationship between the dependent and independent variables and how the study will determine the variables. The review in this chapter will give guidance of the areas to investigate in order to answer research questions of this study.

2.2 Tea Production and Technologies in Kenya

Tea was first introduced in Kenya on experimental basis in 1903, but commercial tea planting started in 1924 (Anon., 2006; Kamau, 2008). The Africans or indigenous people were not allowed to grow tea at inception. In the mid 50's, however, experimental tea growing was introduced for Africans and after attaining political independence in 1963, the legislation to bar Africans to grow tea was repealed. The indigenous citizens took immediate and maximum initiatives and commenced massive tea planting programmes and development, leading to a fast growth of the Kenya tea industry in 1960s to 1980s.

Tea production rose from 18,100 metric tonnes in 1963 to 328, 000 metric tonnes made tea in 2005 (Tea Board of Kenya, 2006). This was largely due to expansion in the smallholder sub sector, improved productivity per unit area in the estate sub sector of the Kenya tea industry. There has also been provision of technical packages developed by the Tea Research Foundation of Kenya (TRFK), and its predecessor, the Tea Research Institute of East Africa (TRIEA) (Othieno, 1981; Othieno, 1988). Kenya is now the leading world exporter of black tea (Mwaura, Nyabundi and Muku, 2005) having overtaken Sri Lanka.

Tea contributed 2.6% of GDP in 2004 compared to 1.8% in 2003. Kenya's share of the world tea market has been increasing gradually form 5.5% in 1970 to approximately 21% in 2003; making

tea the leading export earner accounting for nearly 25% of total export earning (KTDA, 2005; TRFK strategic plan, 2006).

Among the technologies developed are the release of over 45 tea varieties, plucking technologies, pruning technologies, pests and diseases management technologies and various fertilizer technologies (TRFK, 2006). These have been adopted differently in various tea growing areas in both the two tea sub sectors with the smallholder adopting less hence reduced production per unit area (TRFK, 2005). This has also resulted into different tea production levels in different tea growing regions (KTDA, 2005).

Currently over 3 million people in Kenya are either indirectly or directly employed in the tea industry. This figure will increase if constraints in pruning and plucking technologies adoption are identified and remedial measures taken. The small-scale growers account for 66% area under tea and contribute 61% of total production (Kamau, 2008).

Tea contributes to rural infrastructure and in the actual creation of wealth in the rural areas. Currently it contributes 26% of the total export earnings (Tea Board of Kenya, 2005) and 5% of Gross domestic product in Kenya (RoK, 2004;KTDA, 2006)

The Kenya tea industry is composed of the estate sub sector and the smallholder sub sector. The estate sub sector comprises the multinationals and local farmers whose holdings are generally over 10 ha (Kamau, 2008).

The smallholder sub sector is composed of indigenous farmers whose average area under tea is 0.25 ha (Kamau, 2008). They used to grow tea under license given by the Kenya Tea Development Authority (KTDA) up to the year 2000, but now operate as free entities with Kenya Tea Development Agency Limited (KTDA) as their commercial managing agent. The farm units are owned as family units in which the individual farmer is the risk-taking manager, with his/her family. The farmer provides most of the labour and management and delivers tea to KTDA factories which process and market the made tea on his behalf at a management fee. The

smallholder tea sub sector is composed of over 400,000 farmers spread over 57 tea factories (KTDA, 2006; Kamau, 2008).

The tea sector together with other associated sub-sectors (marketing, warehousing, brokerage, packaging and transport) is estimated to maintain directly or indirectly over 3 million Kenyans (Owuor, Kavoi and Siele, 2001). The Kenya smallholder tea sub sector is considered the largest and one of the most successful smallholder schemes in the world (Lamb and Muller, 1982). KTDA is acknowledged as a successful institution in two fields; smallholder rural development and public sector enterprise both of which the Africa experience is often fraught with difficulties and disappointing performance (Lamb & Muller, 1982). The area under tea in smallholder sub sector has been higher than that in the estates sub sector over the years. Total tea production by the sub sector surpassed that of the estates in 2006. Productivity in the estates sub sector has always been higher than in the smallholder sub sector. For example in 2005, the smallholder had 92,682 hectares of land under tea while the estates had 48,633, but the smallholder sub sector produced 197.7 metric tons of tea while the estates produced 130.7 metric tons (TBK, 2005).

2.3 Tea Extension in Kenya

Tea as one of the major agricultural crops in Kenya, has suffered from natural calamities and in particular a series of severe periodic droughts and frosts. Major constraints to agricultural development includes unpredictable weather conditions, poor and inadequate infrastructure, communal land use and tenure systems, inadequate rural credits, poorly organized markets inadequate control of pests and diseases (Anon, 1998; TRFK, 2005). Tea has suffered from all these in addition to low technological adoption of various technologies in different tea sub sectors. Dissemination, which is defined as the act of transferring technologies from a source to a recipient through channels that link them (Adams, 1984), of tea technologies is no longer the dominance of the Ministry of Agriculture. It is the responsibility of private sectors involved such as the independent estates and the various tea processing factory units under KTDA for the case of smallholder tea growers.

The extension agents have linkages with TRFK for acquisition of the approved technologies as well as provision of feedback to the farmers and to research. The agents use various strategies

such as method and result demonstrations to reach the farmers. The adoption of the various technologies is assessed from the level of production realized and the level of complaints/feedbacks from the farmers. The extension agents uses pluralistic and demand driven system which is based on participatory planning and implementation of the technologies (TRFK, 2005).

Poor technology transfer from research to the farmers has been cited as a major factor limiting adoption of most technologies in most developing countries. Several researches have been done to identify why adoption of research recommendations has been low in crops other than tea in different parts of the world. In Ghana, research done in Nyankapola Agricultural Experiment Station (NAES) identified the following as major contributors to low adoption:-

1) Irrelevant solutions to farmers problems
2) Insufficient qualified and motivated staff
3) Insufficient reliable credit facilities
4) Unreliable marketing systems for both inputs and output
5) Traditional and cultural behaviours and values of the farmers

All the above five were forwarded as possible causes of low adoption.

In Kenya's smallholders' tea industry, marketing systems, staff motivation, involvement of the farmers in developing new technologies and credit facilities studies has been done. However, in various surveys poor plucking and poor standards of pruning have been cited as major contributors to reduced yields and quality (KTDA, 2004; TRFK 2004; TBK, 2004), hence the need to study the cause of low adoption rates of these two technologies.

2.4 Adoption of Tea Pruning and Plucking Technologies in Kenya

As highlighted earlier, low adoption of recommended plucking and pruning technologies lead to reduced production and quality of tea. The adoption levels would be as a result of institutional characteristics (Extension contact, Credit and inputs facilities, research, training and access to market), socio-cultural values and other factors such as Farmer characteristics (age, level of education, household income, Employment and other enterprises) as well as technological characteristics.

2.4.1 Socio-Cultural Factors

Different communities in Kenya have different enterprises that they have a comparative advantage in their production and hence adoption of technologies in those enterprises is high with them. For example, the Maasai are mainly specialized in livestock and hence their cash constraints are solved by livestock sales. The Kipsigis community have high responsiveness to livestock farming compared to the Kisii and the Kikuyu communities and hence likely to have different adoptions in crop farming technologies. Other enterprises that give income within short period such as horticultural produce are likely to be affecting adoption of tea technologies in tea growing areas and hence making adoption decision making difficult for smallholder farmer (TRFK, 2005).

Agricultural diversification along with credit availability through micro financial institutions will provide a source of alternative income to the tea workers and reduce corporate social cost burden hence improving adoption in most of the technologies (www.tatatea.com Business world, 12th March 2005).

Cultural values and traditions/customs are sometimes viewed as obstacles to technological adoptions. Values have been defined as conceptions of desirable, as standards of evaluation, as guides for decision making behaviour or simply as expression of preference (Food Agricultural Organization, 2003). The customs and norms are likely to influence farmers' goals and behaviour as technological change requires behavioural change on the part of the farmers. It is feared that this required behavioural changes which will likely boost adoption of approved production technologies will not occur until values, traditions, myths, legends and customs change. In India (Assam), it has been reported that most tea pickers rely on Almighty rather than technology to get blessings to enable plucking of best tea leaves (Indo-Asian News Service, 2006).

In most developing countries, most of the technologies are developed and disseminated on the assumption that farmers are males (Saito and Spurling, 1992). In South Asia, studies have shown that most of the pluckers are women (Sivaram, 2001)

Yet women head most of the farm families and majority of farm workers are women. The extension work of males with women on individual basis is sometimes hindered by cultural

norms (FAO, 1984). Most of the workers in the tea sub sector especially in smallholder are women (KTDA, 2005). Access of agriculture extension increases adoption of technologies and hence increases production and yield (Crowder, 1996; Squire, 2002). There has been poor adoption of most agricultural research finding due to lack of comprehensive approach in dissemination (RoK, 2004), however, TRFK and KTDA have been active in involving farmers in research work and use of contact farmers in extension.

In a study done in Western Kenya, it was found that women-headed families, which form 30% of the population, had higher labour constraints than men-headed families. This was probably due to information transfer discrimination and lack of resources, particularly labour (Krinstjanson, Place, Franzel, and Thornton, 2002).

The success of policies for raising agricultural productivity in low income countries depends upon the quality of decision making by farmers as the efficiency of farmer decision making influences the design of development strategy in a country (Pachico, 1980). If farmers are inefficient in the management of resources, then simply improving the allocation of resources, without having to develop new technologies, which usually are relatively expensive can raise agricultural production. On the other hand, if productive technologies are developed, inefficient decision-making reduces the gains from these technologies, both to the farmers and society as a whole. Similar studies in tea indicate that policies that are user friendly are a pre-requisite for easy of adoption. Incentives to farmers, researchers and extension staff will boost dissemination and hence adoption (Owuor, Kavoi and Siele, 2001; TRFK, 2005).

Land tenure and ownership systems may affect smallholder farmers due to ownership wrangles and family land fragmentation due to inheritance. Also guarantee in stable land ownership through effective tenure system ensures investment on the land. Furthermore rising production costs and stagnated price trends may discourage use of technologies (Kamau, 2008).

Most of the agricultural activities are labour intensive and this has been a constraint in most countries and more so in rural areas where most agriculture is being practised. It therefore implies that most of the technological recommendations such as regular plucking and recommended

pruning practices in tea that are inherently labour intensive results in low adoption. This therefore calls for labour saving technologies and practices in farming activities (FAO, 2003). Mechanized tea pruning is recommended due to its efficiency in labour costs as well as reducing diebacks and increasing bud breaks in the pruned bush (Bore, 2003).

Tea is among the most labour intensive of all the plantation crops. It has been established that in some countries there is lack of interest in farming among the youth, who are seeking alternative employments in urban areas. The productivity of the remaining labour is compromised by lack of physical and mental energy and poor quality tools to enable adoption of modern technologies. Issues of loses of 'human muscle power' due to causes like HIV/AIDS aggravates the situation. This has changed the composition of the labour force and is the root cause of the labour shortages in some farming communities such as in Bondo and Busia districts in Kenya. In these communities, women-headed households accounts for 15-30%. Male without wives, grandparents and orphans headed households' accounts for 10-15% (FAO, 2003).

There is therefore need to understand the scenario of the same in the Smallholder tea growing areas of Gucha district and relate how it influences adoption of recommended pruning and plucking technologies as some of these operations are gender sensitive.

2.4.2 Farmers Characteristics

The adoption of new technologies has been found to be responsive with the age of the farmers and their role in the agricultural industry. Farmers who are young are more inclined to new technologies adoption (Rogers, 1985). However, this factor is likely to be different in adoption of technologies for different crops as there are some that older people are more inclined to and hence high adoption. Studies in South Asia proved that tea plucking productivity has a direct bearing to age and experience (Sivaram, 2001).

Studies done in Kericho District indicated that the productivity of tea was negatively related to the presence of children under five and households being headed by widows, reinforcing the findings on the importance of constraints faced by women farmers (Bulow and Sorensen, 1988). While it is likely that wealth and gender may affect the adoption of agricultural technologies,

studies done in Zambia concerning adoption of improved fallows indicated that neither of the two was important (Fraenkel and Wallen 2002).

Adoptions of general Agricultural technologies have been found to be dependent on education levels / background of the farmers (Chitere and Doorne, 1985; Ndiema, 2002;) The education level enables one to access information needs to make decision to use an innovation, technology and practice. The kind of information the farmers are receiving about technology plays an important role in determining if and how the technologies are adopted. The lessons that are always coming up through studies in enterprises other than tea are that farmers are always willing to visit others and to try out new technologies (Krinstjanson, Place, Franzel, and Thornton, 2002).

It has been established that salaries and employed farmers take most of their time in their occupations and have less time to adopt the approved technologies. They are rarely in touch with their farm workers and hence not able to supervise the adoption of these technologies at the farm level (TRFK, 2005).

2.4.3 Institutional Characteristics

Previous studies have shown that where the marketing system contributes to the welfare of the farm families and the farmer, then the farmers and farm workers are likely to adopt new technologies that will improve production efficiency. Marketing beyond the farm level will immediately bring into play a variety of other market related factors such as transportation, marketing organization, processing capacity (FAO, 2003). Tea has been enjoying favourable prices in the world market. However most of the favourable markets were concentrated in European countries with producer have minimal price controls (Nyoro, 2002). Adequate and timely payments are likely to boost adoption of plucking technologies (Owuor, Kavoi and Siele (2001). There is need to explore new markets of tea for farmers to get increased returns to motivate them apply modern technologies such as plucking frequencies (Wachira and Ronno, 2005).

Availability of other household income sources will determine the level of investment in the acquisition and adoption of new technologies. It also increases the farmer's willingness to take risk. It has a bearing on the socio economic status of the farmers as one from higher socio

economic status has access to resource and institutions controlling resources necessary for the effective adoption of technologies (World Bank, 1993). The adopter in most cases is largely an opinion leader who tends to occupy high socio- economic status, which is positively related to adoption (World Bank, 1993; Adams, 1984).

Credit is essential for acquisition of some of the implement tools and equipment to be used in increasing various adoption. Access to formal credit is as varied as are the sizes of the farmers' farms. Uses of land and production levels, as collateral are likely to improve acquisition of credit. Corruption, political interference in agricultural sector and state owned banks and dysfunctional court systems in the past gave rise to a culture of default thereby leading to high levels of non-performing loan portfolios in the balance sheets of the formal lending institutions affected (RoK, 2004). Studies in other inputs used in tea production such as fertilizer recommendations in terms of types and rates as well as their availability indicate that they are supplied on credit but they tend to reach the farmer late, hence not applied as recommended and leading to lower productivity. Credit for inputs and timely supply to the farmers will increase adoption (Owuor, Kavoi and Siele, 2001).

Most of the implements and equipment used in agricultural production are not readily available. Majorities have to be imported at exorbitant prices that cannot be easily afforded by the farmers. Other inputs that contribute to adoption of plucking rounds such as use of fertilizer is low due to high prices and has to be imported hence farmers also receive them when it is late (TRFK, 2005). In some occasions, the inputs are received late and some farmers don't use recommended rates, frequencies and implements due to lack of proper advises from extension officers (Owuor, Kavoi and Siele, 2001). Studies done in Sri-Lanka concluded that head carried baskets as well as use of unprotected fingers affect the health of the women pluckers and hence reduce productivity (Sivaram, 2001)

Whereas production of tea has increased over years as a result of good organizational framework, improved world prices and well organized liberation process that did not disrupt production, the factories have been congested and hence a challenge to the processing capacity and finally tea

quality. This has in turn affected adoption of various tea technologies in different degrees in different areas (Nyoro, 2002).

Training of Extension agents in tea is under the individual smallholders' factories and their activities are coordinated by KTDA (KTDA, 2005). The training of extension agents on other crosscutting issues like HIV/AIDS, which will determine technology adoption, is very important in the tea industry. Training of smallholders in business approach to tea farming should be intensified by targeting key people who can implement technology adoption (TRFK, 2005). Extension staff who are well trained and have had regular refresher courses play a leading role in imparting the necessary skills and quality control and making agribusiness management an important part of their extension messages while disseminating new production technologies. Related adoption studies in other technologies have indicated lack of knowledge of recommendations and hence low adoption on the side of the farmers who are supposed to implement (Owour, Kavoi and Siele, 2001). Most extension agents have realized the importance of training farmer groups on tea production technologies. This is due to limited extension staff and this hamper adoption of technologies (Ogolla and Kibiku, 2004). The current extension system is long and confusing in message delivery to farmers (Owuor, Kavoi and Siele, 2001).

The levels of adoption of various technologies are determined by various factors and this depends also on the interactions between research, extension and the farmers discussed above and shown in figure 1.

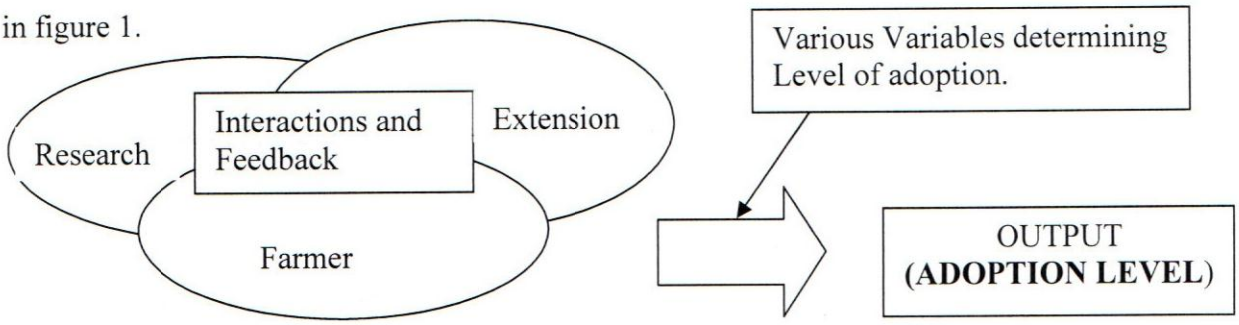


Figure 1: Research –Extension –Farmer Linkage

2.4.4 Rate of Adoption

Rate adoption theories state that an innovation goes through periods of slow, gradual growth before experiencing a period of relatively dramatic and rapid growth. According to Rogers (1995)

he described the rate of adoption theory as innovations which are diffused over time in a pattern that looks like an S- shaped curve as shown in figure 2.

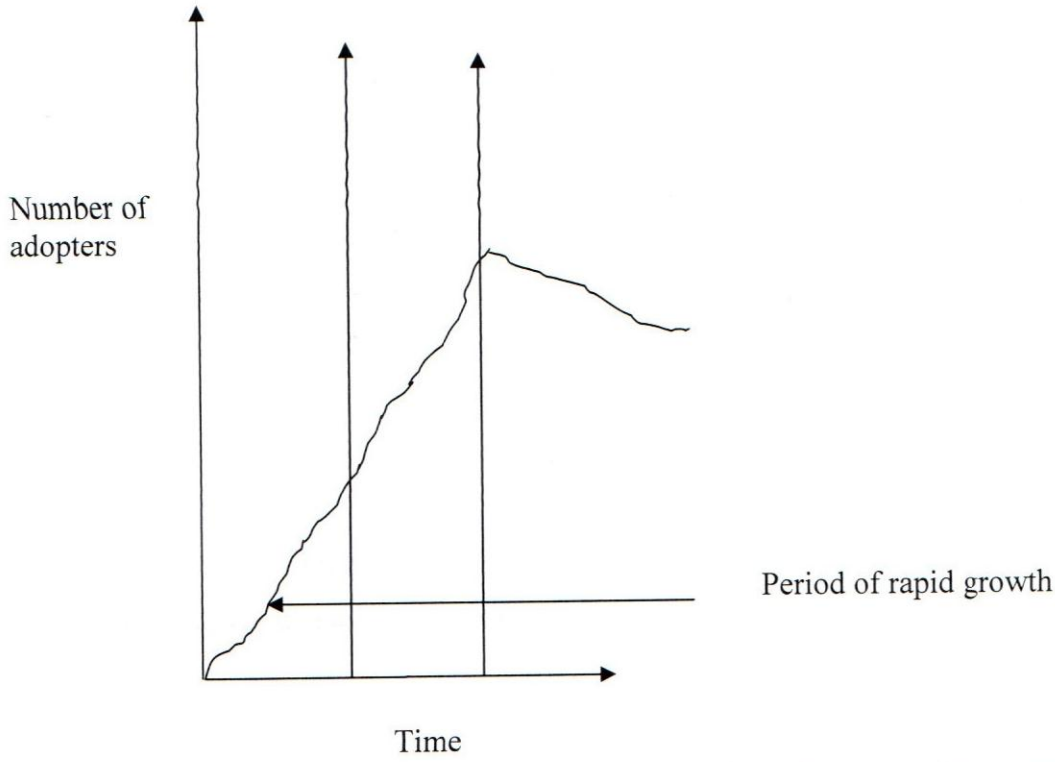


Figure 2: The S-Curved graph representing rate of adoption of an innovation over time

Source: Adopted from Surry Daniel (1997)

The theory states that following the period of rapid growth, the rate of adoption of innovation will gradually stabilize as majority of the farmers adopt the technology and eventually decline (Surry, 1997).

2.5 Theoretical Framework

The theory of diffusion of innovations which was relied on in this study implies that it takes time for new innovations to diffuse into individual farmers and to the community as a whole for them to adopt and practice. The time depends on factors such the complexity of the innovation and the individuals concern and their social norms. Different individuals will show different adoption levels depending on factors such as how they get the technology/ information and understand it

(Generally, how fast they undergo the "innovation decision" process). It is important to understand the process of adoption and diffusion so that strategies can be developed for the time taken for adoption to be reduced (Surry, 1997).

It is also important to understand the barrier to adoption at every stage in innovative decision process. These barriers include lack of awareness, lack of interest, lack of adequate information and lack of implementation capacity. The various technological characteristics will help to explain the difference in adoption rates (Rogers, 1995).

Trialability explains that technologies that can be practiced on a limited basis are generally adopted well than one that cannot. Trials on a small scale can therefore induce the farmers to adopt it. The willingness of the farm to try and the methodology used by extension agents to convince trialability will therefore determine the adoption.

Technologies, which produce better results and quickly compared to the ones in place will be adopted faster. This is due to their relative cost/benefit advantage.

Innovations that are deemed simple and are easily understood and applied are faster accepted compared to complex ones. Complexity and inability of the targets to use the technologies due to factors such as gender and socio- cultural will be a barrier to its adoption.

Technologies that are compatible with existing ideas and beliefs and other socio cultural aspects and various educational levels of the farmer are readily acceptable than those that are inconsistent.

Various factors influence the adoption of recommended plucking and pruning technologies in tea, leading to low production. These factors can be categorized as institutional, farmers' characteristics, socio-cultural and economical as well as technological characteristics (Figure 3).

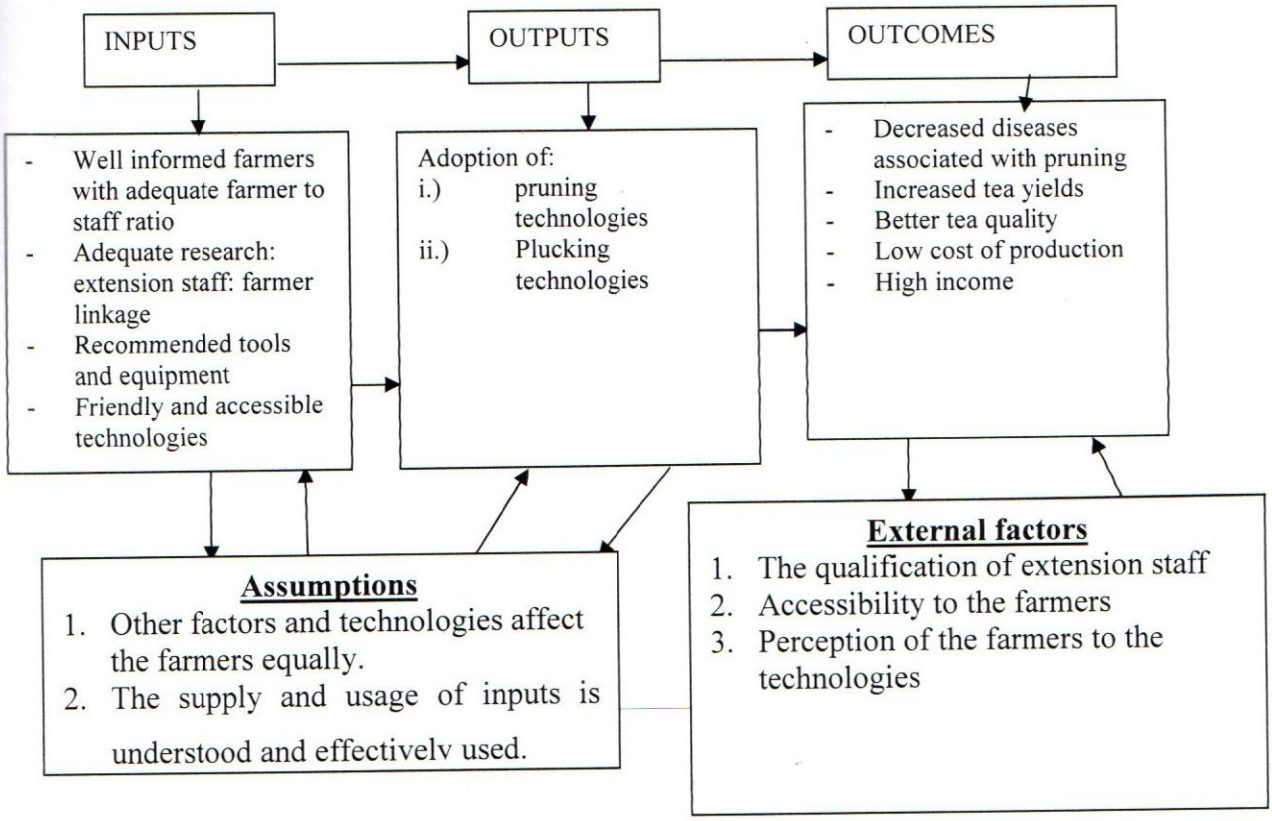


Figure 3: Theoretical framework for describing the production and adoption levels and factors influencing adoption amongst smallholder tea farmers in Gucha District (Adopted from Millar, (2001), Powel, (2002) logic model)

2.6 Conceptual Framework

This framework gives a conceptual outline that will be used to study or identify the various factors contributing to low adoption of recommended tea plucking and pruning technologies amongst the smallholder tea farmers in Gucha District (Refer figure 4). The dependant variable in this study was the adoption of recommended tea plucking and pruning technologies amongst small holders in Gucha District. This was measured using the logistic model for the plucking standards, Frequency, use of recommended tools and equipment for the case of plucking technologies. For pruning technologies were measured using the same model for the pruning cycles, height, method, season as well as tools and equipment used. This was captured by interviewing the sampled farmers on their knowledge in use and awareness of these various pruning and plucking technologies and the application of the same in their current production operations. This will reveal their level of adoption and identify factors affecting adoption of the recommendations.

Various independent variables were studied to reveal pertinent factors that influence adoption of these two husbandry practices technologies. These included -: i) various farmers' characteristics such as education of the farmer, age, gender, family size, off-farm employment and family income level. ii) Various selected institutional characteristics such as extension system used, number of visits to the farm, leaf collection, marketing, research-extension-farmer linkage level, training (types, levels, frequency and numbers) and credit and equipment availability within reach of the farmers. iii) Various socio-cultural and economic characteristics such as myths, norms religion, land ownership, family set-up and beliefs (Refer to figure 4).

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Independent Variables

Selected factors influencing adoption of tea recommended pruning and plucking technologies

1. Farmer characteristics
   - Age
   - Gender
   - Education Level
   - Household income sources
   - Off-farm employment/activities
   - Family size
   - Marital status
   - Land size under tea
2. Socio-Cultural Values
   - Burial ceremonies
   - Circumcision ceremonies
   - Religion
3. Institutional Characteristics
   - Frequency of Extension visits
   - Availability of plucking and pruning tools and equipments
   - Availability of Credit facilities
   - Efficiency in payment to farmers
   - Distance to the factory
   - Distance to the buying centre

Dependent Variables

Adoption of the following tea recommended pruning and plucking technologies.

Plucking Technologies

a) Plucking standards/leaf quality
b) Plucking rounds
c) Use of appropriate plucking equipment

Pruning Technologies

a) Pruning cycle
b) Pruning height
c) Pruning method/type
d) Pruning period/season i.e timing
e) Pruning tools/equipment

Moderator variables

- Infrastructures(roads and Factory Capacity)
- Extension staff qualifications, efficiency etc
- Policy of the extension implementing agencies

Figure 4: **Conceptual framework of the factors that determine adoption of recommended tea plucking and pruning technologies (Source: Adopted from Millar, 2001 and Powel, 2002).**

CHAPTER THREE

METHODOLOGY

3.1 Introduction

This chapter presents the research procedure that was used in order to attain the objectives of this study. It outlines the description of the research design, study location, population of the study, sample size and sampling techniques and procedure, instrumentation, pilot testing, data collection procedures, data organization and data analysis.

3.2 Research Design

A descriptive survey was used for this study. A descriptive survey design was appropriate for the study because it involves studying a situation as it is as well as attempting to explain why the situation is the way it is (O'Connor, 2002; Mugenda, 2003). Surveys are important in research and have been found to be useful in describing the characteristics of a population under study using a sample of the population. The data collected from them concerning various aspects, in this case the adoption of plucking and pruning technologies in tea production amongst smallholders in Gucha District. Data was collected from a sample of the population at one point in time to investigate the adoption of recommended pruning and plucking technologies and get the extent of influence of selected factors in the adoption. Surveys have sometimes been found to have the problem of non-availability of sampled respondents and whenever this happened in this study, appropriate techniques such as calling back on absentee sampled respondents or random replacement where necessary was done (Fraenkel and Wallen, 2000).

3.3 Location of the study

This study was carried out in Gucha District, Kisii County, Nyanza Province in Kenya which is one of the tea growing District in West of Rift Valley. In particular, the study concentrated in the tea catchments of Nyamache and Ogembo Tea Factories. The two factories have a total number of 60,059 growers. The District borders with Transmara, Central Kisii, Masaba, South Kisii and Rongo Districts. The total area under tea in the District is approximately 5,397.4 hectares having 62,603,410 tea bushes. The altitude ranges 1,200-2,100m above sea level with rainfall range of 1,200-2,220mm per year (Nyamache, 2006; Ogembo, 2006)

This study adopted the tea catchments boundaries provided by the factory management (Refer appendix 5 and 6). The study area adopted the 12 electoral zones for Directors as sampling units.

3.4 Population of the study

All the 60,059 registered tea farmers who deliver their tea to Nyamache and Ogembo tea factories constituted the population of the study. These are distributed in the Directors electoral areas as shown in table 1. The area has smallholder farmers, majority of whom own tea as a cash crop in addition to other enterprises such as coffee, pyrethrum, Maize, Beans Sugarcane, Kales and sweet potatoes. A few also have dairy and poultry farming. Men who are the registered owners of the land head majority of the households. Widows head minority households.

3.5 The Sample and Sampling Procedure

A sample of 110 registered smallholder tea farmers was used in this study. According to Kathuri and Pals (1993), a sample of 100 subjects in social sciences studies is deemed adequate. The extra 10 catered for those who would not be traced and those who would not be available at the time of our visit. The sample of 110 growers was also considered adequate due to homogeneity of smallholders. A multi-stage random sampling was adopted in order to get the 110 farmers from the entire population of 60,059. Each of the two factories has 6 zones (Based on the electoral areas for the factory Directors) comprising of various numbers of tea collection centres and the samples were proportionally selected from these zones depending on the number of growers in each zone. Proportionate, purposive and random sampling procedures were used in order to the required respondents.

In order to get the sample to be interviewed, random sampling of one centre from each zone was done. From the selected centre the required numbers of growers that were to be interviewed from that zone were randomly selected (Table 1).

This proportionate random sampling from each zone ensured that the respondents were uniformly chosen from the entire District and hence avoided overrepresentation in certain areas (Borg and Gall, 2003). The format for proportionate sampling was done as shown in table 1.

Table 1: Number of farmers in the zones and sample size by zone.

NAME OF ZONE (Electoral Area)	NUMBER OF FARMERS IN THE ZONE	PROPORTION	SAMPLE SIZE
Ogembo			
Sengera	4715	0.08	09
Majoge Borabu	6836	0.11	13
S. Mugirango	6239	0.10	11
Majoge Chache	8619	0.14	16
Magena	6337	0.11	12
Bonchari	2706	0.05	05
Nyamache			
Basii Central	4702	0.08	09
Basii Borabu	3785	0.06	07
Boitangare	4099	0.07	07
Bogetaorio	3915	0.07	07
Masige	5653	0.09	10
Basii Chache	2453	0.04	05
Total	60,059	1.0	110

Source: Ogembo and Nyamache Tea Factories growers registers as at August 2007

3.6 Instrumentation

Data concerning the study area was sourced from various sources (Published and unpublished) and from various reports from the two tea factories in Gucha District.

Based on the objectives and research questions of the study as outlined in chapter one, a detailed structured questionnaire was constructed for use in interviewing sampled farmers. The questionnaires were administered face to face while at the same time making and recording visual observations on the use of the recommended technologies in question in the farmer's fields and at the same time making clarifications to the farmer on issues that would not be easily understood in the questionnaire. This is therefore a convenient tool for farmers who might be having problems in reading and writing. The tool was easily administered and scored and therefore data was to be easily analyzed (FAO, 1992). Clarification of the issues in the questionnaire by the researcher

ensures that consistence across the respondents is attained (Leung, 2001). It is necessary for the researcher to develop a friendly relationship with the respondents prior to conducting the interview since the administration of the questionnaire was done personally (Mugenda and Mugenda, 2003)

3.6.1 Validity

This is the degree or the extent to which data obtained and results from their analysis actually represents the phenomenon under study. It was therefore necessary to ascertain the validity of the instrument as concern usefulness and its meaningfulness before pre-testing was done. In this study, my supervisor as well as a tea research expert in social science from TRFK assisted in reviewing the instrument in terms of its content depth, construction and face validity. The TRFK expert was considered since all instruments for research studies there are analyzed by him before use in the field. This was to avoid any complexity and to ensure that the tool collected sufficient and useful information that can answer the research questions in chapter one.

3.6.2 Reliability

Pilot testing of this study was done based on guidelines given by Kathuri and Pals (1993), using 10 smallholders' tea farmers in Nyamira District, which has similar characteristics as Gucha District. This testing ensured that there were no deficiencies and any ambiguities in the final instrument, as these were perfected during pilot testing stage.

According to Mugenda and Mugenda (1999), reliability, which is the degree to which a research instrument such as a questionnaire yields constant results or data after repeated results, is influenced by random error which tends to increase as the reliability decreases. Random error will increase if factors concerning the study have not been addressed effectively by the researcher. The reliability of the instrument was estimated using the Cronbach's test and scored 0.85. For research purposes, a reliability coefficient of at least 0.7 is acceptable (Fraenkel and Wallen, 2000).

3.7 Data Collection

Upon being granted authority by the graduate school of Egerton University and the Ministry of Higher Education Science and Technology, the researcher proceeded to seek necessary research

permission from the two KTDA factories to carry out the research study in the field (This was done verbally as the researcher visited the two factories). The management and extension staff in the two KTDA factories in the study location assisted in scheduling the visits. These visits were done after sampling of 110 tea farmers from the two factories and preparation of a friendly and pre-tested questionnaire. The list of respondents in each area were then drawn and their basic data such as the number of tea bushes owned and their registration numbers got from the factory records before proceeding to interviewing them. This interviewing was done face to face where the researcher read the question and recorded in the questionnaire as the farmer responds. To avoid less standardized work, only the researcher administered the questionnaires. In the cause of interviewing the respondents, observations in aspects beneficial to the study such as pruning heights and plucking standards as well as other useful spontaneous and unintended responses were also recorded. The selected respondents were visited under the guidance of extension staff or buying centres officials without prior arrangement with them and those not found at home or farm were later visited on the same day.

3.8 Data analysis

After the data was collected, the questionnaires were edited for completeness, clarity and consistency and finally coded. The data was then entered in excel and then imported to (SPSS) version 11.5 for Windows for qualitative and quantitative analysis. Frequency procedure and descriptive statistics analytical methods were used. These involved the use of frequency distribution; calculation of means, percentages and later tabulations of the results was done. The specific methods used depended on the objective under analysis.

In order to determine the current tea production per bush for Gucha smallholder tea farmers, 2007 and 2008 productions were used to find the average and determine the range where most farmers fell in. The tea production for each interviewed grower was computed against the number of tea bushes he had so as to get the production per bush. This gave the range difference in production for the farmers in the District.

Specific objective one which aimed at determining the current level of adoption of both pruning and plucking technologies was determined by how much the farmers are applying the various

components of these technologies. The adoption levels were categorized as high, medium and low. This was determined by the index on how much closer the farmer was to the recommended technology. 0-40% was categorized as low, 41%-75% as medium whereas 76% and above was categorized as high. For example, the recommended plucking rounds are four and therefore if the interviewed farmer was practicing 2 rounds then this was 50% and hence categorized as medium adoption. Inferential statistics like percentages and averages were used to find the adoption of the individual farmers and then computed to get the range of adoption and finally the average adoption for Gucha District tea farmers.

Specific objectives two, three and four aimed at determining the extent of adoption according to selected personal characteristics, socio-cultural values and institutional factors in the adoption of the pruning and plucking technologies. Their analysis was done by descriptive statistics as tabulated in table 2.

Table 2: Summary of data analysis for objectives two, three and four

Research Question	Independent variables	Dependent variables	Statistical procedure
What is the extent of adoption of recommended pruning and plucking technologies according to Personal characteristics, Socio-cultural values and Institutional factors by smallholder tea farmers in Gucha District?	**Farmer characteristics:** -Age in years -Gender (male and female) -Educational level -Household income sources -Off-farm employment/activities -Family size -Marital status -Land size under tea **Socio-cultural and economic:** -Burial ceremonies -Circumcisions ceremonies - Religion (Catholic, Seventh day Adventists) -Who goes for tea payments **Institutional characteristics** a) Frequency of Extension Visits b) Availability of tools and equipments c) Availability and usage of credits from SACCOs and Banks d) Efficiency of payment to farmers e) Distance to the factory f) Distance to the buying centres	-Plucking standards/leaf quality -Plucking rounds -Use of appropriate plucking equipments -Pruning cycle -Pruning height -Pruning method/type -Pruning period/season -Pruning tools/equipment	Percentages, means and averages.

CHAPTER FOUR

RESULTS AND DISCUSSIONS

4.1 Introduction

This study aimed at determining the selected factors influencing adoption of recommended tea pruning and plucking technologies amongst smallholder tea farmers in Gucha District. This was achieved by determining the current tea production per bush/year amongst the tea farmers, determining the level of adoption of various recommended pruning and plucking technologies and determining the influence of selected personal characteristics, socio-cultural values and institutional factors on the adoption of recommended pruning and plucking technologies by these farmers. The results for each objective were analyzed, tabulated and presented separately. Sub-section 4.2 presents results and discussions on personal characteristics and their influences on various technologies; Subsections 4.3, 4.4 and 4-5 present results and discussions for objectives 1 to 3 respectively.

4.2 Demographic profile of the respondents

4.2.1 Age of respondents

The age of farmers has a bearing on how effective they can be committed to tea farming since tea farming in labour intensive e.g. most plucking and pruning technologies may not be efficiently done by old people. Farmers of various ages have different exposures to technologies hence adopting the technologies differently which will most likely result in different production levels. Table 3 shows the percentages by age of the respondents. Majority of the respondents were 31-40 years (38.2 %) while the minority were within the age bracket of less than 20 years (0.98%).

Table 3: Frequency and percentages of respondents by age categories

Age category in years	Frequency	Percentage (%)
< 20	1	0.98
20-30	7	6.86
31-40	39	38.23
41-50	31	30.39
>50	24	23.5
Total	102	100

Source: Survey data, 2008

4.2.2 Educational level of respondents

In adoption of any new ideas, education level is important as it determines how good the technologies can be understood and actualized. It also determines how best the new technologies can be packaged for dissemination to the targets.

Table 4 shows the percentages of educational level of respondents. Majority of the respondents had no formal education (57.84%) whereas the minority had secondary (1.96%) or college education (1.96%). According to Owuor (2005) studies indicates that the majority of the smallholders had no or low level of education. Passing technical information through bulletins is unlikely to help technology diffusion in the smallholders' tea sub sector. It is recommended that technologies be disseminated to the smallholder farmers through on farm courses based on practical demonstrations in which the farmers have contact with the trainers. This situation is likely to change with time as younger and better-educated farmers are gradually replacing the old farmers. In each side of the valley, there was higher productivity per bush where we had smaller pieces of total land areas possibly due to absence of competing farm enterprises, as the available land was too small to support other farm activities and the land forcing the smallholders in these areas to concentrate on tea production. Where the tea holdings were too large, labour to maintain tea seemed inadequate and farmers possibly were unable to remove the entire crop or to manage the farms effectively.

Table 4: Frequency and percentage of respondents by level of education

Education level	Frequency	Percentage (%)
College(Tertiary)	2	1.96
Secondary	2	1.96
Primary and adult education	39	38.23
No formal education	59	57.84
Total	102	100

Source: Survey data, 2008

4.2.3 Land size of respondents under tea.

Land size under an enterprise is important in adoption of technologies since some technologies are better adopted in large scale due to costs involved. From table 5, it is evident that most of the respondents had tea in 0.5 acres and below. The acreage was high on the lower side of the study

area but the tea in this area had a lot of gaps due to severe environmental factors not suitable for tea. In this region sugarcane was cited as the main alternative source of income. The upper side of the catchment had lower acreage under tea as a result of high population and therefore land sub-division. This is based on the cultural and land tenure system of the community that everybody must own land to survive.

Table 5: Land size under tea by frequency and percentages

Land under tea(acres)	Frequency	Percentage (%)
>1.0	4	3.90
0.76-1.0	5	4.90
0.51-0.75	30	29.4
0.25-0.50	58	56.9
<0.25	5	4.90
Total	102	100

Source: Survey data, 2008

4.2.4 Marital status of respondents

Table 6 shows the percentages of marital status of the respondents. Marital status gives some guidance on sharing of responsibilities and hence adoption of some technologies. It also implies that that in married situation, we have more people working in same farm as opposed to when either single or divorced state. In this study majority of the respondents (97.06 %) were married while the minority (0.98%) were single.

Table 6: Marital status of respondents by frequency and percentages

Marital status	Frequency	Percentage (%)
Married	99	97.06
Single	01	0.98
Divorced	02	1.96

Source: Survey data, 2008

4.2.5 Average family size of respondents

Tea farming is labour intensive and therefore adoption of most of the technologies will require readily available labour. In this study, majority of the respondents had 6-8 members in their families (65.7%) whereas the minority (4.9%) had less than 4 members in their families (Table 7). This suggests that most of the respondents would be self sufficient in labour requirements (If

they all stay and work in the farm) considering the fact that most respondents have less than 0.50 acres under tea.

Table 7: Average family size of respondents by frequency and percentages

Number	Frequency	Percentage (%)
> 8	10	09.8
6-8	67	65.7
4-5	20	19.6
<4	05	04.9
Total	102	100

Source: Survey data, 2008

4.2.6 Major sources of income

It is likely that if an enterprise is a major source of income to the family, then most of its technologies are adopted to improve its productivity as farmers tend to allocate more resources for its management. Majority of the respondents (34.3%) depends on tea as their major source of income whereas minority (6.9%) depends on dairy. 29.4% depended on bananas (Table 8). It was however noticed that most of the families have diversified income sources.

Table 8: Sources of income by frequency and percentages

Source of income	Frequency	Percentage (%)
Tea	35	34.3
Bananas	30	29.4
Coffee	10	09.8
Sugarcane	10	09.8
Horticultural crops	10	09.8
Dairy	07	06.9
Total	102	100

Source: Survey data, 2008

4.3 Tea production levels in Gucha District.

4.3.1 Current tea production per bush along the Age profile of respondents

Those respondents with tea at the age bracket of <20-40 years majority produce over 1.0 kg/bush/year and a minimal number produce less than 0.5kg/bush/year. This is probably as a result of the young being educated and very enthusiastic in entering the tea industry for the first time. In the age bracket of 41-50 year majority produce 0.51-1.0 kg/bush/year and none produces less than 0.51 kg/bush/year. However, at above 50 years most farmers produce at 0.31-0.50 kg/bush/year. This situation is probably due to family pressure to give sons land and hence old people show no interest in tea farming.

Table 9: Current tea production per bush along the age profile of respondents

Profile [Age in years]	Tea production per bush (Kgs/year)	Frequency	Percentage (%)
<20-40	0.31- 0.5	1	0.098
	0.51-1.00	12	11.77
	> 1.00	24	23.52
41-50	0.31- 0.5	0.0	0.00
	0.51-1.00	30	29.41
	> 1.00	1	0.098
>50	0.31- 0.5	20	19.61
	0.51-1.00	1	0.098
	> 1.00	3	2.94
Total		102	100

Source: Survey data, 2008

4.3.2 Current tea production per bush along the educational profile of respondent

Majority of the respondents produce 0.31-0.50 kg/bush/year. Of this most of the respondents are of primary level category (32.35%). Those with secondary education produce at >1.00kg/bush/year category. Those of college and above category produce at lower levels probably due to the fact that they rarely stay in the farm and in most cases may be involved in other activities outside the farm, hence not readily available to implement the recommended technologies. Majority of those with primary education are able to get the new technologies and

apply them properly, hence increased output. They are also readily available within the farm hence reachable by extension staff and have basic knowledge to understand the technologies to use in tea production.

Table 10: Current tea production per bush along the educational profile of respondents

Educational level	Tea production per bush (Kgs/year)	Frequency	Percentage (%)
None	0.31- 0.5	32	31.37
	0.51-1.00	20	19.60
	> 1.00	7	6.86
Primary	0.31- 0.5	33	32.35
	0.51-1.00	5	4.90
	> 1.00	1	0.980
Secondary	0.31- 0.5	0	0.00
	0.51-1.00	0	0.00
	> 1.00	2	1.96
College	0.31- 0.5	2	1.96
	0.51-1.00	0	0.00
	> 1.00	0	0.00
Total		102	100

Source: Survey data, 2008

4.3.3 Current tea production per bush along the marital profile of respondents

Married respondents majority (51.96%) produce at level of 0.51-1.0 kg/bush/year compared to 0.98% realized by those who are single at the same level of production. In the divorced category, all respondents in this category produce at lower levels of 0.31-0.50 kg/bush/year. The low production scenario may be due to lack of partners to motivate them and also as a result of increased workload for the remaining partner.

Table 11: Current tea production per bush along the marital profile of respondents

Marital status	Tea production per bush (Kgs/year)	Frequency	Percentage (%)
Married	0.31- 0.5	21	20.59
	0.51-1.00	53	51.96
	> 1.00	25	24.50
Single	0.31- 0.5	0.0	0.00
	0.51-1.00	1	0.98
	> 1.00	0	0.00
Divorced	0.31- 0.5	2	1.96
	0.51-1.00	0	0.00
	> 1.00	0	0.00
Total		102	100

Source: Survey data, 2008

4.3.4 Current tea production per bush along the gender profile of respondents

The results indicates that farms owned by male respondents majority get less production 0.31-0.5 kg/bush/year whereas only 0.98% get over 1.0 kg/bush/year compared to those of women respondents where a higher percentage produce over 0.51 kg/bush/year. This would be as a result of the fact that most of the farms workers are women and yet most men go for payments hence lost morale if the man is the one owning the tea and yet the work is done by the woman.

Table 12: Current tea production per bush along the gender profile of respondents

Gender	Tea production per bush (Kgs/year)	Frequency	Percentage (%)
Males	0.31- 0.5	67	65.70
	0.51-1.00	8	7.80
	> 1.00	1	0.98
Females	0.31- 0.5	10	9.80
	0.51-1.00	11	10.78
	> 1.00	5	4.90
Total		102	100

Source: Survey data, 2008

4.4 Current level of adoption of recommended pruning and plucking technologies by smallholder tea farmers in Gucha District.

4.4.1 Current level of adoption of recommended pruning technologies.

This discusses results of vary factors that help in monitoring the adoption of the recommended tea pruning technologies. For this study, 70% and above adoption will be considered as high, 50-69% will be considered as average whereas less than 50% will be considered as low adoption.

4.4.1.1 Pruning frequency

The recommended frequency of pruning in tea is 3 to 4 years when adoptions of other farm production technologies are undertaken. Pruning before 3 year indicates poor adoption of technologies such as plucking whereas after 4 years is acceptable up to 5 years after which production will be lower and hence need to prune. From this study Table 13) only an average number (30.3%) prune their tea within the range of recommended pruning duration of 3-4 years. The majority (50.9%) prune after 2 year whereas a minority (18.6%) prune their tea past the recommended duration. The adoption of this pruning parameter adoption is therefore low. The frequent pruning would be as a result of less plucking rounds/frequency **(4.4.2.1)** hence reaching unmanageable heights too soon.

Table 13: Frequency and percentages of pruning by years

Pruning frequency	Frequency	Percentage (%)
2 years	52	50.9
3-4 years	31	30.3
After 4 years	19	18.6
Total	102	100

Source: Survey data, 2008

4.4.1.2 Period of Pruning

The recommended period for tea is July/August during dry and cold wet season and after closing the tea financial year production. The study (Table 14) shows that majority (36.30%) prune their tea at any period when they think it is due. The adoption of this recommendation is therefore low compared to the recommendation. Only an average number (33.33%) prune during this

recommended period. The rest prune in March/April season which interferes with high yields expected in months of April as a result of high rains. This scenario would be one of the many reasons why production per bush per year is low.

Table 14: Percentages and frequencies of pruning by periods in months

Period of pruning	Frequency	Percentage (%)
March/April	31	30.39
July/August	34	33.33
Any time	37	36.30
Total	102	100

Source: Survey data, 2008

4.4.1.3 Determinant of Pruning

Whereas all the reasons given are important in determining the time to consider pruning, the majority (39.21%) in this study determine by observing the unmanageable height of the tea bush. This would be misleading especially where plucking standard are compromised by having prolonged plucking frequency, hence frequent pruning whereas where plucking is properly done the height might not be the best determinant but the number of years and level of productivity. It was evident from this study that most respondents pluck two rounds per month and these might be the ones who prune frequently and determine pruning by height criteria.

Table 15: Frequency and percentages of pruning by determinants

Determinant of pruning	Frequency	Percentage (%)
Number of years	39	38.2)
Height of tea	40	39.21
productivity	23	22.55
Total	102	100

Source: Survey data, 2008

4.4.1.4 Tools of Pruning

The recommended tools for pruning are a standard designed pruning knife and a special designed motorized pruning machine. Majority of the respondents (54.88%) do not use recommended tools citing unavailability of the recommended tools within their locality and being expensive. They therefore resort to using ordinary pangas, a combination of pangas and pruning knifes, and modified pangas as well as locally made pruning knifes, hence low adoption. Only 29.40% use recommended standard pruning knife and pruning machine collectively. The remaining 13.72% use the tools not properly classified as either proper or not (Table16). It would be necessary to sensitize the business community on the importance to stock some of the recommended tools in their shops and this can also marginally reduce their price unlike when sourced from very far.

Table 16: Tools of Pruning by frequency and percentage

Tools pruning	Frequency	Percentage (%)
Standard pruning knife	14	13.72
Ordinary Panga	14	13.72
Pruning machine	16	15.68
Ordinary Panga & pruning knife	16	15.68
Modified panga	14	13.72
Local made pruning knife	14	13.72
Others	14	13.72
Total	102	100

Source: Survey data, 2008

4.4.1.5 Type of pruning applied

Research has indicated that the advantages of lung pruning method compared to complete cut across are enormous and hence the method is highly recommended for use by the farmers.

From this study, table 17 indicates that majority (51.06%) use complete cut across method whereas 32.35% have at some stage used lung pruning method. 15.68% have practised both complete cut across and lung pruning. The study has however demonstrated that these farmers have some information on lung pruning as some have practiced it at some stage; hence what is

needed is to sensitize and enhance them to use this method especially when they prune during off period.

Table 17: Frequencies and percentages for type of Pruning applied

Type of pruning	Frequency	Percentage (%)
Lung pruning	33	32.35
Complete cut across	53	51.06
Both cross &lung	16	15.68
Total	102	100

Source: Survey data, 2008

4.4.2 Current level of adoption of recommended plucking technologies

This discusses results of selected factors that help in monitoring the adoption of the recommended tea plucking technologies.

4.4.2.1 Plucking rounds per month

The economical recommended plucking rounds per month for tea is 3 to 4 rounds for increased productivity and quality. The result (Table 18) indicates low adoption as the majority of the respondents (55.8%) pluck twice per month. Only 35.3% and 2.9% practice the recommended 3 and 4 rounds per month respectively. A minority of the respondents practice 1 plucking round per month. It was noted that the farmers towards the marginal areas bordering Migori and Transmara Districts pluck 1 to 2 rounds per month. This is probably due to the harsh climatic conditions and also due to the fact that tea farming is not their main farming occupation. Few plucking rounds per month leads to a fast height increment of the tea bushes hence likely reason why tea reached unmanageable heights soon and hence frequent pruning rounds (Table 4.4.1.1). Labour constraints or availability was one of the reasons impeding tea production in the smallholder sub sector of the Kenya tea industry (M'Imwere, Z., 1997). Possibly, this problem has persisted. Additionally, the prices of Kenya tea have stagnated or have been declining in the last decade and this could be making farmers to direct attention to alternative competing farm enterprises.

Table 18: Frequencies and percentages of plucking rounds per month

Plucking rounds	Frequency	Percentage (%)
Once	6	5.9
Twice	57	55.8
Thrice	36	35.3
Four	3	2.9
Total	102	100

Source: Survey data, 2008

4.4.2.2 Equipments used for plucking

Majority of the respondents (58.8%) use plucking baskets as recommended due to their good aeration. Majority 70.65 and 74.5% do not use recommended equipments (wands/plucking stick and plucking caps respectively). Majority (60.8% and 56.9%) use un-recommended equipments (Plastic buckets and nylon bags respectively) Unavailability of the baskets as a result of lack of materials to make them was cited as the reason why 41.2% do not use them. Use of plastic containers and synthetic nylon sack is likely to affect the plucked leaf by high heat build up as well as serious bruising by the nylon bags leading to leaf quality and made tea quality deteriorations.

25.5% of the respondents use plucking caps which are meant to protect the pluckers against dew. This would be the reason why most pluckers pluck less since they may be going to the farms late after sunrise.

29.4% of the respondents use plucking sticks. These are meant to make an even plucking table as well as ensure that the plucking is not course hence leaving immature shoots for next round plucking. This was very evident from uneven tables noticed in most of the farms visited. Unavailability of these materials was cited as the cause of their non use.

Table 19: Frequency and percentages of equipments used or not used for plucking

Equipment	Used Frequency	Percentage (%)	Not used Frequency	Percentage (%)
Baskets	60	58.8	42	41.2
Wands/sticks	30	29.4	72	70.6
Caps	26	25.5	76	74.5
plastics Buckets	40	39.2	62	60.8
Sacks	44	43.1	58	56.9
Total	102	100	102	100

4.4.2.3 Leaf quality plucked

The KTDA recommended leaf quality is either two leaves and a bud or one leaf and a bud. Table 20 shows that the majority (50.9% and 19.6% respectively) practiced this. 13.7% pluck more than 2 leaves and a bud whereas 9.8% and 5.9% pluck banji leaves and loose leaves respectively.

KTDA's set standard of plucking is 75% and above of recommended quality. In this study, only 70.5% is achieved. This is likely to impact negatively by reducing tea prices as a result of low quality tea reaching the market. Fine plucking by smallholder farmers under KTDA give them a price competitive advantage compared to the estates sub-sector.

Table 20: Frequencies and percentages of leaf quality plucked

Leaf quality	Frequency	Percentage (%)
One leaf and bud	52	50.9
Two leaves and a bud	20	19.6
Above two leaves and bud	14	13.7
Banjhi leaves	10	9.8
Loose leaves	6	5.9
Total	102	100

Source: Survey data, 2008

4.4.2.4 Source of plucking information

According to this study, most of the farmers do not get their plucking information from recommended reliable sources i.e. TRFK and factory staff. In this study only 37.2% get their information from this source. The rest (62.8%) get information from either their own initiative (reasoning), multinational or use no recommended technologies at all. Technologies copied from multinationals have in most cases been found to be different from those recommended by KTDA e.g. they are allowed to pluck more than 3 leaves and a bud. This scenario would be as a result of most respondents being of low educational levels (Table 4.3.2), method of extension used (Table 4.5.2) or culture of the Abagusii people whose women (who this study shows are the majority pluckers – Table 4.5.5) are usually not allowed to attend most educational forum due to their many domestic roles.

Table 21: Source of plucking and pruning information by frequencies and percentages

Source of information	Frequency	Percentage (%)
Own initiative	25	24.5
TRFK	13	12.7
Factory staff	25	24.5
Multinational	19	18.6
No technology	20	19.6
Total	102	100

Source: Survey data, 2008

4.4.2.5 Who decides when to pluck?

The decision when to pluck is mainly made by the family members as opposed to workers. Of the family members wives take the lead in decision making. This is mainly because majority of the pluckers are women (KTDA, 2005). Generally the key members of the family unit (husband and wife) made the decisions on the farms. Unlike what used to be on tea previously, when females (wives) never made important decisions on tea production, the situation has changed. This study reveals that some decisions such as when to pluck and when to prune are mainly made by women. However men are the ones who mainly go for tea payments and yet most of the farm workers are women. Gender sensitivity is therefore high in smallholder tea unit and this should been encouraged.

Table 22: Frequencies and percentages of who decides when to pluck

Who decides	Frequency	Percentage (%)
Spouse(Wife)	39	38.23
Self (Husband)	15	14.71
Workers	25	24.51
Others e.g. Children/Household members/Both	23	21.57
Total	102	100

Source: Survey data, 2008

4.4.2.6 Production level per plucker per day

Majority (45.09%) pluck 11-20 kg/plucker/day. This is less compared to daily recommended rate of 30kg probably due to the fact that majority of the pluckers who are women have some other home core activities to do such as cooking for their husbands. A minority (8.82%) pluck less than 10 kg per day. Only 29.41 % pluck over 30 kg per day which is the minimum considered to earn a daily rate in most of the tea farms and estates (TRFK, 2005; KTDA, 2005). At the rate of paying 5/= per kg of green leaf plucked, then the majority will earn between 55/= to100/= per day whereas the daily rate ranges 75/= to 120/=.

Table 23: Production levels per plucker per day by frequencies and percentages

Amount (Kgs)	Frequency	Percentage (%)
Less 10	9	8.82
11-20	46	45.09
21-30	17	16.66
Above 30	30	29.41
Total	102	100

Source: Survey data, 2008

4.5 The extent of adoption of recommended pruning and plucking technologies according to Personal characteristics, Socio-cultural values and Institutional factors by smallholder tea farmers in Gucha District.

4.5.1 The influence of Personal characteristics on the extent of adoption of pruning and plucking technologies.

Presented and discussed in this section are the respondents' personal characteristics such as age, educational level, land size under tea, marital status, family size, major sources of income as well as whether they have other off-farm activities. The extent (percentages) how they affect the adoption of recommended plucking and pruning technologies are presented.

4.5.1.1 Adoption according to age of respondents

Those under 20 years adopt both plucking and pruning technologies 100% whereas those over 50yrs show very low adoption percentages. Generally this study showed that adoption levels decrease with increase in age. This shows young people are generally more responsive than old people to the technologies adoption.

Table 24: Frequencies and percentages of extent of adoption according to age of respondents.

Age (Years)	Frequency	Adopting Technologies. Frequency	plucking Percentage (%)	adopting technologies Frequency	pruning Percentage (%)
<20	1	1	100	1	100
20-30	7	6	85.7	5	74.1
31-40	39	30	76.9	26	66.7
41-50	31	10	32.3	12	38.7
>50	24	7	29.2	8	33.3

N=102

Source: Survey data, 2008

4.5.1.2 Education level of respondents

The adoption of recommended plucking and pruning technologies was generally low for those with no formal education. Those with primary level of education generally had the highest adoption compared to the rest. This would be due to the fact that they are likely to be residing at farm level compared to those with secondary and college education level that may not be at the farm fully to oversee the implementations.

Table 25: Frequencies and percentages of the extent of adoption according to educational level of respondents.

Education level	Frequency	Adopting technologies Frequency	plucking Percentage (%)	Adopting technologies Frequency	pruning Percentage (%)
College	2	1	50	1	50
Secondary	2	1	50	2	100
Primary	39	30	76.9	32	82.1
None	59	25	42.4	20	33.9

N= 102

Source: Survey data, 2008

4.5.1.3 Land size under tea

Generally those with more than 1 acre under tea were adopting technologies better than those with tea in less than one acre of land. This is probably due to the economies of scale involved where it has been demonstrated that it may not be economical when you have tea in less than one acre of land. So those with under 1 acre are not motivated to adopt the technologies due to low returns the may be realizing.

Table 26: Frequencies and percentages of the extent of adoption according to Land size under tea.

Land size (Acres)	Frequency	Adopting technologies Frequency	plucking Percentage (%)	Adopting technologies Frequency	pruning Percentage (%)
>1	4	4	100	3	75
0.76-1.0	5	3	60	4	80
0.50-0.75	30	18	60	16	53.3
0.25-0.49	58	35	60.3	30	51.7
<0.25	5	1	20.0	1	20.0

N= 102

Source: Survey data, 2008

4.5.1.4 Marital status of the respondents

The study showed that single people adopt technologies better than married people. This is probably due to the fact that once convinced, the single person adopts immediately unlike married where family conflicts are likely to lower adoption. Divorced people have low adoption probably due to the traumatized situation they would have undergone.

Table 27: Frequencies and percentages of the extent of adoption according to marital status of the respondents.

Marital status	Frequency	Adopting technologies Frequency	plucking Percentage (%)	Adopting technologies Frequency	pruning Percentage (%)
Married	99	90	90.9	88	88.9
Single	01	01	100	01	100
Divorced	02	01	50	01	50

N= 102

4.5.1.5 Family size

The adoption in families with higher number of family members is high probably as a result of enough labour available to implement the technologies. This is possible where family members

are staying and working in the farm. Tea is labour intensive and hence families with small size are not likely to adopt majority of the technologies especially where farms are big.

Table 28: Frequencies and percentages of the extent of adoption according to Family size of the respondent.

Family size	Frequency	Adopting technologies Frequency	plucking Percentage (%)	Adopting technologies Frequency	pruning Percentage (%)
>8	10	10	100	6	60
6-8	67	60	89.6	53	79.1
4-5	20	10	50	12	60.0
<4	05	02	40	01	20.0

N= 102

Source: Survey data, 2008

4.5.1.6 Gender of the respondents

The study revealed that females adapt to a large extent most of the technologies compared to males. This is possibly due to the fact that most of the technologies are implemented by females who are the majority of the farm workers.

Technologies concerning pruning seem to have the same extent of adoption by both male and female. Males are the ones who prune tea, but majority of the pluckers are females hence their high influence to affect or influence pruning technologies.

Table 29: Frequencies and percentages of adoption according to Gender of respondent.

Gender	Frequency	Adopting technologies Frequency	plucking Percentage (%)	Adopting technologies Frequency	pruning Percentage (%)
Male	76	9	11.8	40	52.6
Female	26	16	61.5	18	69.2

N= 102

Source: Survey data, 2008

4.5.1.7 Major source of income

Of the 35 respondents whose main source of income is tea 85.7% and 91.4% of them adopt plucking and pruning technologies respectively.

However majority of the respondent have other sources of income which are major to them, hence low adoption of the plucking and pruning technologies in this category of respondents.

Table 30: Frequencies and percentages of adoption according to major source of income of the respondents.

Source	Frequency	Adopting technologies Frequency	plucking Percentage (%)	Adopting technologies Frequency	pruning Percentage (%)
Tea	35	30	85.7	32	91.4
Other sources	67	20	29.9	30	44.8

N= 102

Source: Survey data, 2008

4.5.1.8 Other off-farm activities of the farmer

Majority of the respondents had only tea as a major activity and as a result of this they seem to be adopting the technologies to a large extent. Those with other jobs show a low percentage of them adopting the technologies since they seem not to be valuing their tea farming compared to the other jobs they do e.g. teaching, business etc.

Table 31: Frequencies and percentages of adoption according to major activities of the respondents.

Activities of the farmer	Frequency	Adopting technologies Frequency	plucking Percentage (%)	Adopting technologies Frequency	pruning Percentage (%)
Only tea	92	80	87	75	81.5
Other jobs	10	04	40	04	40.0

N= 102

Source: Survey data, 2008

4.5.2 The influence of socio-cultural values on the extent of adoption of pruning and plucking technologies.

In this section issues concerning traditional ceremonies such as circumcision and burial events as well as resting days are discussed. This is by relating what percentage is affected and how they are affected in the adoption of the pruning and plucking technologies.

4.5.2.1 Traditional ceremonies

62 of the respondents indicated that burial rites affect their adoption of tea plucking and pruning technologies with a higher percentage of the effect (72.6%) affecting plucking technologies compared to a lower percentage (32.3%) effect on pruning technologies. This is possible since most of the burials take place in weekdays and the tradition allows for rest days whenever a family or neighbour is bereaved. 40 of the respondents are affected by circumcision rites and this affects mainly plucking (75%). In this community circumcision is done in December for both girls and boys and this is considered a major ceremony. Pruning is mainly done in March /April and July / August, hence low effect on technology by this ceremony (12.5%)

Table 32: Frequencies and percentages of adoption according to influence of traditional ceremonies.

Traditional Ceremonies	Frequency affected	Frequency affecting plucking	% affecting plucking	Frequency affecting pruning	% affecting pruning
Burial rites	62	45	72.6	20	32.3
Circumcisions	40	30	75.0	05	12.5

N= 102

Source: Survey data, 2008

4.5.2.2 Religion/resting day.

The study revealed that plucking technologies are barely affected by rest days where as pruning technologies are highly affected. This would be due to the fact that plucking is not done on those two rest days whereas farmers would prune in any of these days.

Table 33: Frequencies and percentages of adoption according to day of resting.

Resting day	Frequency affected	Frequency affecting plucking	% affecting plucking	Frequency affecting pruning	% affecting pruning
Sunday	56	10	17.9	30	53.6
Saturday	46	08	17.4	34	73.9
N= 102					

Source: Survey data, 2008

4.5.3 The influence of institutional factors on the extent of adoption of pruning and plucking technologies.

Presented under this section are findings from the frequency of extension visits, availability of tools and equipments required for proper adoption of the plucking and pruning, availability and usage of credit facilities, efficiency in payment of growers, distance from the farms to the factory as well as distance from the farms to the leaf collection centres.

4.5.3.1 Frequency of extension visits

The study revealed that the more the farmers are visited the more they adopt the technologies. The study showed that those visited more than twice in a year, 83.3% of them had adopted plucking technologies whereas 100% had adopted pruning technologies.

Table 34: Frequencies and percentages of adoption according to the number of extension visits.

Number of visits	Frequency affected	Frequency adopting plucking	% adopting plucking	Frequency adopting pruning	% adopting pruning
Once a year	59	20	40	20	40
Twice a year	31	15	48.4	18	58.1
>twice a year	12	10	83.3	12	100
N= 102					

Source: Survey data, 2008

4.5.3.2 Availability of plucking and pruning tools

Some of the technologies in plucking and pruning require availability of appropriate tools and equipments. Where these tools are readily available and acceptable, the adoption is high. However this would also be affected by the ability of the farmers to afford these tools e.g pruning machines. This would be the reason why even though 23 of the respondents accept that the tools are readily available, only 87% and 78.3% of them adopt plucking and pruning technologies respectively.

Table 35: Frequencies and percentages of adoption according to availability of necessary tools and equipments.

Tools availability	Frequency	Adopting technologies Frequency	plucking Percentage (%)	Adopting technologies Frequency	pruning Percentage (%)
Readily available	23	20	87	18	78.3
Not readily available	79	15	19	18	22.8

N= 102

Source: Survey data, 2008

4.5.3.3 Availability of credit facilities

Of the 60 respondents who have access to Sacco loans, 83.3% and 70% of them are adopting recommended plucking and pruning technologies. This would be possibly due to the fact that they are motivated to get high yields to assist them paying the loans. They may also be using the loans in buying the tools and equipments needed and also to finance the operations.

Table 36: Frequencies and percentages of adoption according to availability and usage of credits.

Availability of credit facilities	Frequency	Adopting technologies Frequency	plucking Percentage (%)	Adopting technologies Frequency	pruning Percentage (%)
Readily available	60	50	83.3	42	70
Not readily available	42	20	47.6	24	57.1

N= 102

Source: Survey data, 2008

4.5.3.4 Efficiency in payment period

From this study, it was revealed that timely payment to growers can be a motivator to adoption of both plucking and pruning technologies. This is probably due to the fact that proceeds realized are used in acquisition of tools and equipments used. Proceeds are also used to implement recommended strategies e.g. adhering to 7-9 days plucking rounds.

Table 37: Frequencies and percentages of adoption according to efficiency in payments

Payment Efficiency	Frequency	Adopting technologies Frequency	plucking Percentage (%)	Adopting technologies Frequency	pruning Percentage (%)
Timely	90	80	88.9	70	77.8
Not timely	12	2	16.7	3	25.0

N= 102

Source: Survey data, 2008

4.5.3.5 Distance to the factory

The study revealed that those respondents closer to the factory adopt the plucking and pruning technologies more than those from far. This would probably be due to them being closer to source of constant information transfer and learning from source e.g. factory tea farm.

Table 38: Frequencies and percentages of adoption according to the distance from the factory.

Distance (Km)	Frequency	Adopting technologies Frequency	plucking Percentage (%)	Adopting technologies Frequency	pruning Percentage (%)
<5	29	20	69	18	62.1
5-10	17	08	47.1	15	88.2
11-15	12	05	41.1	05	41.7
16-20	14	05	28.6	06	42.9
>20	30	08	26.7	15	50

Source: Survey data, 2008

4.5.3.6 Distance to the buying centre

These closer to the leaf collection (buying) centre (<5km) had a higher percentage of them adopting the technologies than those from far (6-10km). This would be so because probably they get better services when they are closer to the centers such as having enough time to pluck their tea farms hence proper management leading to adoption of pruning technologies such as 3-4 years pruning cycle. Those from far get disadvantaged as they have to leave their farms earlier hence their tea gets mismanaged.

Table 39: Frequencies and percentages of adoption according to distance from the buying centre.

Distance (Km)	Frequency	Adopting technologies Frequency	plucking Percentage (%)	Adopting technologies Frequency	pruning Percentage (%)
<5	98	70	71.4	65	66.3
6-10	04	01	25.0	01	25.0

N= 102

Source: Survey data, 2008

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

This chapter summarises the key findings of the study in line with the objectives of this study. It outlines what was achieved and how it relates to the known previous research. Based on what was achieved from the study, conclusions have been drawn and recommendations on how the findings can be applied have been forwarded for implementation to various stakeholders.

5.2 Summary

From the various literature used in this study, it was evident that the adoption of various tea production technologies was low in Gucha district. This has lead to low production of tea in this area compared to other tea producing Districts. Most of the farmers in Gucha District produce less than 1 Kgs green leaf /bush/year compared to the national average of 1.25 kg green leaf/bush/year and the average research achievement of 3.6 kg green leaf/bush/year.

Studies in other factors affecting tea production such as fertilizer usage have been done by TRFK and recommendations forwarded for use by the farmers. The smallholder farmers produce much below the production levels realized by the estates even though the various production technologies are developed from one source (TRFK) and hence available to all. This study only sought at determining the current adoption of pruning and plucking technologies and the extent to which selected personal characteristics, socio-cultural values as well as institutional factors influence the extent of their adoption.

The study used descriptive statistics to analyse the data collected from sampled smallholder tea farmers concerning the influence of selected factors in the extent to which they influence adoption of tea pruning and plucking technologies (Objectives 2, 3 and 4). The study also analyzed the data and presented results to show the current adoption of tea pruning and plucking technologies in Gucha District (Objective 1)

Many factors could contribute to the low green leaf production in the smallholder sub sector of the Kenya tea industry. Some of the factors could be due to low adoption of the various technologies for various reasons such as personal, cultural and institutional factors. Labour

constraints or availability was one of the reasons impeding tea production in the smallholder sub sector of the Kenya tea industry (M'Imwere, Z., 1997). Possibly, this problem has persisted. Additionally, the prices of Kenya tea have stagnated or have been declining in the last decade and this could be making farmers to direct attention to alternative competing farm enterprises. Although the above technical packages have been produced and made available to the growers, it is not known if they reach the targeted users. People in smallholder farms include the smallholders, smallholders' family, and hired worker. It is important to know who in the smallholder tea sub sector receives the technical information or training and how often each smallholder actually receives technical advice and if he uses it. Other factors that may be contributing to low yields are discussed in objective two, three and four of this study. It is also important to note that most farmers pluck extra fine teas (one leaf and a bud) as opposed to the recommended two leaves and a bud. Despite the fact that this will give superior teas in the market, it is not likely that it will give superior returns and hence farmers' productivity is affected by this over demanded plucking standards.

Studies show that immediate and uniform adoptions of innovations in agriculture are quite rare (Mwaura , Nyabundi and Muku, 2005). Some innovations have been well received while other improvements have been adopted by only a very small group of farms. Improved productivity in the agricultural sector is more difficult when one is dealing with traditional oriented smallholders (Kamau, D. K., 2008). However, farmers recognizing that their traditional farming techniques and present level of knowledge impose a limitation on farm enterprise seem to be on the road to success (Mwaura , Nyabundi and Muku, 2005). In the long run, farmers can improve productivity through adopting and using more efficient husbandry technologies which are made available through development of sufficient technological and organizational innovativeness. Increased agricultural productivity will only come about through revolution in the pattern and methods of production on the individual farm units. However, a closer look at the transfer and/or adoption of technological advancement and improved farming practices show that it is the Kenyan large-scale tea farmers/estates that have benefited from the use of these technologies (Othieno, 1981; Othieno, 1992; Othieno, 1994). The small-scale farmers who account for the bulk of tea producers have lagged behind in adoption of improved practices.

5.3 Conclusions

The study revealed that there is very low tea production per bush among smallholder farmers in Gucha District. Most of the farmers harvested 0.91-1.00 Kgs of tea /bush; however the least tea production per bush was 0.31-0.40 Kgs. This study has revealed that most of the technologies that are likely to increase production per bush such as frequency of plucking as well as season and frequency of pruning are not adequately adopted hence reduced yields and compromised health of the tea bush. There was also evidence that most farmers prune after two year as opposed to recommended 3-4 years cycle. This was possibly due to the long plucking interval of 14 days as opposed to the recommended 7-9 days; hence losing tea yields. This calls for coordinated trainings and extension methodology.

The study revealed that the adoption of various pruning and plucking technologies is quite low; being influenced differently by selected factors analyzed in this study. It was evident that many farmers get information on plucking technologies on their own initiative, barely follow recommended plucking standards, pluck twice a month, do not use plucking caps as well as plucking sticks during tea plucking , prune within a period of two years and pruning is done any time of the year. However minority of the farmers get information on plucking through TRFK, do not follow recommended plucking standards, pluck tea four times a month, use plucking caps during tea plucking, pluck pieces and bruished leaves, prune tea after a period of five years and pruning is done within July and August.

The results contrasts with the recommended plucking standard in KTDA which is two leaves and a bud, resulting in high quality tea, while some estates harvest more than two leaves and a bud, reflecting more production but lower quality of made tea. As a result, the smallholder teas fetch high prices in the auction markets than the estates teas. It is therefore expected that farmers would be guided by the price factor in the output markets to make quality decisions in the allocation of strategic inputs, within the context of their variable factor price regimes and quantities of fixed factors. Hence, they would be price-efficient in their operations. The extent of price-efficiency, which is a component of economic efficiency, among the small-scale tea farmers needed to be determined. It was hypothesized that the extent of rationality in allocation of resources in the tea enterprise is relatively low. Hence, the smallholder tea productivity has

remained relatively lower than in the estate sub sector, high yielding clones and useful agronomic recommendations extended in the smallholder sub sector notwithstanding (Owuor, 2005).

Many of the farmers in Gucha were males, within the age bracket of 31-40 years, self employed, married , lacked formal education, rest on Saturdays, originate from a distance of over 21 Kilometres from the factory, less than 5 Kilometres from the buying centre and hire females to pluck tea whereas low number of the farmers were females, less than 20 years of age , have relatives or workers who stay with them in their farms, single or divorced , have secondary or college education , rest on Sunday, originate within a distance over 21 Kilometres from the factory, less than 5 Kilometres from the buying centre and hired males to pluck tea .

The study revealed that most of the smallholder tea farms are managed by owners or members of the family. This was the hope when the smallholder tea sub sector was being established. Generally, the key members of the family unit (husband and wife) made the decisions on the farms. Unlike what used to be on tea previously, when females (wives) never made important decisions on tea production, the situation has changed. This study revealed that some decisions such as when to pluck and when to prune are mainly made by women. However men are the ones who mainly go for tea payments and yet most of the farm workers are women. Gender sensitivity in division of work is therefore high in smallholder tea unit and this should been encouraged. Large percentage of the family members lived permanently on the farms and thus derived their livelihood from the tea enterprise.

Most smallholders were relatively old and were unwilling to subdivide the tea holdings to their children, despite the children doing most of the work on the farms. This creates less incentive for the youngsters to work on tea farms since their work is paid in kind not by cash and may lower tea production.

The study revealed that the main forum of technology dissemination is through barazas and yet this is not very reliable since barazas are attended by even non tea farmers. It was observed that there was higher productivity per bush where farmers had smaller pieces of total land areas possibly due to absence of competing farm enterprises, as the available land was too small to

support other farm activities and hence forcing the smallholders in these areas to concentrate on tea production.

Tea production is higher where farmers had longer plucking duration per day as transport schedules are optimized. It was noted that in some leaf collection centres, the leaf collection lorry collected leaf only once in a day from most buying centres, and in some buying centres this was done as early as 11 am.

The irregular leaf collection programme was mainly due the poor state of the roads. Due to the fact that the tea farmers are now paying substantial amount of money through road cess to ensure the roads are in a fair state, accountability should be enhanced so that the money collected is used for the intended purposes effectively. Again as tea is a major contributor to the Kenya economy, the government needs to inject further money to maintain tea roads. Tea roads must be in fair conditions to improve smallholder tea production/productivity.

The following conclusions/findings were made from this study:

1. The adoption of most of the tea pruning and plucking technologies in smallholder tea farmers in Gucha District was quite low. This has possibly resulted to low tea production per bush in this area (less than 1.00kg/ bush/year).
2. The selected personal characteristics were found to be influencing the extent of adoption of pruning and plucking technologies in different ways. Young people (below 20 years), educated farmers (primary and above), farmers with over 0.76 acres of land, married or single farmers, those with over 4 family members staying and working in the farm, those with tea as major source of income and those with tea as only source of income showed high adoption of the two technologies. Males were the ones who mainly go for tea payments and are the owners of land, hence reduced morale of women who are the main workers in most operations in tea farms.
3. Socio-cultural values such as burial rites, circumcision rites and rest days affect the two technologies differently. Burial rites and circumcision rites tend to affect adoption of plucking technologies more than they do to pruning technologies. The days of rest were found to be mainly affecting pruning.

4. Various institutional factors were found to be contributing to low adoption of recommended tea pruning and plucking technologies. This includes low frequency of extension visits, delayed provision of inputs and other services, non-readily available required tools and equipments, long distances to the factory and to the buying centre as well as poor state of the roads. Farmers mainly got information on plucking and pruning technologies either on their own initiative or don't get the technology at all; hence end up using technology whose source is not proven. Timely payments and availability of credit facilities to farmers were found to be contributing to high adoption.

5.4 Recommendations.

5.4.1 Specific Recommendations.

There is need to address the various personal, socio-cultural values and institutional factors that were seen to be having various extents in the low adoption of plucking and pruning technologies. Based on objectives two, three and four, the following recommendation are hereby forwarded from this study for implementation by various concern stakeholders.

1. The majority of the smallholders had low level of formal education. Passing technical information through bulletins is unlikely to help technology diffusion in the smallholder tea sub sector. It is recommended that service providers disseminate technologies to the smallholder farmers through on-farm courses or methods such as farmers field schools based on practical demonstrations in which the farmers have contact with the trainers. The trainings should be designed to reach the women who are majority farm workers. The government through educational and training institution to incorporate tea related courses at both lower, tertiary and higher learning levels to yield desired results. Low adoption situation is therefore likely to change with time as younger and educated farmers gradually replace the old farmers.
2. KTDA management should draw leaf collection schedules in a manner that ensures farmers pluck for longer durations. This should not be delegated to drivers or clerks. This increased plucking time will compensate for time wasted during socio-cultural interferences such as circumcision and burial rites.
3. Tea cess funds to be used more efficiently to make roads all weather in order to enable leaf collection at all times and possibly in runs. Consultation between all stakeholders

involved in road works e.g. CDF should be done to avoid duplications in one road due to personal interests. Maintenance of roads is very critical taking into considerations that 29.41% of the respondents in this study came from over 20 km away from the factory.

4. Service providers such as KTDA, TRFK and input suppliers should mount regular intensive trainings (both formal and informal) for both farmers and extension staff in order to improve on recommendations concerning plucking rounds, leaf quality, plucking rate, educate on recommended pruning aspects such as pruning period, pruning methods, pruning tools as well as frequency of pruning. Farmers should also be trained on proper storage of inputs such as fertilizers so that when supply is delayed due to other logistics, they are able to store them properly until that appropriate time to apply them in the farms.
5. There is need for the farmers to be regularly sensitized to improve on quality of leaf plucked which if properly processed will result in high quality made tea and hence improve market demand and prices. This can be done through frequent communication of market performance and demands to the farmers though appropriate forums or forms such as local (vernacular) air media and summarized market reports by concern factories.

5.4.2 Recommendations for further studies.

Most smallholders were relatively old and were unwilling to subdivide the tea holdings to their children, despite the children doing most of the work on the farms. This creates fewer incentives for the youngsters to work on tea farms since their work is paid in kind and not by cash and this lowers tea production. A detailed study should be done to come out with clear policy on how to deal with this problem.

It was observed that there was higher productivity per bush where farmers had smaller pieces of total land area possibly due to absence of competing farm enterprises, as the available land was too small to support other farm activities and hence forcing the smallholders in these areas to concentrate on tea production. Where the tea holdings were too large, labour to maintain tea seemed inadequate and farmers possibly were unable to pluck the entire crop or to manage the farms effectively. It is recommended that the effect of labour availability in tea production be confirmed in a separate detailed study.

REFERENCES

Adams, M.E. (1984). *Agricultural Extension in Developing Countries.* Intermediate tropical Agricultural series. Longman ,Harlow Essex, England.

Anon. (1998). *National Development Plans 1997-2001.* Government Press, Nairobi, Kenya.

Anon. (2002). *National Development Plans 2001-2005.* Government Press, Nairobi, Kenya.

Anon. (2003/2004). Nyamache Tea Factory Annual Report, Kisii, Kenya.

Anon. (2003/2004). Ogembo Tea Factory Annual Report, Kisii, Kenya.

Anon.(2004). Kenya Tea Development Agency Limited statistics pamphlet 2004.Nairobi, Kenya

Anon. (2004/2005). Nyamache Tea Factory Annual Report, Kisii, Kenya.

Anon. (2004/2005). Ogembo Tea Factory Annual Report, Kisii, Kenya.

Anon. (2005/2006). Nyamache Tea Factory Annual Report, Kisii, Kenya.

Anon. (2005/2006). Ogembo Tea Factory Annual Report, Kisii, Kenya.

Anon. (2005). Tea Board of Kenya Statistics in 2005. Nairobi, Kenya.

Bore J. K., Itulya, F. M.& Ngetich, W. K: (2002). Effects and Time of Pruning and Lungs on non-structural carbohydrates of tea (camellia sinensis L.): *Tea journal* 23(1), 12-21. TRFK, Kericho, Kenya.

Bore, J. K., Itulya, F. M. & Ngetich, W. K. (2003). Effects of pruning time and resting period on total non-structural carbohydrates, re-growth and yield of tea (camellia sinensis L.): *Journal of Horticultural Science and Biotechnology* 78, 272-277. T RFK, Kericho, Kenya.

Bore, J. K., (2003). Effects of pruning machine on recovery and yield of tea; *Tea Journal 24(2) 69-73,* T RFK, Kericho, Kenya.

Borg, W. R. & Gall, M. D. (2003). *Education Research: An introduction (6^{th} Edition).* Longman, Inc., White plains.

Bulow D. Von & Sorensen A. (1988). *"GENDER Dynamics in contract farming:* women's role in smallholder tea production in Kericho district, Kenya", CDR Project Paper 88.1. Centre for development Research, Copenhagen, Denmark.

Bulow D. von & Sorensen A. (1990). *"Gender and Contract farming in Kericho, Kenya",* CDR Project Paper 90.4. Centre for Development Research, Copenhagen, Denmark.

Cheruiyot, R. D. (1995): Managing Small holder sector in Kenya. Proceedings of the East African Tea Trade Association International Tea Seminar, White Sands Hotel, 26th Oct 1995, 72-80. Mombasa, Kenya.

Chitere, P. A. & Van Doorne, J. H. (1985). *Extension Education and farmers performance in improved crop farming in Kakamega District.* Agricultural administration Vol. 18 (2). Elsevier Applied Sciences Publishers, England

Chiyemba, M. J. (1997): *Enhancing household food security by strengthening the Agricultural Extension System to reach more rural Women:* The Zimbabwean experience. African Crop Science Conference Proceedings, Pretoria, South Africa.

Crowder, L. V. (1996). *Enrolment of Women in agricultural studies at intermediate and higher levels of education.* FAO, Rome, Italy.

Ellis, R. T. & Grice, W. T.(1998). Plucking policy and techniques. TRFCA Quarterly Newsletter 41.

Food and Agricultural Organization (2003). Labour constraints and the impact of HIV/AIDS on rural livelihoods in Bondo and Busia Districts, IFAD, Western Kenya.

Food and Agricultural Organization (2003). Labour saving technologies and practices for farming and household activities for Eastern and Southern Africa: Bondo and Busia, IFAD, western Kenya.

Fraenkel, J. R. & Wallen, N. E., (2000). *How to Design and Evaluate Research in education.* McGraw Hill Publishing Co. New York.

Indo-Asian News Service (2006).Tea pickers rely on almighty rather than technology (FEATURE). Retrieved on 22/07/2007.

International Tea Committee, (2006). International Tea Committee Bulletin of Statistics 2006, Aitken Spence Printing (Pvt) Ltd, Colombo, Sri Lanka.

Kamau, D. M. (2008). Productivity and Resource use in Aging Tea Plantations. PhD thesis Wageningen University, Netherlands.

Kathuri, N. J. & Pals D. A., (1993). *Introduction to Educational research.* Educational Materials Centre, Egerton University, Njoro, Kenya.

Kenya Tea Development Agency Ltd (2003). Annual Report, Nairobi, Kenya.

Kenya Tea Development Agency Ltd (2004). Annual Report, Nairobi, Kenya.

Kenya Tea Development Agency Ltd (2005). Annual Report, Nairobi, Kenya.

Kenya Tea Development Agency Ltd (2006). Annual Report, Nairobi, Kenya.

Kenya Tea Development Agency Ltd (2003). 2nd Quarterly Report. Nairobi, Kenya.

Kenya Tea Development Agency Ltd (2002). May 2002 Chai Newsletters. Nairobi, Kenya.

Kenya Tea Development Agency Ltd (2004). October 2002 Chai Newsletters. Nairobi, Kenya.

Krinstjanson, P., PlaceF, Franzel, S. & Thornton, P. K. (2002). *Assessing research impacts on poverty:* The importance of farmers' perspectives. - Agricultural systems.

Lamb, G. & Muller, L. (1982). Control, Accountability and Incentives in a successful development institution. World Bank staff working paper number 550.

Leung, W. C. (2001). *How to conduct a survey. University of East Anglia.* Available online at http.www.studentbjm.com/back issues/0501/education.Html

M'Imwere, Z., (1997). Tea production in smallholder sector of Kenya- Achievements, problems and prospects. Nairobi, Kenya.

Mugenda,O. & Mugenda, A. G. (2003). *Research Methods: Quantitative and qualitative Approach.* African Centre for Technology Studies, Nairobi, Kenya.

Mwaura, F., Nyabundi, K. & muku, O. (2005). Situation analysis of the small-scale Tea Growers and their contribution at the local auction market in Kenya: Tea journal 26(2) pp 35-45, TRFK, Kericho, Kenya.

Ndiema, A. C. (2002*): Factors affecting the adoption of wheat production technologies by farmers in Njoro and Rongai division of Nakuru District, Kenya.* Unpublished M.Sc. Thesis, Egerton University, Njoro, Kenya.

Nyoro, J. K. (2002). *Agriculture and rural growth in Kenya,* Tegemeo Institute, Egerton University, Njoro, Kenya.

O'Connor, T., (2002). *Research Methods.* Retrieved from http://www.faculty.ncwc.educ/toconnor/308/308lect0.7htm

Ogolla, S. O. & Kibiku, P. N (May 2004): TBK Small Holder Tea Growing Enterprise, Productivity and Profitability Survey Report, TBK, Nairobi, Kenya.

Othieno, C. O., (1981). Effect of pruning removal on nutrient uptake and yield of tea. *Tea Journal No. 2,* TRFK, Kericho,Kenya.

Othieno, C. O (1992). Tea: Cultivation to consumption, *Tea Journal,* TRFK, Kericho, Kenya.

Othieno, C. O (1994). Agronomic practices for higher tea productivity in Kenya. *Proceedings of the International Seminar on Integrated Management in Tea: Towards higher productivity.* Colombo, Sri Lanka, 26-27th April, 1994 pp79-85.

Owuor, P. O., Kavoi M. M. & Siele, D. K. (2001). Socio-economic analysis of chemical inputs in smallholders tea sub-sector in Kenya: A quantitative study on Extension services Knowledge and farm adoption levels. *Tea Journal 22(2), 94-102,* TRFK, Kericho, Kenya.

Owuor, P. O., Kavoi M. M. & Siele, D. K. (2001). Policy factors influencing smallholder tea production in Kenya: I. socio-economic analysis of Extension staff. *Tea Journal 22 (2), 110-116,* TRFK, Kericho, Kenya.

Owuor, P. O., Kavoi M. M. & Siele, D. K. (2001). Policy factors influencing smallholders' tea production in Kenya: II. A socio-economic analysis of smallholder farmers. *Tea Journal 22(2), 117-124,* TRFK, Kericho, Kenya.

Pachico, D. (1980). Applying efficiency analysis to small farms in low income Countries: Some theoretical and empirical considerations. New York State College of Agriculture Life Science.

Reinjtes et al (1995). *Farming for the future: An introduction to low low-external-input and sustainable agriculture:* Macmillan ILEA, lensden, Netherlands.

Republic of Kenya (2002), *National Development Plan of 2002-2008*, Government printers, Nairobi, Kenya.

Republic of Kenya (2003). The Economic Rcovery Strategy for Wealth and Employment Creation of 2003-2007. Government printers, Nairobi, Kenya.

Republic of Kenya (2004). Economic Survey 2004. Ministry of Planning and National Development, Government printers, Nairobi, Kenya.

Republic of Kenya (2004). *Strategies for Revitalizing Agriculture 2004 – 2014.* Ministry of Agriculture, Nairobi, Kenya.

Republic of Kenya (2007), Kenya Vision (2030): *A globally Competitive and Prosperous Kenya.* Government printers, Nairobi, Kenya.

Rogers, M. E. (1995). *Diffusion of innovation (4th Edition).* The free press. New York.

Saito, K. A. & Spurling, D. (1992). *Developing Agricultural extension for women farmers.* World Bank Discussion paper No. 156. Washington DC USA: The World Bank.

Sivaram, (2001). Productivity improvement and labour relations in the Tea industry in south Asia, ILO, south Asia.

Squire, P. J. (2002). *Strategies for enhancing women's full participation in suitable agricultural development and environmental preservation in Sub Saharan, Africa*, AIAEE (2002). Proceedings of the 18th Annual conference. Durban, South Africa.

Surry, D. W. (1997). *Diffusion Theory and instructional Technology.* Retrieved from World Wide Web. http://www.gsu.edu/-www:tr/diffussion/index.html

Tea Board of Kenya (2003, 2004, 2005 and 2006). *Annual Reports.* Nairobi, Kenya.

Tea Board of Kenya, (2007). Fact sheet on Kenya tea. TBK statistics, Nairobi, Kenya.

Tea Research Foundation of Kenya (2002). *Annual Technical Report*. TRFK, Kericho, Kenya.

Tea Research Foundation of Kenya (2003). *Annual Technical Report*. TRFK, Kericho, Kenya.

Tea Research Foundation of Kenya (2004). *Annual Technical Report*. TRFK, Kericho, Kenya.

Tea Research Foundation of Kenya (2005). *Annual Technical Report*. TRFK, Kericho, Kenya.

Tea Research Foundation of Kenya, *Tea Journals Volume 21, Number 1 (July 2001), Vol 23 No._1 (July 2002); Vol. 24 No. 2, December 2003; vol. 26 No1, July 2005).*

Tea Research Foundation of Kenya (2002), *Tea Growers Handbook 5th Edition.* Times Printing Services Ltd., Nairobi, Kenya.

Tea Research Foundation of Kenya, (2006). Strategic Plan 2005-2010, TRFK, Kericho, Kenya

Wachira, F. N. & Ronno, W. (2005). Tea research along value chains: Constraints and potential areas of inter-institutional Collaboration. *Tea Journal No.26 (1), 19-31,* TRFK, Kericho, Kenya

APPENDICES

APPENDIX 1: INTERVIEW SCHEDULE FOR SAMPLED FARMERS

Influence of selected factors on the extent of adoption of recommended tea pruning and plucking technologies in smallholder tea sub-sector of Gucha District, Kenya

Interview No..... **Date**.....

You have been selected among the smallholder tea growers of Gucha District to assist in provision of information leading to finding solutions for the above referred survey. Any information you provide as regards to this will be treated with total confidentiality it deserves. Kindly provide the response freely as directed in each item.

SECTION A: Farmer's Personal Characteristics

Name of Factory .....

Gender of grower. Male ☐ 1

Female ☐ 2

Age of Grower. Below 20 years ☐ 1 20-30 ☐ 2 31-40 ☐

41-50 ☐ 4 above 50 ☐

Marital status	Respondent	Reg. Farmer
Married	☐ 1	☐
Single	☐ 2	☐
Divorced	☐ 3	☐
Separated	☐	4 ☐
Widowed	☐	☐

What is your educational level

None	primary	secondary	College	University and above

6) i) what size of your family stay in the farm

Members	**Number**
Spouses	
Children	
Relatives	
Others (Specify)	
TOTAL	

Which day of the week do you rest?

Saturday ☐ Sunday ☐ Friday ☐ Others (Specify) ☐

Distance In Kilometres of your farm from:

The factory	
The Buying centre	

SECTION B: Tea Farming basic information

7) Years in tea farming

1-5 years	6-10 years	11-15 years	More than 15 years

8) Tea Production (green leaf)

Year	Kg Green leaf	No. of Tea bushes	Kg/Bush
2007/08			

9) Other farm enterprise as compared with tea for farmer's livelihood

Enterprise	Area (acres)	Rank (As source of income)
1. Tea		

SECTION C: Socio- economic and Cultural factors

10) Other off farm activities of the farmer (registered farmer)

Formal employment 1 ☐

Own Business 2 ☐

Informal/casual employment 3 ☐

None 4 ☐

Specify .....

11) Who owns the land where tea is planted?

i. Husband ☐ 1 ii. Wife ☐ 2 iii. Leased ☐

iv. parents ☐ 4 v. Brother/ sister ☐ vi. Others ☐

12) Who plucks your tea in most cases?

Husband alone ☐

Husband and Wife alone. ☐

husband, Wife and children (family members) ☐ 3

Hired labour. ☐

Others (Specify) ☐

13) Gender of most of your hired pluckers Male ☐ Female ☐

14) Who makes decisions on tea Plucking and pruning

	Plucking	Pruning
Wife	☐ 1	☐
Husband	☐ 2	☐
Workers	☐ 3	☐
Children/household members.	☐ 4	☐ 4

15) Who goes for tea payments in most cases?

Husband ☐ 1

Wife ☐ 2

Others (specify). ☐ 3

16) Where does the registered owner of the tea live?

In the farm ☐

Outside the farm but within factory catchment ☐

Outside factory catchment ☐

17) How are the various clones planted in the farm?

Pure stand ☐ 1

Mixed stand ☐ 2 iii. Others (Specify) ☐

18) How do you mainly apply your fertilizers?

Single dose ☐ 1 ii. Split dose ☐

19) Is plucking labour readily available?

Yes ☐ 1 ii. No ☐ 2 iii. Sometimes ☐

Explain.....

20) i) Are your pluckers aware of plucking standard and requirements?

i.Yes ☐ 1 ii. No ☐

ii) Do you belief there is new information you can learn on plucking? Yes ☐ 1 No ☐ 2

21) How do pluckers get the required standards/technologies?

Own initiative from others/seminars/field-days etc ☐

TRFK ☐ 2

Factory staff ☐ 3

Multinational/estates ☐ 4

No technologies ☐ 5

22) How many plucking rounds do you do per month?

i.One ☐ ii. Two ☐ 2 iii.Three ☐ iv.Four ☐

23) What alerts you when to pluck your tea

	☐ 1
Availability of labour	
Two leaves and a bud above plucking table	☐ 2
Number of days	☐ 3
Zoning by the factory	☐ 4
Other factors (specify)	☐ 5

24) i) What equipment/containers do you use in plucking?

	Uses	**Never uses**
Plucking baskets		
Plucking wands/stick		
Plucking cap		
Buckets/Plastics		
Sacks		

ii) Are the equipment readily available in the catchment Yes ☐ 1

No ☐ 2

iii) Are they readily acceptable for use Yes ☐ 1 No ☐ 2

If No, Why.....

25) What leaf quality do you pluck and deliver

(To be observed at time of visit)

Type	**percentage**
1 leaf and a bud	_____
2 leaves and a bud	_____
Above 2 leaves and a bud	_____
Banjhi leaves	_____
Pieces and bruished leaves	_____

26) Why do you pluck the leaf mentioned/seen in 36 above?

.....

.....

.....

27) How many kgs can an average plucker pluck per day?

Less 10kgs ☐ 1 10-20kgs ☐ 2 20-30kgs ☐ Above 30kgs . ☐

28) How do you pay pluckers?

Per kg plucked .....How much.....

Per day worked .....How much.....

Monthly rate .... How much .....

Family/relatives/self and no payments.

29) Is your farm paddocked for easy of planning

(To be observed)

Yes ☐ 1 No. ☐ 2

30) a) How often do you prune your tea .

2 years _____

3 years _____

After 3-4 years _____

After 5 years _____

Others _____(specify)_____

b) When do you prune your tea and why this period?

March/april_____why_____

July/august _____ why _____

Iii Any time .....why.....

31) What mainly determines when to prune your tea? Rank the following:

	Rank
Number of years (Age)	
Height of tea	
Reduced productivity	
Diseases and pests.	
Others (Specify).....	

32) Who does pruning for you?

Hired

Self and spouse

Self, spouse and household members

Others (specify) .....

33) Do you have shortage of qualified pruning people

Yes

No

34) How are pruners paid and how much

Type	**Rate**
Per day	.....
Per bush	.....
Per unit area (e.g.ha.)	.....

35) What determines rate of payment to pruners (Choose the most determinant).

Age of Tea

Explain .....

Management of tea

Explain .....

Pruners experience

If prunners are trained.

How much cleaning of the bush is required

The is a set standard rate

36) What cutting tool do you use to prune your tea?

Standard Pruning knife

Panga

Pruning machine

Panga and pruning knife

Modified panga

Local made pruning knife

Others (Specify)

37) What protective clothing do you use or provide to the pruner when pruning tea?

Leggers/boots.	Yes	No
Helments.	Yes	No
Ear Masks.	Yes	No
Hand gloves.	Yes	No

Others (Specify)

38) What method/type of pruning do you use in your mature tea?

Complete cut-across

Lung pruning

Both cut across and lung pruning

39) Why do you use the above method?

.....

.....

.....

.....

40) If lung-pruning, at what stage do you remove the lungs

When shooting/bud-breaking starts in the pruned branches

When tipping-in starts in the pruned branches.

After one year

Not aware

41) Where do you place your cut prunes after pruning?

On top of cut branches/bush

On the ground

Both (i) and (ii) above at pruning time

Not aware.

42) If prunes are left on top of pruned tea bush, at what stage do you remove them?

When buds breaking starts

When tipping is due

Not aware.

43) a)Have you ever practiced skiffing?

Yes

No

b) If yes how often do you do it?

3-6 months

6-12 months

After every one year

Others (specify)

c) Why do you practice skiffing?

Lack of labour

Due to Mixed clones.

Lack of pruning people

to remove diseases and pests

Others (Specify).

44) a) Do you clean your tea bush during pruning?

Yes

No

b) If yes, why do you do it?

.....

.....

.....

.....

c) If no, why?

.....

.....

.....

.....

45) a) What do you use the prunes for?

Cover the cut bush, later placed in-situ in the farm

Sometimes used as firewood

Others (specify) .....

46) How do you determine when your tea is ready for tipping–in?

.....

.....

.....

.....

47) a) Do you intercrop your tea with other crops after pruning (To be observed)

Yes

No

b) If yes, which crops?

.....

.....

.....

c) If no, why?

.....

.....

.....

d) Does intercropping influence your pruning heights and period?

Yes

No

e) Explain the answer in d) above

.....

.....

48) Which traditional ceremonies affect your plucking and pruning technologies and when?

Traditional ceremony	**When/Time period**	**Particular Technology affected**

Section D: Institutional characteristics.

49) a) Has the owner of the farm ever been trained on pruning and plucking?

Pruning **Plucking**

Yes

No

b) If yes, who trained?

TESA ☐ 1 TRFK ☐ 2 Neighbour ☐ 3 Private Company ☐ 4 Other ☐ 5.

50) a) Are the people who prune and pluck for you trained?

	Pruning	**Plucking**
Yes		
No		
Not aware if they are trained.		

b) If trained who trained them?

TESA ☐ 1 TRFK ☐ 2 Neighbour ☐ 3 Private Company ☐ 4 Other ☐ 5

51) How often do the TESA update you with the pruning and plucking technologies?

	Pruning	**Plucking**
Once a year		
Twice a year		
More than twice a year		
Others (specify)		

52) What forums/methods/venues are used to update you with new technologies in pruning and plucking?

Method	**Rank** (Importance/Effectiveness)	**Pruning**	**Plucking**
Baraza	.....		
Farm visits	.....		
Field days	.....		
Demonstrations	.....		
F.F.S	.....		
Others (specify)	.....		

53) a) are there cases of *Hypoxylon woodrot* in your farm (to be observed)

Yes

No

b) If yes, what do you associate it with?

.....

.....

.....

c) How do you Manage/control it?

.....

.....

.....

54) a) What tools do you use in tipping-in your tea?

.....

.....

.....

b) How far do you buy the tools from.....

55) When do you apply NPK fertilizers to tea due for pruning?

One month before pruning

Immediately after pruning

1-3 months after pruning

After two rounds of tipping in

Other (specify)

56) How often do you get the new recommendation approved by TRFK?

Once a year

Twice a year

More than twice a year

IV. Never received.

57) When were you visited by TESA and advised on issues concerning pruning and plucking?

	Pruning	**Plucking**
Last one week		
Last one month		
Last three months		
Last 3-6 months		
Last 6-12 months		
Over one year		
Never done so.		

58) a) Did you call him/her or she/he was on schedule/voluntary?

Called ..... why .....

On schedule/voluntary .....

Others (specify) .....

59) a) Are you satisfied with his/her visit and method of information dissemination

Yes

No

b) How would it be improved?

.....

.....

.....

60) How many barazas/fielddays/open days/demonstration on tea production have you attended in the last three years?

i) 1 ii) 2-5 iii) 6-10 iv) Over 10

Why this number and not more or less?

.....

.....

61) Have you ever needed credit for plucking and pruning operations, for payment of labour and for purchase of tools?

Plucking		**Pruning**	
Yes	☐	Yes	☐
No	☐ 2	No	☐

62) Are you aware of where you can get credit? Yes ☐ 1 No ☐ 2

Name these credit sources

.....

.....

.....

.....

63) i)Are you a member of any SACCO? Yes ☐ 1 No ☐

iv) Have you ever borrowed a loan from the SACCOs

Yes ☐ 1 No ☐ 2

64) a) Are the tools and equipments required for plucking and pruning readily available to you?

Plucking		Pruning	
Yes	☐ 1	Yes	☐ 1
No	☐ 2	No	☐ 2

b) How far do you buy them (Km) i) Plucking tools…….. ii) Pruning tools……..

65) Do you encounter any problems in delivering/selling your tea?

Yes ☐ 1 No ☐ 2

66) If Yes, What are these problems

……

……

……

67) i) In your views does marketing influence your plucking and pruning technologies

Plucking		Pruning	
Yes	☐ 1	Yes	☐ 1
No	☐ 2	No	☐ 2

ii) How do you think marketing/deliveries/selling can be improved?

……

……

……

iii) Is there tea hawking in your area? Yes ☐ 1 No ☐ 2

Why this answer……

68) What do you consider to be the main constraints in (ranking them in order of importance 1 to 5 where 1 is major constraint and 5 is least constraint).

Constraints	Pruning Ranking	Plucking Ranking	Pruning suggested solutions	Plucking suggested solutions
1) Equipments and tools not available -Expensive				
2) Technology complicated				
3) Delayed supply of inputs and services				
4) Religion/ cultures/gender				
5) Lack of exposure and knowledge				
6)Others (Specify)				

69) Adoption of plucking and pruning technologies- Tick where applicable to you.

Personal characteristics

Characteristics	**Plucking**	**Technologies**	**Pruning**	**Technologies**
Indicate your characteristic	**Adopts**	**Not adopting**	**Adopting**	**Not adopting**
Age (years)				
Education				
Land size				
Marital status				
Family size at home				
Gender				
Major source of income				
Other off farm activities				

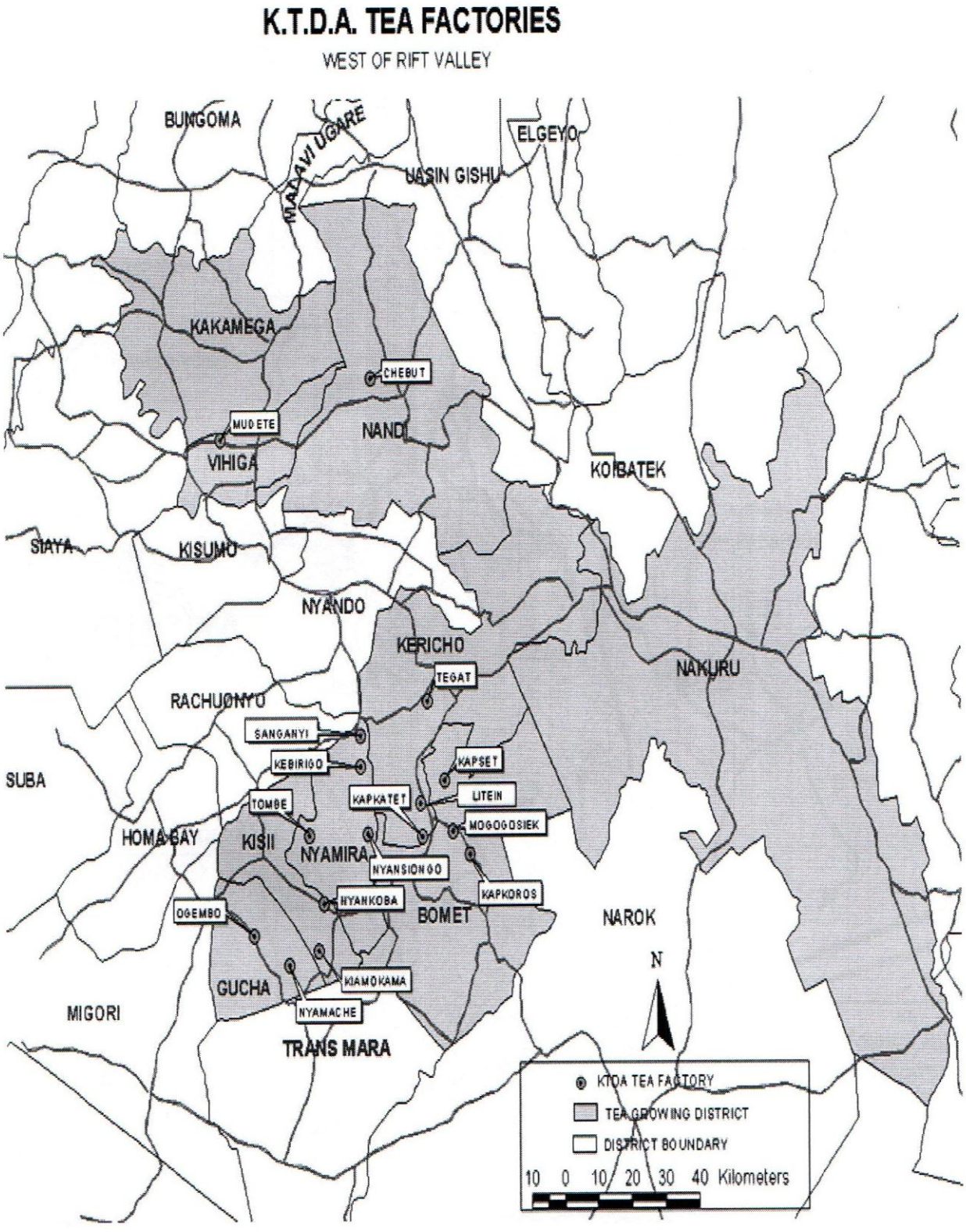
Socio-cultural values

Characteristics	**Plucking**	**Technologies**	**Pruning**	**Technologies**
Indicate your characteristic	**Adopts**	**Not adopting**	**Adopting**	**Not adopting**
Traditional ceremonies				
Resting day				

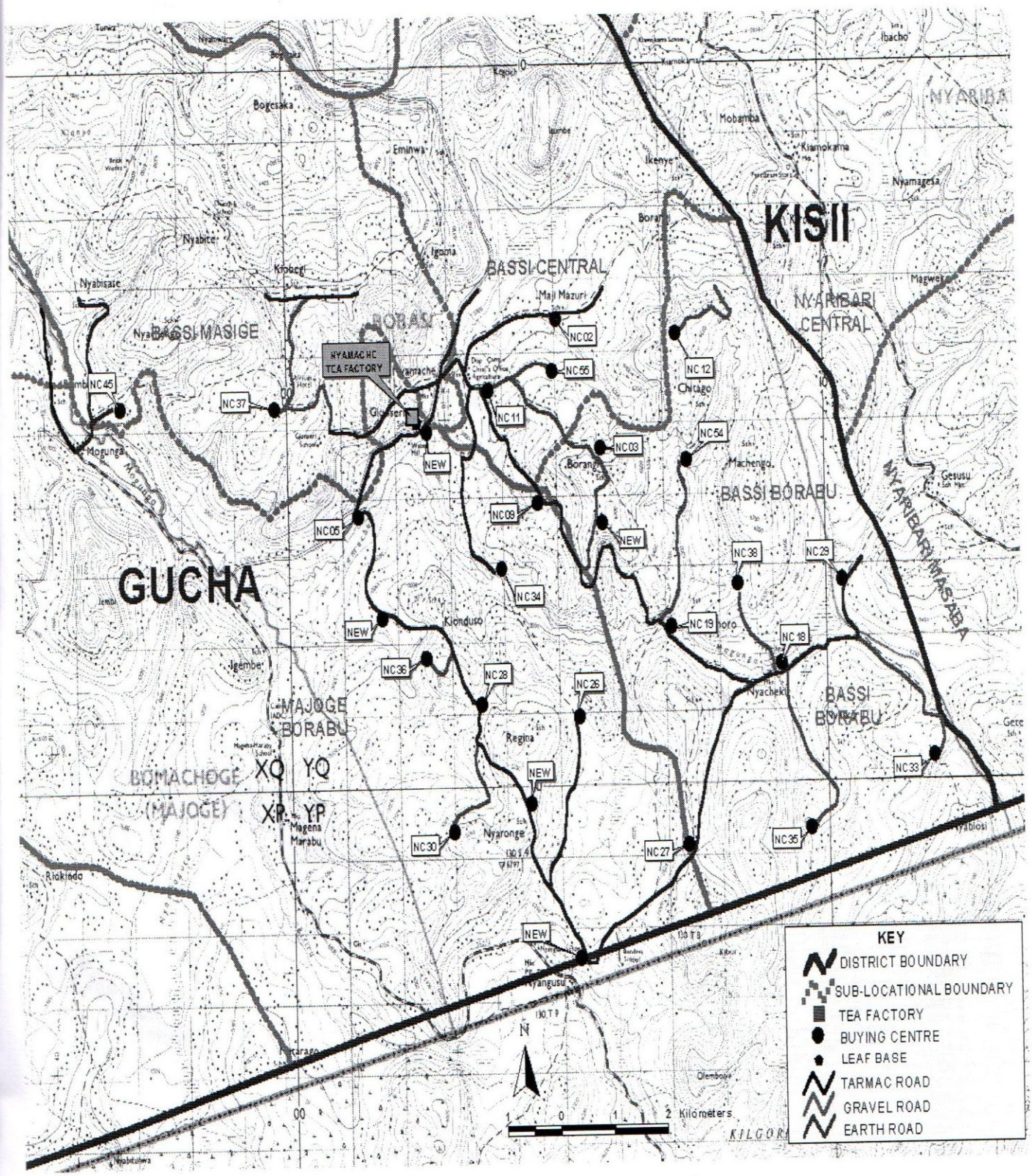
Institutional factors

Characteristics	**Plucking**	**Technologies**	**Pruning**	**Technologies**
Indicate your characteristic	**Adopts**	**Not adopting**	**Adopting**	**Not adopting**
Frequency of extension visits				
Availability of plucking and pruning tools				
Availability of credit facilities				
Efficiency in payments				
Distance to the factory (Km)				
Distance to the centre (Km)				

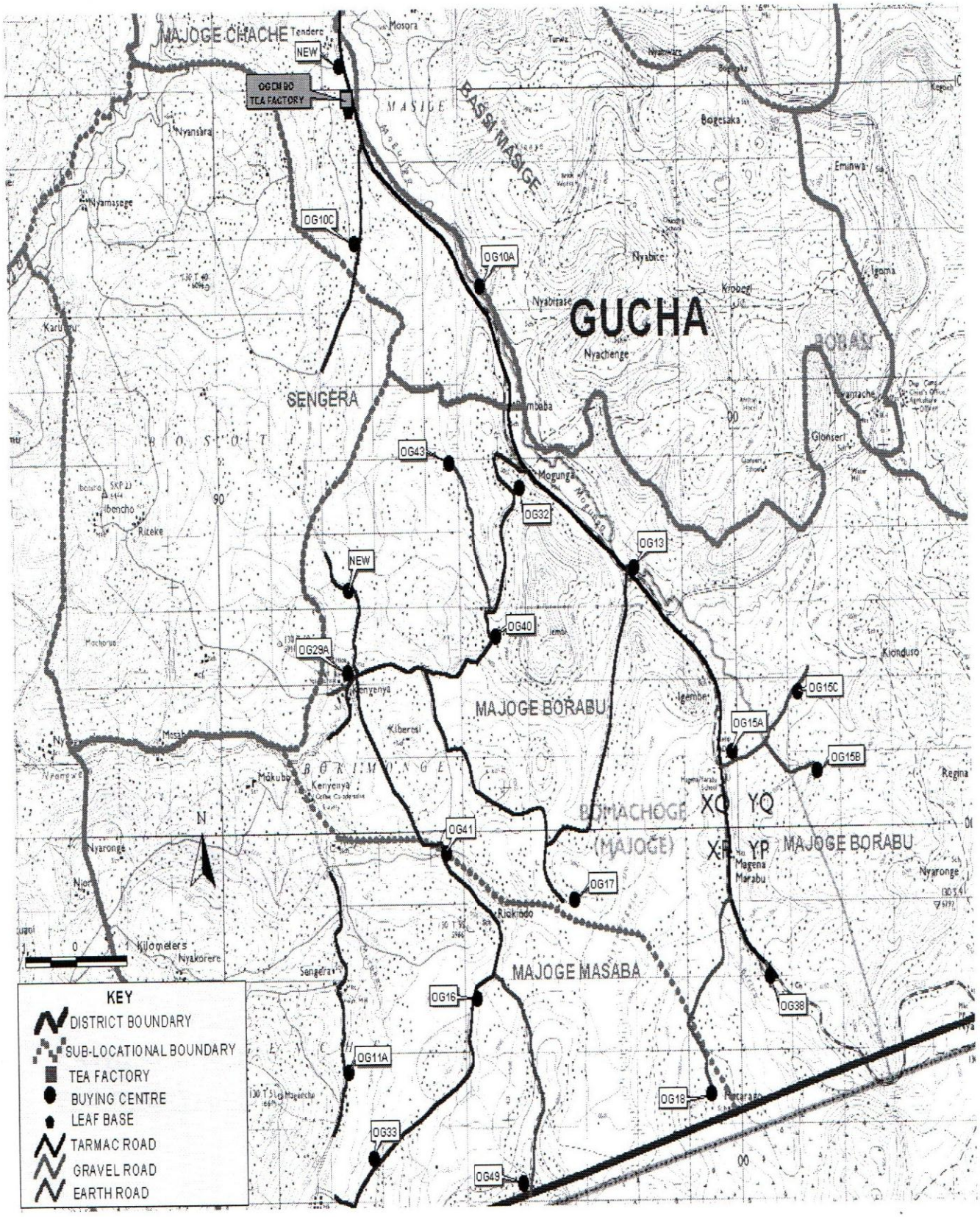
APPENDIX 2: MAP OF KTDA TEA FACTORIES IN WEST OF RIFT VALLEY



APPENDIX 3: LOCATION OF NYAMACHE FACTORY WITH BUYING CENTRES



APPENDIX 4: LOCATION OF OGEMBO FACTORY WITH BUYING CENTRES



APPENDIX 5: BASIC DATA OF OGEMBO TEA FACTORY

Our Ref: ...ST/FSC/OGE02..... **Date:** ...30/08/2007.

OGEMBO TEA FACTORY DATA REPORT FOR TRFK

1. Current total number of reg. tea farmers.....**35,452.**
2. Total area under tea.....**2856.40 hectare**.....
3. Total tea bushes.....**34,290,410**.....
4. Total area of your catchments .....
5. Altitude range.....**n/a**.....
6. Rainfall range.....**0.1MM -470MM In a month** .....
7. Total Production for **2005/2006.....17,806,371kgs**.....
8. Total production for **2006/2007.....21,048,498**.....
9. No of farmers in each Catchments.....

NO	ELECTRAL AREA	NO OF CODED BC	NO OF REG. GROWERS
1	SENGERA	11	4715
2	M. BORABU	20	6836
3	S. MUGIRANGO	18	6239
4	M.CHACHE	20	8619
5	MAGENA	20	6337
6	BONCHARI	12	2706
	TOTAL	**101**	**35452**

CATHERINE K. JUMBA

FIELD SERVICES CO-ORDINATOR.

APPENDIX 6: BASIC DATA OF NYAMACHE TEA FACTORY

FROM: FIELD SERVICES CO-ORDINATOR- NYAMACHE TEA FACTORY

TO: FAO-TRFK

ATTENTION: FUM, TEA OFFICERS,FSM/C

We (TRFK) are intending to assess adoption of TRFK technologies in your catchment in abide to get ways on how to upscale their use by tea farmers. To enables us do this study, we kindly request you to urgently send to us the following information for your catchment.

1) The current total number of registered tea farmers-24650
2) The total area under tea- 2541
3) The total tea bushes -28,313,000
4) The total area of your catchment -635.5KM
5) Altitude range -1540 -2100 M
6) The rainfall range -1500-2220
6) Total production for the years 2005/06 and 2006/07

2005/06 – 17,414,765KGS

2006/07 - 23,880,263KGS

7) The number of farmers in each Director's zone.

Central - 4702 Borabu - 3785 Boitangare – 4099 Bogetaorio - 3915

Masige - 5653 Chache - 2453 **Total -24607**

Yours faithfully, S. Ooga, Field Services Coordinator, Nyamache Tea Factory.

APPENDIX 7: EGERTON UNIVERSITY AUTHORITY LETTER.

EGERTON UNIVERSITY

OFFICE OF THE CHAIRMAN
DEPT. OF AGRICULTURAL EDUCATION & EXTENSION

Our Ref: AEE/1/3/4 Your Ref:

Date: 16th June, 2008

The Permanent Secretary,
Ministry of Education,
P.O. Box 30040 – 00100
NAIROBI

Dear Sir,

REF: RESEARCH PERMIT – JARED ABERE KEBAYA

I wish to introduce to you the above named student in the Department Agricultural Education and Extension, Faculty Education and Community Studies.

He is a registered MSc student in this University. His research topic is entitled:

"Selected Factors Influencing Adoption of Recommended Tea Pruning and Plucking Technologies in Smallholders Tea Subsector of Gucha District".

He is preparing for collection of data, and I am requesting that he be issued with a research permit to enable him collect data from relevant offices.

Yours faithfully,

Dr. F U. Ngesa
Chairman,
DEPARTMENT OF AGRICULTURAL EDUCATION AND EXTENSION

APPENDIX 8: MINISTRY OF EDUCATION AUTHORITY LETTER

CONDITIONS

1. You must report to the District Commissioner and the District Education Officer of the area before embarking on your research. Failure to do that may lead to the cancellation of your permit.
2. Government Officers will not be interviewed without prior appointment.
3. No questionnaire will be used unless it has been approved.
4. Excavation, filming and collection of biological specimens are subject to further permission from the relevant Government Ministries.
5. You are required to submit at least two(2)/four(4) bound copies of your final report for Kenyans and non-Kenyans respectively.
6. The Government of Kenya reserves the right to modify the conditions of this permit including its cancellation without notice

GPK 6055—3m—10/2003

REPUBLIC OF KENYA

RESEARCH CLEARANCE PERMIT

(CONDITIONS—*see* back page)

PAGE 2

THIS IS TO CERTIFY THAT:

Prof./Dr./Mr./Mrs./Miss. JARED ABERE KEBAYA

of (Address) EGERTON UNIVERSITY P.O.BOX NJORO

has been permitted to conduct research in

.....Location,

GUCHA .....District,

NYANZA .....Province,

on the topic SELECTED FACTORS INFLUENCING ADOPTION OF RECOMMENDED TEA PRUNING AND PLUCKING TECHNOLOGIES IN SMALL HOLDERS TEA SUB SECTOR OF GUCHA DISTRICT

for a period ending 31ST DECEMBER 2008

PAGE 3

Research Permit No. MOHEST 13/001/38C 468

Date of issue 11.8.2008

Fee received SHS.500



SCIENCE AND TECHNOLOGY

M.O.ONDIEKI

Applicant's Signature

Permanent Secretary Ministry of Science and Technology

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