EFFECT OF INFORMATION PATHWAYS ON SMALL SCALE TEA PRODUCTION IN WESTERN KENYA

MBIGIDDE VICTORIA

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DECLARATION AND RECCOMENDATION

Declaration

I hereby declare that this is my original work and has not been presented in this or any other university for the award of a degree.

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Recommendation

This work has been submitted for examination with our approval as university supervisors.

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DEDICATION

I dedicate this work to my beloved parents Musisi Charles and Nassanga Margret. You first appreciated the great need of education for a woman, and you chose right for me. To you I say thank you and may God Bless you always.

To the loving memory of my late aunt Mrs. Theopista Naggujja Adipala who worked tirelessly in my academic achievements.

To all my relatives and friends who helped me in my academic struggle, and all those individuals who have had a positive influence on my life.

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ABSTRACT

Tea contributes to about 10% of the GDP, employs about 3 million people and is the second highest foreign exchange earner in Kenya. Currently, there are about 420,000 small-scale tea farmers who are under the control of KTDA. In spite of technological advances (varieties and fertilizer recommendations), crop yield among small scale tea farms continue to decline. It is against this background that a study to assess the effect of different information pathways on small scale tea production was carried out. A total of 206 smallholder tea farmers from Sabatia, Vihiga and Emuhaya Districts of western Kenya were interviewed. Descriptive statistics were used to identify, and characterize agriculture information pathways and the socio-economic factors that influence their choice and use. The cobb-Douglas production function analysis estimated via ordinary least squares was carried out to analyse the effect of information and other factors on smallholder tea production. The factory and fellow farmers were the major sources of information. The farmer's knowledge, adoption and adoption of the recommended tea production technologies depended largely on the effectiveness of extension system since it was the main channel through which information reached farmers. More information on crop management was available to farmers than that related to marketing. Socio-economic characteristics (age, education, gender, family size, land holding, farming experience, and marital status of household heads had a great impact on access in terms of choice and use of a particular information pathway . Results from the regression analysis showed that the total amount of fertilizer and price were significant determinants of tea production. This was attributed to the fact that fertilizer (NPK) application is a prioirity for tea production in Kenya. Information accessibility affected production but only to a limited extent. The study emphasized the need for production among smallholder tea farmers to be effective.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF ACRONYMS AND ABBREVIATIONS

AIS	Agricultural Information System
AICM	Agriculture Information and communication management
AKIS	Agricultural Knowledge Information Systems
C-D	Cobb-Douglas Production Function
CPDA	Christian Partners Development Agency
CSO	Civil Society Organizations
EATTA	East Africa Tea Traders Association
FAO	Food and Agriculture Organization
FFS	Farmer Field Schools
GDP	Gross Domestic Product
GIS	Geographical Information Systems
GOK	Government of Kenya
IK	Indigenous Knowledge
KTDA	Kenya Tea Development Agency
KTGA	Kenya Tea Growers Association
LRM	Logistic Regression Model
MOA	Ministry of Agriculture
NARO	National Agriculture Research Organization
NTDC	Nyayo Tea Zone Development Corporation
OLS	Ordinary Least Square
PPT	Push Pull Technology
TRFK	TEA Research Foundation of Kenya
TRFEA	Tea research foundation of east Africa
TBK	Tea Board of Kenya

TCC	Tea Collection Centers
TT	Technology Transfer

CHAPTER ONE

INTRODUCTION

1.1 Background

Tea, one of the most important cash crops in Kenya contributes about 10% of the GDP, employs about 3 million people, and is the second highest foreign exchange earner (Mwaura *et al.*, 2007). The country contributes about 21% of the total tea export in the world.

The crop is grown mainly by small scale farmers, large scale plantations and the Nyayo Tea Development Corporation/ Nyayo tea zones. There are about 420,000 small-scale farmers under the control of Kenya Tea Development Authority (KTDA). The farmers own about 80% land under tea and produce over 60% made tea (mt) in the country (Knyili, 2003). The large scale tea plantations are under the control of big multinational companies.

Since introduction in 1924, production of tea has grown from18 million to 300 million kilograms made tea per annum (Kinyili, 2003). The increase has mainly been through expansion of area under the crop and productivity. (Rono *et al.*, 2005). The Tea Research Foundation of Kenya (TRFK) has developed the pre-requisite high yielding genotypes, fertilizer recommendation rates and harvesting practices aimed at enhancing productivity. The efficiency of utilization of the technologies is however limited, as seen from the declining crop yields among the small scale by farmers. For example, clones with a potential yield of 4000kg made tea per ha have been developed but small and large scale tea farmers however realize 2075kg and 3954kg per ha respectively (Othieno, 1994). The yields realized by small scale farmers are much lower compared to their large-scale counterparts. In addition to variation between farmers crop quality also vary with regions. Eastern parts of the rift valley in Kenya realize higher crop yield and quality compared to their western counterparts (Owour, 2001).

The declining crop yield among the smallholder tea farmers is probably because the improved production technology innovations are not reaching the individual farmers or that they are not being adopted (Owuor *et al.*, 2005). Assessment of the technology transfer and adoption by smallholder tea farmers has shown that farmers knowledge of

tea production and use of agronomic recommendations is relatively low (Owuor *et al.*, 2005).

Previous studies show that the yield of tea per hectare in Kenya was among the highest in the world. However, lately the yield has been declining especially among the small holder farmers. In addition, the tea sector is facing challenges that include global oversupply, high cost of production, concentration on a few traditional markets and inefficiencies in the management (Kibaara *et al.*, 2008). The small land sizes under tea (over 50% of the households have less than 1 acre) also pose a big challenge to the sector. Most of the potential land for tea production has been planted with crops, hence further increase in output will mainly have to come from increased productivity.

The benefits of adopting new and/or innovative technologies and farming practices of tea are clear from the cost/return relationships. It is however the large-scale tea farmers/estates that have largely benefited from the use of the tea production technologies (Othieno, 1981). The small-scale farmers have generally lagged behind in adoption of improved practices. Sustainable and improved tea production requires effective mechanisms and enabling environment for transfer and use of the technology.

Information is an important factor in production because it reduces uncertainty and enhances the awareness of possible actions that can be taken to solve problems.

Information dissemination is the process through which information about a new technology reaches the intended users (Parr *et al.*, 1990). Salteil (1994) defined it as the repackaging of information in an acceptable and usable format to increase the level, intensity and speed of technology uptake by users. Generally, only 30% of the farmers implement new tea management practices as a result of information received (Oleru, 2004).

Kinyili (2003) and Owour (2001) noted access to information as a potential avenue for improving yield among the small holder tea farmers. Production related information that is commonly disseminated by TRFK is however more concerned with agronomy (plant nutrition, breeding, soil fertility, environment, and fertilizer applications) and quality. Market related information that dictate the demand, and supply chains, is important not only to producers but also to other stakeholders in the production and marketing chain of agricultural produce (Edriss ,2003). Identifying the information types, the pathways used,

perception of the intended users and the socio-economic factors that influence access to different information is likely to improve yield level realized by small scale tea farmers.

1.2 Statement of the Problem

The yield of tea in Kenya continues to decline despite the development and dissemination of innovations aimed at enhancing production. The decline is more experienced on smallholder farms than their large scale counterparts. For example, in 2006, the contribution of small scale tea farmers was 61.6% of the total area under tea. Ironically, the returns to the small-scale farmers have remained much lower than that of the plantation and other big producers. Western province is one of the areas where tea production is very low in spite of the optimal environmental conditions. Most studies to address the declining tea yields have mainly focused on production based-innovations like plant nutrition, breeding, processing and quality enhancement. Access to information is one of the most important factors influencing both production and marketing decisions. Little has however been done to quantify and document the effect and efficiency of information dissemination on yield of tea among smallholder farmers.

1.3 Objectives

1.3.1 Broad Objective

The broad objective of the study was to contribute to increased tea production among small holder tea growers through efficient information dissemination.

1.3.2 Specific Objectives

1. To identify sources of information used by small holder tea farmers, in western Kenya.

2. To determine the socio-economic factors which influence the choice and use of information pathways of tea production, in western Kenya.

3. To determine the extent to which information dissemination pathways impact on the tea production among small scale tea farmers, in western Kenya.

1.4 Research Questions

1. What types and sources of information are used by tea farmers in western Kenya?

2. What are the socio-economic factors that determine the choice and use of the type of information?

3. To what extent does information dissemination affect tea production among small scale tea farmers?

1.5 Justification

Kenya is one of the major producers of high quality black tea in the world. In 2010, tea earned the country about Ksh 97 billion in foreign exchange, making it one of the leading foreign exchange earner. Although the proportion of tea under smallholder is higher than that in the estates, total tea production by the later is higher. In 1998, the smallholders and estates had 84,266 ha and 33,762 ha of land under tea respectively, leading to an output of 2,075 and 3,954 kg made tea per hectare for the smallholders and estates.

Western province is among the areas with a good bio physical environment for tea production. It is unfortunately one of the areas that experience sub - optimal yield and quality of tea in spite of the research recommendations. It is against this background that the study took a closer look at the pathways used in information dissemination, the socio-economic factors relating to choice and use of information among farmers, and also the extent to which different information pathways affected tea production in an effort to improve yields in the tea sector.

CHAPTER TWO

LITERATURE REVIEW

2.1 Tea farming in Kenya

Tea production in Kenya started in 1903 when the first tea plants were introduced in Limuru, Central Kenya (CPDA, 2008). The early settlers and the colonial government restricted tea and coffee growing to large-scale farmers and multinationals, ostensibly to maintain quality. The main reason however was to lock out local farmers from the then lucrative cash crop farming (Kinyili, 2003).

At independence in 1963, various Land Reform Bills were passed resulting in initiation of tea growing by local farmers. The crop has since spread across the country and is currently an important economic mainstay for many small holder farmers. Tea is generally grown in areas ranging in altitudes for 1500 to 2700 m above sea level, rainfall between 1200mm and 2700 mm per annum fertile, well drained soils (Kinyili, 2003).

The smallholder tea is produced under the management of the Kenya Tea Development Agency (KTDA). KTDA manages 422,000 growers, 53 factories, and markets the produce. Management involves supervising and advising farmers on good husbandry practices; provision of inputs, collection and transportation of harvested tea to the factories, processing and marketing of the final product (CPDA, 2008). Technological recommendation for maximizing green leaf production is availed to small holder farmers by the Tea Research Foundation of Kenya (TRFK) through various publications (Anon, 2002). Indeed, TRFK has released clones, which are yielding in excess of 4000 kg made tea/ha. Tea production in the smallholder sub sector is however relatively lower than in the estates sub sector and the potential. In terms of area under tea and production the small-scale tea farmers have surpassed that of the large estates

The increase in production by small-scale farmers has however mainly been due to expansion in area under tea rather than better agronomic and processing skills/technology (CPDA, 2008).

In an effort to improve efficiency, the Kenya government recently liberalized the smallholder tea sub-sector by restructuring KTDA and the ownership of tea factories (Sudath, 2008). Despite the liberalization, services like tea processing, marketing and supervision of the smallholder tea industry is done by KTDA. A parallel system where

farmers sell green tea leaf directly to private factories or to middlemen for immediate payments without any contractual arrangements is however emerging (Kinyili, 2003).

2.2 Agriculture Knowledge and Information

Information is data that are processed to be useful and it provides answers to "who", "what", "where", and "when" questions. In addition, information is data that has been given meaning by way of relational connection. Knowledge is defined as the appropriate collection of information, such that its intent is useful. More still, knowledge is a deterministic process whose application of data and information answers "how" questions (Gene *et al.*, 2004).

Information is important for effective mobilization and utilization of resources, policy formulation and implementation and other activities involved in agricultural development. Increased knowledge is generally considered a prerequisite for the adoption of new practices and technologies (Erbaugh *et al.*, 2001). The concept of knowledge relates to the way in which people view and understand the world and how they structure, code, classify, interpret and apply meaning to their experiences (Blaike *et al.*, 1996). Generally, everyone has knowledge and operates within a knowledge system, that is linked to the social, cultural, environmental and institutional contexts (Blaike *et al.*, 1996). If the realities of the small scale farmers are to receive greater recognition, new approaches and methods for knowing, learning and interaction are needed. The challenge is how to effectively use the scarce resources of extension and agricultural research for the heterogeneous system from which the resource poor farmers derive their livelihood.

Agricultural Knowledge and Information System (AKIS) a subset of agricultural establishment, generates and conveys the new knowledge needed to address problems affecting agriculture (McDowell, 2004). The AKIS links people and institutions to promote mutual learning and generate, share and utilize agriculture-related technology, knowledge and information (Zulberti, 2000). The system integrates farmers, agricultural educators, researchers and extensionists to harness knowledge and information from various sources for better farming and improved livelihoods.'

2.2.1 Sources of Agricultural Knowledge and Information

Farmers obtain information from a wide range of sources. Rees *et al.* (2000) noted that the major local sources of agricultural knowledge for farmers in Kenya were neighbors, family, markets, and community based organizations. Non Governmental Organizations (NGOs) and churches are also other important sources of information in those areas where they are active. In Uganda, information and visual centers that produce pocket books, leaflets, posters and films serve as alternative sources of agricultural information for farmers (Mubiru *et al.*, 2001). The diversity of information sources contributes to the effective communication. In spite of the diversity, little has been done to quantify and document the role different sources play in tea production.

2.2.2 Access to information

Access to information is a crucial component of efficiency in farming (Feder *et al.*, 1984). Information connects organization components together to provide better operation and survival in a competitive environment (Catherine *et al.*, 2002). The agriculture industry depends on information related to the market, efficient allocation of available resources and use of new or innovative farming practices. In some circumstances access to information speeds up adoption and diffusion of new technologies much more than subsidies to the farmers. Margarita et al. (2006) noted that provision of information and not subsidies was an effective way of promoting adoption of organic farming. If extension workers and farmers as well as researchers, policy makers and planners get suitable information about modern agriculture a better production of food stuffs will be achieved (Nassrin, 2004). Generally, information appraises, stimulates, and reduces uncertainty, reveals alternatives, influences individuals and inspires them to act.

2.3 Information Needs of farmers in Tea Production

The target audiences for agricultural information include researchers; agriculturalists, policy makers, NGOs, international organizations and farmers. The information needs of each of the categories vary, hence the need to develop suitable mechanisms for communicating. Empirical analysis found that information needs of farmers were

tremendously complex and varied across types of farmers and those in different regions (Oleru, 2004).

Farmers' information needs vary from community to community. Zijp (1998), noted that farmers mainly needed information on rural entrepreneurship, accounting and economic skills, income sources, consumer preferences, small scale technologies, cost reduction and labor savings techniques. Rees *et al.* (2000) however found that most farmers in Kenya needed mainly marketing information. In Uganda, poor productivity has been associated with lack of information dealing with food and income generation, soil conservation, pest and disease control, marketing, processing and pertinent government policies and regulations (Ministry of Agriculture Animal Industries and Fisheries, 2000).

2.4 Socio-economic Factors Influencing Agricultural Information Preferences

The transfer of technology from basic research to adoption, pose a major challenge for extension workers (Roling, 1991). For information access to be effective, dissemination channels need to be oriented towards the user's needs, as well as the types and levels of information and in forms and language preferred by the user (Barbara *et al.*, 2001). Generally, there is limited understanding of use patterns and the role of different information dissemination channels in inducing adoption (Schnitkey, 1992). In determining the effectiveness of a particular channel, the criteria should not only be known to institutions promoting the technology, but also to the target user and the recipient. This implies that the users of the information cannot be ignored when developing dissemination strategy.

Farmers strive to acquire information and knowledge from different sources (Feder *et al.*, 2004). While other farmers are main source of information through participatory learning (Feder *et al.*, 1985; Rees et al., 2000), technical matters require specialized sources of information. There has been a considerable debate concerning farmers' attitudes towards specific information sources. Some studies have related farm characteristics and preferences to information sources in an effort to address the farmers' attitudes (Brent *et al.*, 2000). Some surveys however found no relationship between farmer's characteristics and use of information source or preferences (Roling, 1991)

2.5 Efficiency of Agricultural Knowledge and Information Dissemination

The traditional dissemination of technology model has been eclipsed by newer models, which acknowledge the overlapping of researchers, outreach workers and farmers (Christoplos *et al.*, 1993). Rather than focusing on technology itself, the new approach recognizes that information and knowledge provide a common denominator among farmers, extension workers and researchers. The notion of agricultural knowledge and information systems describes the two-way flow of information and knowledge among the research, extension organizations and farmers.

Efficiency is the extent to which information is successfully disseminated to the end user. Indicators include product output, nature of channels used, and the amount of agricultural knowledge and technology that meets the needs of the clients. Although often used interchangeably, the terms 'technology transfer' and 'dissemination' apply to the movement of a technology, management practice or methodology and the subsequent diffusion of a new practice among potential end-users.

Initially dissemination of information focused on technology per se. The new approach recognizes that information and knowledge provide a common denominator among farmers, extension workers and researchers (Christoplos *et al.*, 1993). The agricultural knowledge and information system describes the two-way flow of information and knowledge among the research, extension organizations and farmers (Oleru, 2004).

In most cases, journalists, extension staff, NGOs and librarians come together to communicate information. The reference librarian/extension agent act as information intermediaries and disseminate the required information to users in anticipation and on demand (Feder *et al.*, 2004). The efficiency of information flow is a critical design of a dissemination strategy as it affects the financial sustainability of farmer information services (Feder et al., 2004). It is assumed that the larger the number of farmers who adopt a technology, the greater the benefits to the programme. Thus a channel that triggers adoption of a technology is more efficient because the benefits are realized much earlier. According to Brent et al. (2000), allocating budgets across the various information sources or generators is an important decision for adoption. While various dissemination channels were used to uplift pest management technologies, each of these channels had a different level of demand on local resources, researches' time and money (Ampofo et al., 1996).

2.5.1 Technology Transfer

Technology is a process designed to achieve a given action while reducing the uncertainty in the cause-effect relationship (Simpson *et al.*, 2002). Technology transfer is not merely an exchange of documents or reports embodying the details of an innovation, but a process whereby the transfer of knowledge from one person to another takes place (Ratnasiri, 1994). On the other hand it is the process by which innovations are exchanged between individuals, businesses and organizations on one hand, and those putting technological innovations into use. It is however not simply a one-way process because there are feedback linkages from current and potential users about their needs and about the effectiveness of existing processes (Simpson *et al*, 2002).

One of the models for technology transfer is Training and Visit (T&V) extension system was promoted by the World Bank. The system was developed to put the farmer, the resource constraints, abilities and needs at the center of the whole extension effort (Semana, 2002). The high costs of operating the elaborate structures, combined with the lack of new technologies, however led to the abandonment of the model. Few of the classic T&V programs still operate (Semana, 2002).

Conventional extension technology approach, particularly in developing countries, has been designed as a mechanism to transfer technologies developed at research institutes to the farmers in order to help them increase their production which served as source of national revenue (Semana, et al., 2000). In this system of extension, farmers are seldom involved in agenda setting for technology development, or in testing and evaluating technologies. The plans are largely based on national priorities, and decisions on objectives, content to be taught are made without farmers' in-put (Amujal, 2003).

2.6 Agriculture Information Channels

Information channels are avenues through which information is transferred to farmers. The information channels can either be personal or interactive. Channels include radio, print media, farmer teachers, field days and farmers field schools (FFS). Different dissemination channels influence adoption at the different stages of the individual decision making process (Rogers, 1995). For example Mass media creates awareness but for adoption to take place, technical assistance and detailed knowledge are required (Corinne, 2002). The effects of mass media and interpersonal communications are

however closely inter-related hence the poor relationship with adoption of technology (Longo, 1990). Mass media is however the more passive form of information transfer relative to the active technical services such as Field days and Farmer Field Schools. Non-adopters generally cite mass media as their main source of information while adopters prefer sources that offer technical assistance (McBride *et al.*, 1999). A combination of mass media and interpersonal communication channels are more effective as they play complementary, rather than competing roles in the dissemination of innovations (Rogers *et al.*, 1998).

Field days are one of the extension approaches in which farmers gather at a particular farmers plot and a short, specific topic is demonstrated and discussed with extension agents and researchers (Minja *et al.*, 2004). These are important events that provide opportunities for publicizing information and knowledge from on-farm testing and research programme interventions (Margarita *et al.*, 2006). Field days are important tools for disseminating agricultural technologies to diversified farming communities and policy makers at different levels. In Eastern Africa, Field days are generally organized by participating farmer groups in collaboration with local authorities, extension and research programmes and other community service providers such as traders, or non-governmental organization (NGOs). In this regard, Field Days (FDs) provide a forum for sharing information on different farm practices and exchanging experiences, thereby encouraging farmer-farmer technology dissemination (Rogers, 1995).

More experienced farmers become the best discussion partners for other farmers (Campbell, 1995; Place et al., 2005). Together, they assess the worthiness of technologies and suitability to their farming conditions (Minja at el., 2004). If this assessment is positive, then the farmers may test and subsequently adopt the demonstrated technologies on their own farms. Historically, advice via specialist advisors has served farmers well when it was easy to come by and either government funded or relatively inexpensive. However, as the number of advisors has decreased this source of information is more difficult to access and probably more costly than in the past (Salteil, 1994)

2.7 Role of extension in sustaining agricultural production

Extension is often defined as a combination of a communication dimension and educational dimension, meaning transmission of technical information to farmers and

assisting them in development of skills to make use of technical information. Agricultural extension is primarily used as a means of information delivery to farmers. Improving agricultural production may not be achieved without an effective agricultural extension service, which is well linked to research information relevant to farmers needs (Catherine et al., 2002). Extension programs functions only when there are profitable innovations to extend (Mahapatra, 2001). Extension services in Africa have been uneven because of the heterogeneity of farmers, environment and infrastructure. For the extension program to have an impact it has to have strong mobile staff, well instructed in a limited number of farm activities and with profitable innovations to extend. The role of the extension worker has been changing. This means providing the methodology for the process; facilitating communication and information flow; and providing the technical backup options. The extension worker co-ordinates and organizes the knowledge acquisition, and documents the farmer knowledge and produces simple guidelines for training (Anandajayasekeram *et al.*, 2008).

In Kenya, the number of extension staff has been declining due to the frozen employment in the various government sectors. The KTDA has to employ extension staff to make them more accountable to the farmers. In addition, the staff has to be better trained and well equipped to undertake the extension duties. For example, Mudete Tea factory that cover over 10,000 farmers has only five extension workers.

In a broader interpretation, the purpose of agricultural extension is to advance not just production knowledge but the whole range of agricultural development tasks, such as credit, supplies, marketing and markets (agricultural process development) (FAO. 2001). Agricultural extension has the potential to stimulate agricultural development and is often used as a tool for implementing government policy.

2.8 Adoption of Innovations

Schumpeter (1999) defined innovation as setting up of a new production function. This includes, introducing a new product or service, a new form of organization such as a merger, or the opening up of new markets (Sudath, 2008). The determinants of adoption decisions may differ with channels of information (Woziniak, 1993). Different dissemination channels influence farmers' attitude and this happens at different stages of

adoption process. At the initial stage of technology awareness, individuals become aware of the existence of a technology but have little knowledge about it. It is after this stage that potential adopters actively seek for the details about the technology (Rogers, 1995). Sometimes a channel may have great influence on adoption decisions, especially if the technology in question is more costly than a generic information program (Stan *et al.*, 2001).

According to Sudath (2008), the factors that affect agricultural innovation diffusion and adoption include cost of the innovation, economic benefits, consistency with existing social values and norms, knowledge of how to use it and the cost involved in acquiring it. Demonstrations and the opportunity to see how it works, information on the innovation, collaborative efforts of diffusion partners towards dissemination, after sales service, maintenance and depreciation rate for machinery, relative advantage, convenience, risk and uncertainty, suitability for present conditions, adaptability of the innovation to local needs, and the promotion efforts of extension agents and/or suppliers may also determine adoption decisions.

CHAPTER THREE

MATERIALS AND METHODS

3.1 Study Area

The major tea growing zones in western Kenya include the following districts; Shinyalu, Hamisi, Vihiga, Emuhaya and Sabatia (Figure 1). The area lies between longitudes 34^0, 30 and 35^0 East, and between latitudes 00 and 0^0 15 North and covers about $563km^2$.It lies at altitude between 1750 and 2000 meters above sea level, has a temperature range of between 15^0C to 34^0C, well drained soils and receives between 1800mm to 2200mm, of rainfall per annum. The area is rated as medium to high potential agricultural land for tea production (Jaetzold et al., 2006).

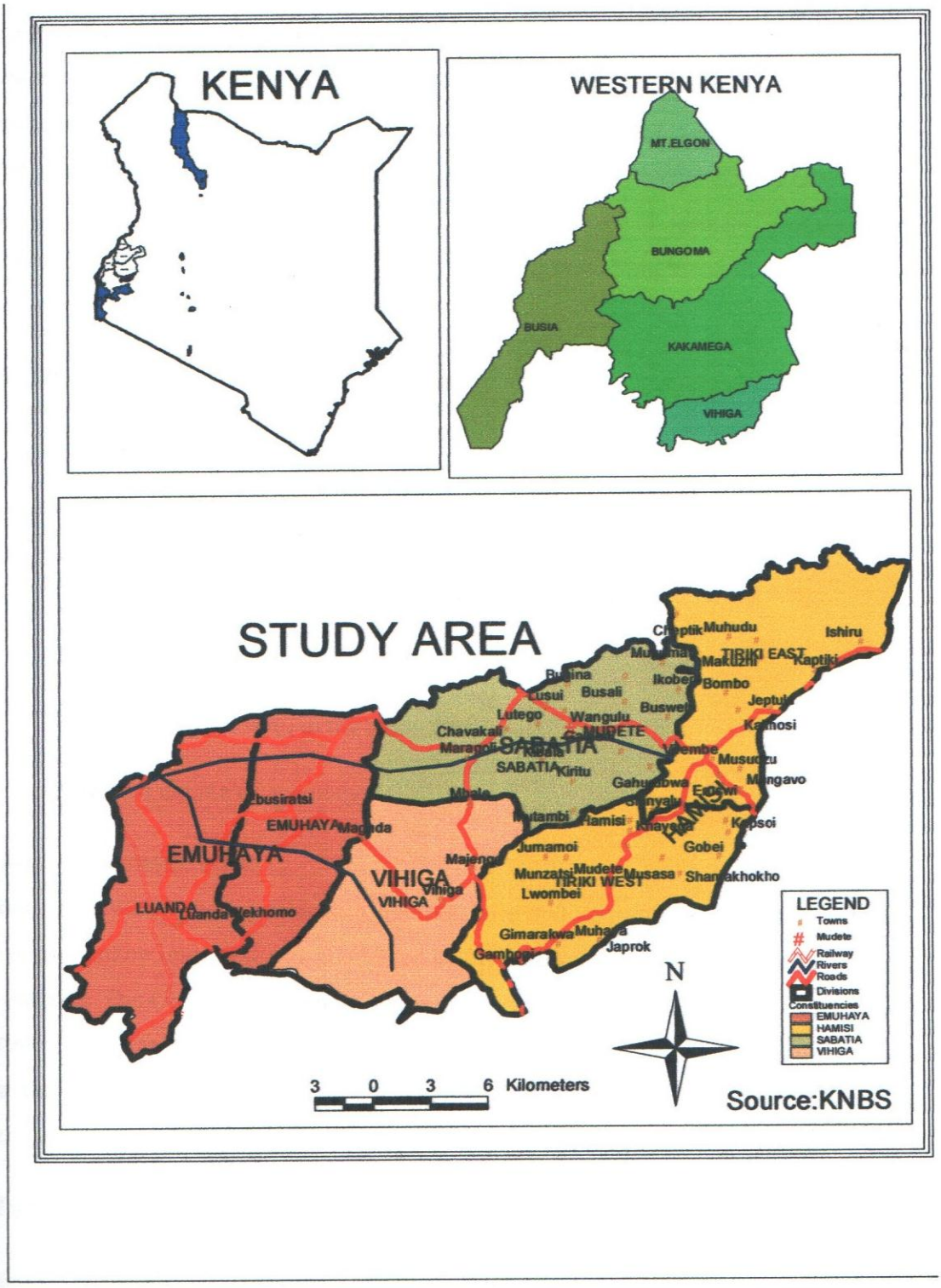

Figure 1: Major tea growing areas in western Kenya.

3.2 Research Design and Sampling Procedure

A purposive, multi-stage random sampling technique was used. Three districts (Sabatia, Vihiga and Emuhaya) were purposively selected based on the tea yield production. Ten collecting centres varying in tea production levels were purposively selected from Vihiga, Sabatia and Emuhaya districts. A sample frame consisting of farmers involved in tea growing in the target collection centre was then developed. Simple random sampling was then used to select the respondents

The sample size was determined according to Yamane (1973) formula;

$$N=z^2pqN/ (z^2pq+Ne^2)$$

Where z= the standard deviate

P= the proportion of the population with the desired characteristics

Q= 1-p

N= Number of growers in the study area.

e= desired degree of accuracy.

3.3 Data Collection

Primary data was gathered through a questionnaire and administered by the researcher. The questionnaire interview was conducted by the researcher and enumerators trained for the purpose. Data on the household characteristics (age, education level, gender, and income levels), farm characteristics (farm size,), product levels and information pathways were the main target. Pre-testing of the survey instrument was done in (Shinyalu) a different tea growing area.

3.4 Data Analysis

Objective 1 and 2: To identify and characterize sources of information used by small holder tea farmers, in western Kenya.

The objectives were analysed using descriptive statistics (percentages, means and cross tabulations), correlations and multivariate regression, statistical package for the social sciences (SPSS) version 11.5 was used.

Objective 2: To determine the socio-economic factors that influences the choice and use of information pathways of tea production, in western Kenya.

A Logit model was estimated to assess the relationship between use of different dissemination pathway and the farmers' decision to choose that particular pathway. The model according to Rubinfield (1996) was specified as:

$$\frac{P_i}{1-P} = \Sigma (a_i X 1 + \beta_i Y_i + \varepsilon) \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots 3$$

Where $\frac{P_i}{1-P}$ is the probability of use (P_i) and non-use of information (1-P),

α and β is the vector of parameters to be estimated.

Y is 1 if a person used/accessed information and 0 if otherwise. This implies that Y is binary or dummy, forcing use of either logit or probit model. But this study opted for logit because it has more density mass at the margins allowing logistic distribution of the sample in terms of response. It allows logistic distribution of the respondents' interview than response.

X represents other socio economic factors that influence the use of information such as, age, income, education among others, and ε is the unexplained variation. The socioeconomic and farm characteristics were put in the model so as to control for their influence on the decision to use a particular pathway. **Independent variables**

YRS.FAR: Farming Experience

GENDER: Gender of farmers

LAND: Farm holding

HHHEAD: Nature of household head

CRPS: Number of other crops grown

DIST1: Distance to tea collecting centers

DIST2: Distance to the factory/Market

EDUC: Education Level

3.4.1 Objective 3: To determine the extent to which information dissemination pathways impact on the tea production among small scale tea farmers, in western Kenya.

A modified Cobb Douglass production function was used to estimate the overall effect of agricultural information on Small Scale tea production in western Kenya. A Cobb-Douglas model is a suitable function because of its simplicity and as a benchmark model for production process (Debertin, 1992).

The original model was specified by Douglas and Cobb as, $\mathbf{Q} = \alpha \chi^{\beta}{}_1 \chi^{\beta}{}_2$ a multiplicative non-linear function, but later developed to the logarithmic form or natural logarithmic form by Arrow. *et al.*, (1961). The expression reads, $\mathbf{Q} = \alpha_0 + \beta_1 \ln X_1 + \beta_2 \ln X_2 + \varepsilon$, for effect of capital and labour on production. This will allow linear expression of the model in this research.

Where **InQ** = quantity of out put

α_0 =constant

β_i =coefficient with k 1, 2.....n which estimate the elasticity of transformation ratio of the inputs

$\ln X_1$ = Capital

$\ln X_2$ = Labour

ε = Desired degree of accuracy

This approach has been used in several production studies (Biggs *et al.*, 1995; Saito *et al.*, 1994 and Elamin *et al.*, 2000). The model assumes that all farmers are profit maximizers and price takers. The random term is assumed to have a mean of zero and always positive otherwise the model could yield negative outputs, which violates theory. In addition the model assumes that the elasticity of substitution among the inputs is unity. This though theoretical, is not true because inputs like fertiliser and seeds cannot substitute one another on one to one basis, particularly for this study. More so, this research is not concerned with input substitutions but contribution of the inputs on total production.

The Cobb-Douglas functions have been the most popular in farm analysis. This model provides a compromise between (a) adequate fit of the data, (b) computational feasibility and (c) sufficient degrees of freedom. In other words, the function is relatively "efficient user' of degrees of freedom.

More even, the model has greatest use in diagnostic analysis in capturing marginal resource productivity at mean levels of inputs. This basis is relevant for variable factors such as fertiliser, seeds, pesticides and labour used with a fixed input such as land (Debertin, 1992). The coefficients 'β' measure the elasticities or respective variable shares in production process and show how output responds to changes in the factors of production. The use of elasticity of production is advantageous because elasticities are absolute values and ignore the units of measurement such as kilograms or man-days. This helps in comparing the inputs' contribution on production on the same premise.

Specification of the model

The model was adopted in the study as follows;

$$Q_c = \ln\theta + \alpha_1 \ln \lambda_1 + \alpha_2 \ln \lambda_2 \ldots\ldots \alpha_4 \ln \lambda_4 + \beta_1 \ln \emptyset_1 + \beta_2 \emptyset_2 \ldots\ldots \beta_4 \ln \emptyset_4 + \varepsilon$$

Where:

Q_c = total quantity of tea (kgs)

λ_1 = Total farm size allocated to tea (ha);

λ_2 = Total amount of fertilizers applied to tea crop (kgs);

λ_3 = Total family labour used in tea production (number of active persons);

$\emptyset_1$ = Age of household head (kgs);

$\emptyset_2$ = total number of years of education of household head (years);

$\emptyset_3$ = Access to information (dummy: 1-access and 0- no access);

$\emptyset_4$ = Gender of respondent (dummy: 1-male and 0- female);

Table 1: Variables used in the Cobb Douglas Regression Model

Variable	Unit	Expected sign	Descriptive
X_1	Years	+, _	Age of head (yrs)
X_2	Years	+	Education of head (yrs)
X_3	Kilograms	+, _	Fertilizer used/ha (kgs)
X_4	Dummy	?	Whether hire or not
X_5	Persons	+, _	Number of dependants
X_6	Dummy	?	Gender of head
X_7	Dummy	?	Access information or not
X_8	Hectares	+	Land Size
X_9	Years	+, _	Years in tea farming
X_{10}	Kilo meters	+, _	Distance to market
X_{11}	Hectares	+	Area under tea

CHAPTER FOUR

RESULTS AND DISCUSSION

4.1 DESCRIPTIVE ANALYSIS: HOUSE HOLD CHARACTERISTICS

4.1.1 Socio Economic Characteristics of the Smallholder Tea Farmers

The tea industry is dominated (72.8%) by male farmers (Table 2). The scenario is typical of western Kenya where land ownership and hence resource is generally a male domain. Tea is a major cash crop in this area, hence financial decisions are made by the male members of the households. Women play a vital role as agricultural producers and as agents of food and nutritional security. They however have less access to productive assets such as land and services such as finance and extension (World Bank, 2007). As a result of the limited access to essential production resources, such as land, labor, and inputs, women's role in crop agriculture is often restricted to producing subsistence food crops with low potential to generate income (World Bank, 2007). Tembo (2007) noted that multiple responsibilities in the household hinder full involvement of women in income generating activities.

Education is an essential element in the development of a country. Educated farmers, are assumed to understand agricultural instructions, manage and adopt technologies faster than the uneducated farmers ones (Edriss, 2003). Primary schooling was the dominant level of education attained by a majority of smallholders (47.5%). Ferhan *et al.* (2010) similarly noted that 40% of the target farmers were primary graduates, and 79% derived their income from agricultural activities or farming.

Generally education thought to make farmers more receptive to extension advice and able to deal with technical recommendations that require a certain level of literacy (CIMMYT, 1993).
The low formal education level manifested among farmers implies that technologies have to be disseminated through the practical based demonstrations.

Table 2: Socio economic characteristics of the Household heads among small scale Tea farmers

Characteristic	Variable	Percent
Gender	Male	72.8
	Female	27.2
Education	None	10.6
	Primary	47.5
	Secondary	29.1
	Tertiary	12.6
Marital status	Single	2.9
	Married	71.3
	Widow	20.3
	Widower	5.3
Income source	Formal	13
	Self employment	16
	Farming	71
Land tenure	Private/own	94
	Communal	6
Type of house	Permanent	27.6
	Semi permanent/ Rental	69.9
	Grass thatched	2.4
Livestock	Cattle	69.9
	Goat	8.9
	Sheep	2.4
	Chicken	18.8
Labour source	Hired	78.2
	Family	21.8

N=206

Table 3 : Mean age, farm size and farming experience of sample small scale Tea farmers

Characteristics	Unit	Mean
Age of Household head	Years	61.0
Land holding size	Acres	2.2
Farming experience	Years	21.4
Size of household	Number	6

Land ownership is major factor of production, especially for perennial crops like tea (Edriss, 2003). A majority (94%) of the farmers privately owned land while 6% owned it communally. The 6% of the land was communal because it had not been sub-divided among the sons as required by the Luyha culture. The size of land under tea production varied from 0.25 to 2.5 acres, with a mean of 2.2 acres (Table 3). The increase in population is however forcing farmers to sub divide the land under tea enterprise.

The type of house has been used as an indicator of resource endowment in western Kenya (Anon, 2002). Only 28% of the farmers had permanent houses, 70% had semi-permanent while 2% had grass thatched residences. This is an indication low resource endowment in the tea growing zone.

Tea farming is a major enterprise and a major source of income. As a result of low yields, tea farmers have diversified to other farm enterprises including dairy, maize, ground nuts, and horticultural crops.

Dairy and poultry farming supplemented the tea enterprise in 70%, and 18% of the cases respectively. The small ruminants (Sheep and goats) were however less popular. Farmers kept livestock mainly for financial reason (43%), subsistence, food security, as well as for dowry costs.

Farmers predominantly use hired labour for tea production. This highlights the laborious nature of the enterprise. Some (21.8%) farmers relied strictly on family labour because they could not afford to hire any outside labour.

Over 70% of the farmers depended solely on farming as a source of income. Farmers with supplementary sources of income acknowledged the enormous contribution of farming to their gross earnings. These farmers invested their earnings from these external sources into their farms.

The mean age of small holder farmers interviewed was about 61 years (Table, 3). This implies that most of the farms are managed by old people. This likely influenced their attitudes, and perceptions about agricultural practices.

The mean household size noted in the study was six compared to the five persons according to 1999 census.

The mean number of years spent in tea farming coupled with the fact that tea is a perennial crop meant that farmers had some knowledge about the kind of crop they were dealing with. The results about farming experience and household size were consistent with Mwaura *et al.* (2007).

The study found that farmers allocated most of their land to crops followed by pasture and lastly tea. Crops (ground nuts, maize, beans, vegetables etc) occupied the largest portion probably because food security was a priority. Moreover tea being a cash crop required more investment which farmers could not afford.

4.2 Sources of information

Fellow farmers and mass media (radio and TV) were the most common sources of information (Figure,2).

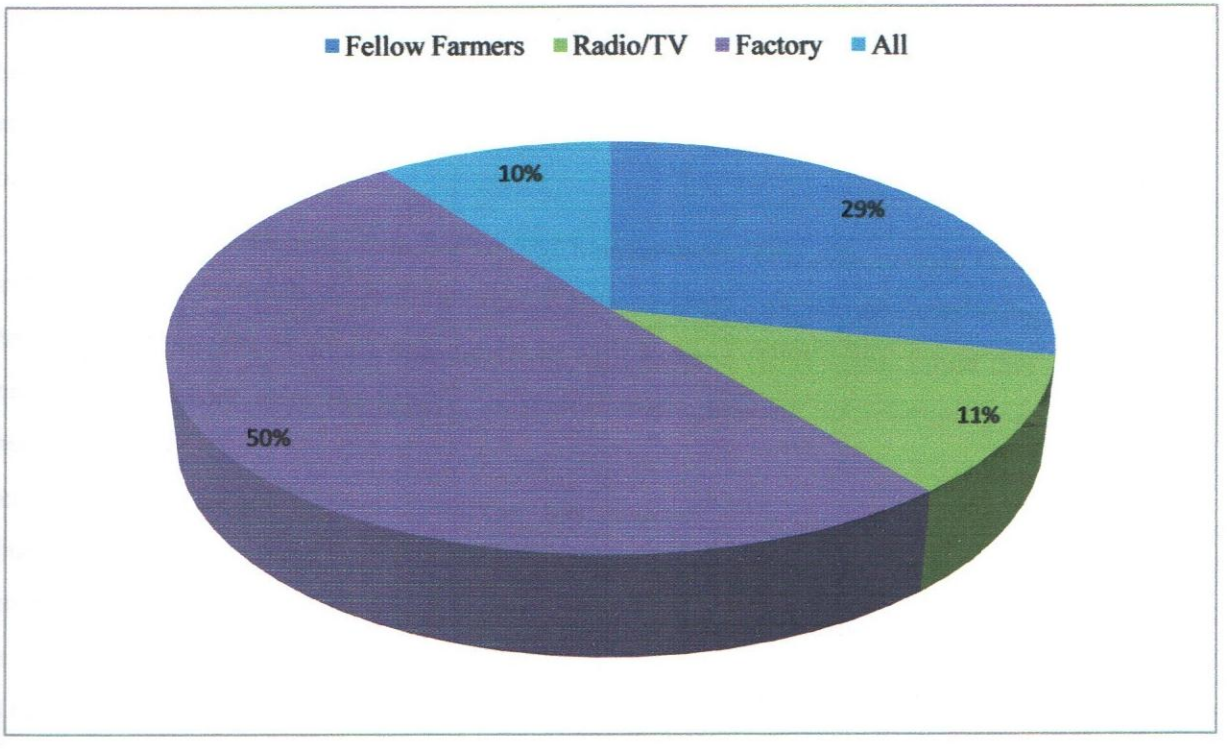

Figure 2: Sources of tea information

A majority (50%) of the farmers accessed agricultural information from the factory, through KTDA extension staff. Owour (2001) noted that extension staff formerly under the ministry of Agriculture were redeployed to be under specific factories to make them more effective and

directly answerable to the farmers. In a related study, Yapa *et al.* (2005) noted that farmers preferred factories and input supplying companies to offer extension services.

Mass media (radio and television) also disseminated much of crop management information to farmers. This was probably because most of the information generators target the radio and television for dissemination of information. Information received from the radio and televisions was however mixed and did not focus on specific topics. Shepherd (2001) noted that in Africa, radio is the most appropriate communication channel available to a majority of rural farmers. Rohana (1998) noted mass media was a critical channel for information dissemination.

Individual fellow farmers were the second important source of information (29%). This was expected because as they interact with others, they listen and see what is done hence learning more effectively. Yapa (2005) also noted that a majority of the small holder tea farmers rely on their own experience and neighboring farmers to get the required knowledge on tea cultivation. Sivayoganathan (2008) similarly found that farmers were the second most important source of information. Anandajayasekeram (2008) noted that outsiders are less effective in determining the 'best practices' for rural people because they have less time to interact, and have differences in culture.

The channel mainly dealt with crop husbandry/ management. This was mainly because farmers were limited in the technical bit complexities. Farmers rarely disseminated marketing and credit related information. The results are comparable with Rohana (1998) who found that individual farmers and neighbors were the second most available source of information to small holder farmers.

Generally the role of the extension workers has changed from that of being a teacher to a facilitator. This means providing the methodology for the process, facilitating communication and information flow; and providing the technical backup (Anandajayasekeram, 2008).

Mass media (radio and TV) were third in ranking. Ismet *et al.* (2010), in their study also found mass media to be a vital source of information. In a related study, Rohana (1998) noted that radio was an important source of information especially among small holder farmers.

Other sources of information for the tea farmer include Non Governmental Organizations (NGOs). Being private oriented, NGOs were expected to be thorough and more effective but this was not the case. The inefficiency was probably because of the fact that they were not actively

involved in tea production. Management and organization of the Tea industry in Kenya made it difficult for NGOs to intervene on behalf of small-scale farmers.

The above results are comparable with Farhan *et al.* (2010) who noted that fellow farmers and the Ministry of Agriculture contributed about 70% of the information.

Table 4 : Farmer perception of the Factory Extension System in the tea industry

		Sabatia (n=128)	Vihiga(n= 59)	Emuhaya (n= 19)
		%	%	%
Do you Access information?	**Yes**	28	15.3	53
	No	72	84.7	47
How do you get Extension to visit your farm?	**Scheduled visits**	27.3	30.5	78.9
	Invitations	60.9	35.6	15.8
	Randomly	6.3	32.2	5.3
	No idea	5.5	1.7	0.0
No of visits last year	**Three**	29.7	81.4	15.9
	Twice	0.0	5.1	5.3
	Once	21.1	10.1	26.3
	None	49.2	3.4	52.6
The preferred frequency of visits per year	**Twice a year**	39.1	76.3	31.5
	Once a year	14.1	15.3	5.3
	More than twice	46.8	8.5	63.2
Adequacy of fields days organized last year	**Adequate**	14.8	3.4	5.3
	Inadequate	85.2	96.6	94.7
Most effective training method Preferred	**Baraza/Group**	60.2	71.2	94.7
	Single farmer	39.8	28.8	5.3

4.2.3 Small Holder's perception of the Extension Services in tea industry

Extension services are largely provided by KTDA, organized under specific factories. The success in farmers knowing, adopting and adapting recommended tea production technologies depends on the extension system reaching the farmers and educating them on ways of improving tea production and productivity (Owour, 2001).

Access to information

Most farmers indicated inadequacy in the extension services (Table, 4). The study established that the whole region has five extension officers who are responsible for disseminating information to over 1000 farmers. Owuor *et al.* (2008) noted that since 1974/75 the number of extension staff has been declining while the number of farmers continually increased. The extension officer to farmer ratio has continuously decreased, influencing tea yields negatively. CPDA (2008) noted that information flow and sharing within the sub-sector was poor or in some cases completely missing. Ninety percent of the farmers did not receive extension services, hence contributing to the poor yield. Anandajayasekeram (2008) noted that dissemination of relevant information and advice to farmers has to be channeled through agricultural extension, since it has an extensive network.

Farm visits by extension

A majority (60.9%, and 35.6%) of the farmers in Sabatia and Vihiga districts respectively were visited only after requesting/inviting extension staff for the same. In Emuhaya however, most (78.9%) of the farmers reported the visits to have been scheduled. In related study, Owour (2001) found most of the farmers to have invited the extension staff to their farms. According to the current extension approach, the Ministry of agriculture (MOA) operates in a Focal area where they provide all the relevant information, before moving to another region (TBK, 2006). As a result of the focal area approach, the limited number of extension workers, could not adequately supplement KTDA staff. Emuhaya district was different probably because it is a new zone where tea is still being established, hence most visits were scheduled.

Number of visits last year

Forty nine percent of the farmers in Sabatia were not visited by extension staff in 2010. Thirty percent of the farmers were however visited three times last year. A majority (52.6%) of farmers in Emuhaya were not visited by extension staff last year. Sixteen percent of the farmers however reported extension visiting them three times. In Vihiga District, 81.4% of the farmers were visited

three times by extension staff last year. The positive effect is probablyly because of the districts proximity to the factory. Owour (2001) similarly noted that extension staff, rarely visited farmers. Most farmers preferred to be visited more than twice a year in Sabatia and Emuhaya (46.8 and 63.2) respectively. In Vihiga a majority (76.3%) of farmers preferred to be visited twice a year. Emuhaya expressed a higher frequency of preferred visits probably because tea was more recently introduced in this area. Amajority (78.9%) of farmers in Emuhaya District reported were visited only after prior scheduled visits, when asked the number of visits last year 52.6% said they didn't see any officer.

When farmers were asked some of the methods employed during training sessions by extension officers, field days, demonstrations, farmer field schools were most preferred. About 85.2%, 96.6%, and 94.7% of the farmers, in Sabatia, Vihiga and Emuhaya Districts respectively reported the methods to be ineffective. Farmers pointed out the need for extension officers to avail an annual calendar of activities, for effective participation. This was a clear indication of poor communication because most farmers were not aware of the new extension approach of using clusters/zones. Farmers in the three districts identified field days to have been inadequate especially in the previous years. Owour (2001) similarly noted that it was necessary for extension visits to be planned in advance to make them beneficial to both farmers and extension staff.

The need for more frequent visits by extension staff is an indication of farmers yearning for information.

A survey of the farmer's opinion of the most effective way of training showed that 60.2%, 71.2%, and 94.7% of the respondents in Sabatia, Vihiga and Emuhaya districts respectively preferred the group/baraza approach. Owour *et al.*, (2008) similarly noted the effectiveness and ease of reaching the farmers through the group training approach.

A few farmers (39.8%, 28.8% and 5.3%) in Sabatia, Vihiga and Emuhaya district respectively however preferred the single farmer approach probably because it gives them a chance and ample time to interact with extension staff. In a similar study, Yapa (2005) identified farmer training classes, field demonstrations, seminars, individual visits and exhibitions to be the primary methods by which small holder farmers received extension services. CPDA (2008) noted that small-scale tea farming in Kenya is expanding hence overstretching the limited extension services.

Agricultural and rural extension is a unique service because it provides smallholder farmers with non-formal education and information service. While extension can provide them with services to increase productivity, their food security however depends on the institutional development and income-generation that in combination give higher food crop output (FAO, 2001). Extension education programs should thus focus on farmers, especially those extensively using traditional information sources and have weak linkages with the society (Ismet *et al.*, 2010).

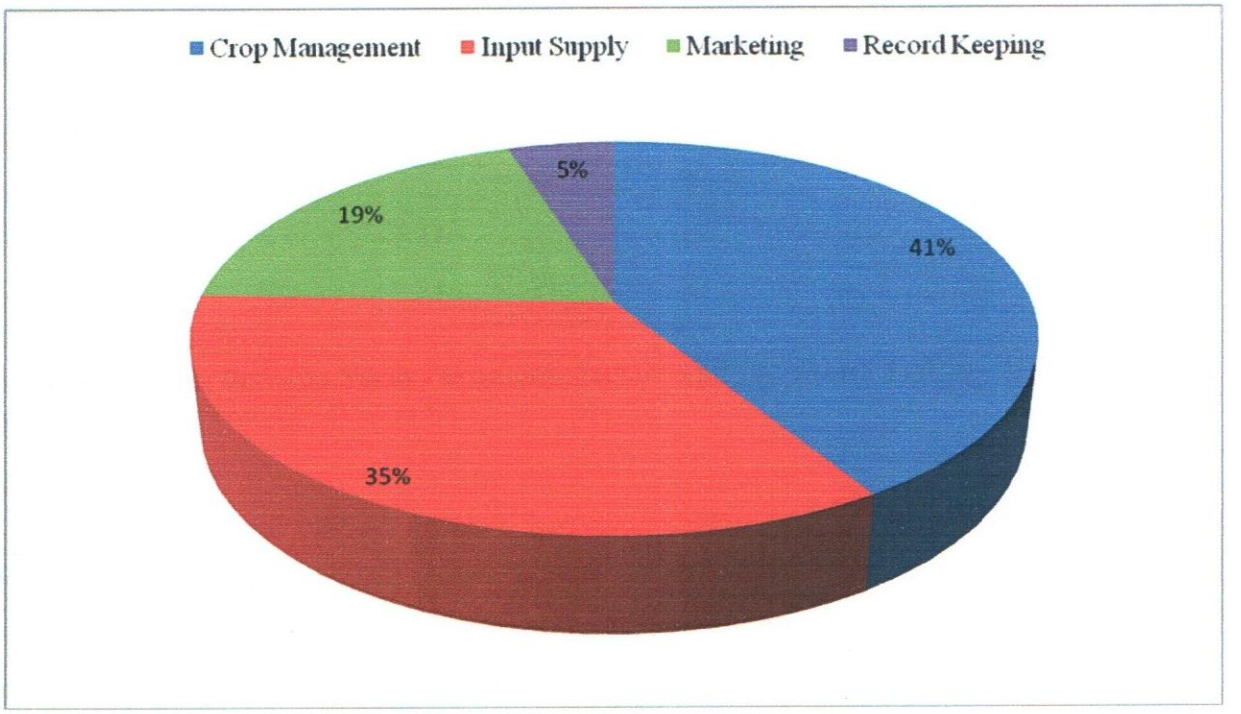

Figure 3: Type of information disseminated to farmers

4.2.4 Type of information disseminated to farmers

Crop management was the most common type of information disseminated to farmers (figure 3). Kinyili (2003) similarly noted that more crop husbandry information compared to other types. Information concerning the supply of tea in puts ranked second (35%) in predominance.

Little (19%) information concerning marketing was however disseminated. This was probably because in the small holder tea sector, marketing is done by the factory TBK/KTDA. This implies that the relevant agent KTDA has not delivered on its role of providing agronomic support and marketing of Kenyan tea. Record keeping is equally important as marketing since through it farmers will understand better their investments in tea.

The sources of information varied with districts (intensity of tea production). In Sabatia, farmers received most (62.5%) of the information from factory (Table, 5). In Vihiga, 22% of the farmers

received information from all the available sources. Mass media (Radio and Television) was used in 20.4% and 21.1% in Vihiga and Emuhaya district respectively compared to Sabatia 4.7%. Vihiga had the highest proportion of farmers receiving information from mass media (radio and television). In Sabatia information was mainly from the factory probably because of its proximity. In Vihiga and Emuhaya, farmers got information from a variety of sources.

Table 5: Rating (%) of Sources of tea production information among farmers.

District	Fellow	Extension	Radio	Factory	All
Sabatia	29	2	5	61	3
Vihiga	30	5	21	22	22
Emuhaya	21	10	21	21	27

4.3.0 Relationship between Socio - economic factors and the choice and use of information dissemination pathways.

Education Level

Farmers got information from a variety of sources. A majority of farmers had primary level of education, and received most information from fellow farmers, factory and TV/radio (Table, 6). Those with formal education mostly received information from mass media. Education is one of the few socio economic factors that had a positive effect on the choice and use of these information sources. Ismet *et al.*, (2010) similarly found that a farmers' education level greatly influenced the choice to use a particular source of information.

Table 6 : Rating (%) the effect of education level on the choice and use of information source

Characteristic	**Sources of information**		
Education level	Fellow farmers	Radio/TV	Factory
None	15	3	11
Primary	49	42	49
Secondary	25	38	28
Tertiary	10	19	11

Farming Experience

Farmers in all categories of farming experience used the factory as the main source of information. This is probably because the factory source (KTDA, extension staff) are organized to reach all farmers irrespective of their experience. The farmers with the highest experience in tea farming, that is above 51 years received little information and from the factory only. The fact that they have spent a long time in the enterprise coupled with the scarcity of information implies they are likely experienced.

Table 7: Rating (%) the effect of farming experience on the source of information

Characteristic	**Sources of information**			
No of years in tea farming	Fellow farmers	Radio/TV	Factory	All
1-10	16	23	25	29
11-20	27	45	24	38
21-30	38	14	23	14
31-40	13	9	18	9
41-50	7	9	9	10
51 and Above	0	0	1.0	0

Most farmers irrespective of the age groups and categories used the factory as their main source of information (Table 8). Old farmers, ≥ 71 years were the least/ used less of factory as the main source of information. The same was the case with the media (Radio and television) and fellow farmers. Owour (2005) similarly noted that farmer's mainly source information from the factory through extension officers.

There were fewer young farmers (Table 8), probably because mature farmers were unwilling to subdivide the pieces of their tea holdings to their children.

Table 8 : Rating (%) the effect of household head age on a particular source of information

Characteristic	Sources of information			
Age	Fellow farmers	Radio/TV	Factory	All
21-30	0	0	1	0
31-40	5	5	3	16
41-50	10	9	11	29
51-60	17	32	27	6
61-70	50	46	50	24.8
71-80	17	4	4	11
81 and Above	2	5	4	10

Gender

Gender affected the choice and use of information (Table 9). Female farmers fellow farmers to be their main source of information. This is probably because women are more interactive with their female farmers. On the other hand, male farmers used factory and mass media (radio and television) as the main source of information. This was probably because of the high levels of education and control of resources at farm levels. Sorensen *et al.* (1990) also noted that major decisions on tea production/farms were made by males.

A large number of male farmers used the factory, fellow farmers as well as radio as sources of information on tea. The females however sourced most of the information from fellow farmers. Men are in a better position to source for information since they are household heads and move whenever they want thus getting in contact with a lot of informed people. Female headed households were mainly widows, aged and with limited resources as well as interactions.

Table 9: Effect of gender of house hold head on source of information

Characteristic	Source of information			
Nature of H.H head	Fellow farmers	Radio/TV	Factory	All
	%	%	%	%
Male	61	91	79	86
Female	39	9	21	14

Source of Income

The numbers of farmers whose main source of income was derived from farming surpassed those who are self employed and those who are employed by the public sector (Table 10). Farmers who depended on farming as their sole income were leaders in seeking for information. This was probably because this category of farmers depended on farming and dedicated all their time compared to their counter parts.

Farmers who were involved in other off farm activities (business/self employed) had less time for their farms, which also affected their production levels. This is because farmers who are self employed spent most of the time in their side businesses which generate daily income and end up neglecting tea. Engoru *et al.* (2001) also observed that farmers who spend more time caring for their gardens got more benefits from them than those who did not under similar conditions.

Table 10 : The effect of major income source on the choice and use of a particular source of information

Characteristic	Source of information			
Main source of income	Fellow farmers	Radio/TV	Factory	All
Formal/Public Service	7	23	15	10
Business	15	18	13	33
Farming	78	59	72	57

Marital status of household head

Married farmers were more active with sourcing for information. This was probably because married farmers dominated or turned out to the majority in the study area. This meant that marital status (married) had a positive effect on the choice and use of information channels.

Most widows got tea information from the factory as well as fellow farmers. Women play a crucial role in family matters as well as taking up responsibilities in a home. This puts them in better positions to control the home even after demise of their spouses.

Table 11: Effect of marital status of household head on choice and use of a particular source of information

Characteristic	Source of information			
Marital status	Fellow farmers	Radio/TV	Factory	All
	%	%	%	%
Single	2	0	5	0
Married	63	91	69	86
Widow	32	9	18	10
Widower	3.4	0	8	5

N=206

Family Size

Farmers whose dependants ranged from 0-5 accessed information from at least 2 sources of information (Table, 12). Farmers with dependants ranging from 6-10 mainly received tea information from fellow farmers and the factory. Only 3 farmers had dependants which were above 10 persons and their sources of income included the factory. Mass media was second (radio and television). The high numbers of dependants in most cases translated into increased family pressure on the limited resources among farmers. In other instances, it ambiguously translated into having more school going dependants thus making school fees payment a priority at the expense of tea production.

Table 12: Family size and its' Effect on the Choice and Use of a Particular Source/Channels of Information

Characteristic	Source of Information			
Number of dependants	Fellow farmers	Radio/TV	Factory	All
	%	%	%	%
0-5	80	59	77	86
6-10	20	36	21	14
11-15	0	5	2	0

N = 206

Land Tenure

Land tenure system is the law or custom that relates to control and use of land by an individual or group of people. The tenure system greatly influences the organization and efficiency of agricultural production and the allocation of production resources (Ahmed, 2003). Most farmers owned the land they used for tea cultivation (Table, 13). Tea being a perennial crop, requires secure land ownership if farmers have to invest in the enterprise. Private land ownership favors the practice. and investment in tea industry. Farmers who had land title deeds accessed information from many sources (fellow farmers, the factory, and mass media).

Table 13: Land tenure system and its effect on the choice and use of information sources

Characteristic	Source of Information			
Land tenure system	Fellow farmers	Radio/TV	Factory	All
	%	%	%	%
Private/own	99	77	96	90
Communal	2	23	4	10

Farm Size

Land being a major factor of production, immensely affects the source of information. Most farmers had between 1-5 acres of land (Table, 14). Land is however scarce and is a major source of livelihoods for small scale farmers (Edriss. 2003). Most farmers accessed information mainly through the factory, fellow farmers, and mass media.

Since the survey focused on small holder tea farmers, only 1.7% of farmers had more than 10 acres of land and the major source of information was fellow farmers. This was surprising because such a farmer was expected to have several sources of information in order for his land to be more productive. The annual returns shows that tea enterprises enjoys better returns and may have a comparative advantage in Kenya highlands considering the low adoption of technology among smallholder (Owour *et al.*, 2002). The farm size also translated into the level of resource endowment since land is considered as a major asset among communities in western Kenya.

Table 14: Effect of Farm Size of Respondents on Sources of Information

Characteristic	Source of Information			
Farm size (acres)	**Fellow farmers**	**Radio/TV**	**Factory**	**All**
	%	%	%	%
1-5	93	96	96	95
6-10	5	4	4	5
7 -10	2	0	0	0

N = 206

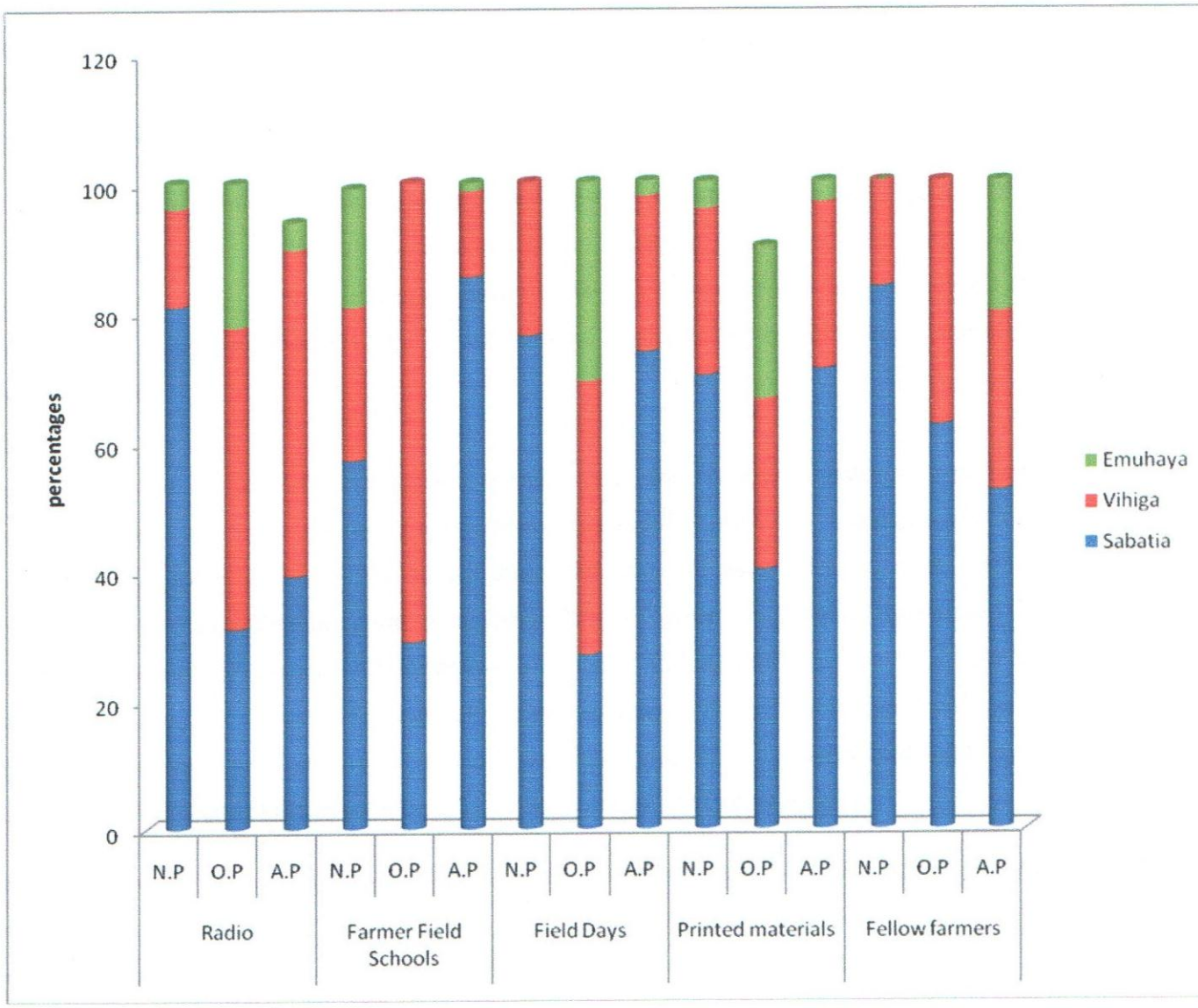

Figure 4: Farmers preference levels of the information dissemination channels

(N.P = Never preferred, O.P = Often preferred, A.P = Always preferred).

4.3 Farmer Preference of the Information Dissemination Channels

Farmers preferred a variety of sources of information (Figure, 4). Field days, fellow farmers and farmer field schools were the most preferred channels. Radio and printed material were however rarely preferred. Field days provide forum for sharing information on different farm practices and exchanging experiences, thereby encouraging farmer -to-farmer technology dissemination (Doss, 2003; Minja *et al.*, 2004; Florencia, 2006; Knowler *et al.*, 2007).

Oswald (2005) also noted that the channels provided farmers with opportunities for publicizing information and knowledge from on-farm testing and research observations and for obtaining feedback for improving future research programme interventions.

A large number of farmers in Sabatia District never preferred radio/ television (Figure 4). Even with such rating, radio and television appeared to be consistently preferred compared to other channels. Ismet *et al.* (2010) found mass media to be a preferred source of information. This indicates how much mass media is popular with farmers regard less of the agricultural enterprise a farmer practices.

Field days

Field days (FDs) are one of the extension approaches in which farmers gather at a particular farmer's plot and short, specific topics are demonstrated and discussed with extension agents and researchers (Campbell *et al.*, 1995). In the three districts field days were the most preferred channel for information dissemination. A majority (78%) of farmers in Sabatia District used field days as a dissemination channel of information. Minja *et al.* (2004) similarly found that field days are important tools for disseminating agricultural technologies to diversified farming communities and policy makers. David *et al.* (2009) also found that a majority of farmers used field days to acquire knowledge and skills related to pull-push technology (PPT) components.

Smallholder tea farmers in Emuhaya district often preferred field days, printed materials and radio as channels of information. Fellow farmers were always the preferred source of information among Emuhaya tea farmers. This was probably because such a source is cheaper and timely.
In Vihiga district, farmers often preferred all the five channels of information dissemination. This was probably because of the high yields experienced, encouraged farmers to seek for more information. Yapa (2005) similarly found that small holders greatly relied on neighbors and their fellow farmers, Radio/TV, News bulletins/ Leaflets, and a minimal on News papers for information.

4.4.0 The farmers' perceived constraints to crop yield among small scale tea

Lack of fertilizer

Farmers reported in adequate fertilizers as a major cause of the low crop yield. This was mainly in Sabatia district and Vihiga. The limited access to fertilizers was due to the high prices of the commodity. Some farmers however used the little fertilizer supplied by KTDA through the

factory on other competing crop enterprises. CPDA (2008) similarly noted that farmers perceive fertilizer prices imposed by Kenya Tea Development Agency (KTDA) to be high.

Lack of tea management information

Information is a major in-put for agricultural production. The amount of information supplied to small holders however depends on the availability of the source (frequency and duration) as well as the information level. Small holder tea farmers got most information from the factory. Owour (2005) found that a high fraction of farmers do not have adequate information on tea production technologies. A majority of farmers in Vihiga district (39%) reported less tea management information they receive responsible for the less yields experienced in the sector (Table, 15). In Sabatia and Emuhaya districts, the rating was 17.2 % and 5.3% respectively.

Poor prices

Poor pricing of tea was one of the major constraints in tea production (Table, 15). Most farmers felt that they were not making any profits because of low producer prices. Poor prices scored were rated by 14.2%, 10.2% and 10.5% of the farmers in Sabatia, Vihiga and Emuhaya Districts respectively.

Globally there is overproduction and oversupply of tea on the international markets (Owour *et al.*, 2008, TRFK, 2006). This together with poor and cheap quality teas from other countries has led to a drop in world tea prices. Kenya being a leading producer and exporter has been directly affected (CDPA, 2008). This coupled with the performance of the Kenyan shilling against the US dollar results in less and less returns to the small-scale farmer. All these internal and external factors are impact negatively on small-scale tea farming in Kenya (Anon, 2002).

Poor management practices/Poor crop husbandry

Farmers pointed out poor management practices to be the root cause of low crop yields among small holder tea farmers (Table, 15). The problem was felt more in Emuhaya district (73.7%) compared to Sabatia and Vihiga with 33.6 and 23.7% respectively.

Some farmers linked the poor practices to lack of information especially Vihiga district (39%). Other respondents also reported labour shortage especially during plucking as a short coming as far as tea farming and low leaf production in smallholder tea production is concerned. Collision (1987) noted that chronic labour shortages limit the adoption of new technologies particularly those with high labour requirements in peak periods. Owour (2005), found poor crop husbandry,

late supply of farm inputs (fertilizer), poor leaf collection programmes, drought, excessive rainfall, cold weather, and inadequate factory capacity to contribute to low leaf production in the smallholder sector of tea industry, in Kenya.

Other factors which were attributed to low leaf production included lack of credit facilities, and lack of tea in fills. In related studies, Gesimba *et al.* (2005) points out that lack of credit facilities is a major concern to the small holder farmers. The effect of this is an overall decline in quality of tea and hence low returns to producers and other players in the tea industry. Mwaura *et al.* (2005) also found that some of the other factors affecting the returns and the variation in return include efficiency in resource allocation and adoption of technologies.

Table 15: Rating (%) of factors contributing to low tea production among small scale tea producers

Characteristic	Factors leading to low crop yield			
District	Lack of fertilizer	Less management information	Poor prices	Poor management practices
	%	%	%	%
Sabatia	34	17	15	34
Vihiga	27	39	10	24
Emuhaya	10	5	11	74

N=206

4.4.3 Farmers perceived strategies for Improving Small Scale Tea Production

Most fertilizers are too expensive for farmers hence the negative effect on their yields. More fertilizers at subsidized prices are needed if farmers are to experience much better yields and the sector at large.

The need for training to be done more regularly was cited in Sabatia and Vihiga with 23.4% and 11.9% respectively (Table. 16). This encompasses different training methods which include demonstrations, and participatory analyses. The farmers reported lack of skills as a limiting factor to their actual yields. Annon (2002) noted that green leaf production in the small holder tea sub sector could be improved by improving first training.

The need for regular and clear information came out so strongly (Table, 16) especially in Vihiga (30.5%) as farmers tried to express their dissatisfaction. The same strategy scored 7.8% and 15.8% in Sabatia and Emuhaya Districts respectively. Farmers wanted more information on tea production at hand and in a usable form. They claimed to have outdated information which was provided more than seven years ago through the extension staff. Owour (2005) similarly noted that an increase in extension activities was necessary for enhanced yields. Targeting information to the demand areas will improve extension impact as tea is a perennial crop (Mwaura *et al.*, 2007).

Hiller *et al.* (2008) similarly found that easy accessibility of information has significantly increased the knowledge of the farmers. It is anticipated that a high level of dissemination of information on sustainable tea production will drastically increase leaf production among the small holder tea sub sector.

Table 16: Suggestions on how to improve small scale tea production

Characteristic	**Factors to boost small scale tea production**				
District	More fertilizer	**More training**	**Better prices**	**Improved mgt**	**More information**
	%	%	%	%	%
Sabatia	31	24	14	23	8
Vihiga	27	13	10	20	30
Emuhaya	5	0	5	74	16

N =206

Other factors which farmers thought would increase their production included better prices and, proper weighing scale at tea collecting center (TCCs). Farmers reported that some clerks were corrupt and interfered with the weighing scales while others were ignorant about tea practices.

CPDA (2008) similarly noted that the weighing scales at the TCCs were generally erroneous. Measurements done at the TCCs did not tally with on-farm measurements.

The main factors contributing to the high cost of production included; labour, cost of farm inputs particularly fertilizers, high cost of energy/fuel at the factories, high cost of transport due to poor roads and numerous taxes and levies (Anon, 2002). CPDA (2008) pointed out the marketing chain being lengthy, therefore calling for a critical review in order to identify gaps, find solutions for

them to help establish genuine and more authentic pricing of tea with special consideration to small-scale tea farming at the local levels.

4.4.4 Logistic Regression Model

Access to information through a specific source and channel (factory, radio, TV, fellow farmers) is considered as a dichotomous dependent variable that is influenced by some explanatory variables (socio economic characteristics of a farmer).

Table 17: Logistic regression results for factors that influence access to information among smallholder tea framers in western Kenya

Variables	B	S.E.	df	Sig.	Exp(B)
Constant	-6.602	1.085	1	.000	.001
YRS.FAR	-.033	.020	1	.095	.967
GENDER	-.935	1.247	1	.453	.393
LAND	-.006	.121	1	.959	.994
HHHEAD	1.514	1.215	1	.213	4.544
CRPS	1.114	.272	1	.000	3.045
DIST1	.073	.180	1	.684	1.076
DIST2	-.032	.042	1	.451	.969
EDUC	2.983	.418	1	.000	19.741

Key to Table 17

Independent variable: Access to information (No, Yes)

Access to information was mainly influenced by education and the number of crops grown by each individual farmer. These factors were positive and statistically significant at 10% level (Table 17). These were thus the main factors that most likely influenced the farmer's decisions to use a particular source and channel of information.

Farming Experience (YRS.FAR)

This had a negative influence on the choice and use of a particular source of information, implying that the more experience farmers had, the more relaxed they became and those with less experience were the opposite. In other words, the older farmers who had more experience in the

tea enterprise had an edge over their younger counterparts. This signifies that less experienced farmers were more active and yearned for more and more information so as to maximize their output since they had just ventured in the enterprise. These findings in a way concur with those of Dimara *et al.* (1998) who reported that younger farmers are more dynamic in the adoption of new farming techniques, while older farmers are more experienced and skillful but less energetic. Generally, the probability of highly experience farmers to access tea information is less than those with less experience.

Farm holding (LAND)

Land also had a negative influence on the choice and use of available sources and channels of tea information. In other words, a farmers' land holding does not directly dictate the output of this farmer. This is probably because output per unit area may be more important than overall yield per se. The probability of a farmer with large land holding to influence access to information is low.

Number of other crops grown (CRPS)

The number of other crops apart from tea, grown by a farmer positively influenced the choice as well as the use of information sources and channels. As hoped, the more crops a farmer had, the more he sourced for information in an effort to achieve maximum output. It was therefore concluded that the probability of farmers with large numbers of crops grown to access information is acute compared to those with less crops.

Distance to tea collecting centers (DIST1)

The model indicates that distance to the TCC has positive coefficients but was not statistically significant at 0.05% level. The results imply that the probability of farmers who live closer to the tea collection bandas to access information is much higher compared to those who move long distances to the collection center in search for information.

Education Level (EDUC)

The model indicates that education had positive coefficients and was statistically significant at 0.05%. The results imply that farmers with high level of education had more chances of access to information than their counterparts with lower level of education. Thus the probability of highly educated farmers to access information was higher compared to farmers with low education level, hence influencing the information decision made. Education turned out to be positive because the differences in education levels of the sampled farmers were at times visibly manifested both in the

different ways they applied various agronomic practices and in their approach to sourcing for information. This is in line with the findings of Mafuru *et al.* (1999) and Gemeda *et al.* (2001) who noted that more educated farmers easily learn new technologies, synthesize the information and apply it to the farming situation.

Gender of farmers (GENDER)

Gender was a non-significant variable with a negative relationship with the dependent variable. This could be due to male farmers having more access to information than female farmers.

4.5 Determinants of information dissemination on Tea production among small scale tea farmers

The ordinary least-square (OLS) method was used to determine the extent to which information dissemination affected tea production among small scale tea farmers.

Table 18: Ordinary Least-Square Estimates for Factors that Influence Tea Production among smallholder farmers in Western Kenya

Variable	Standardized Coefficients		t-value	Significance
	B	Std. Error	Beta	
Constant	5.431	2.125		2.556	.012
LNLAND	-.084	.187	-.057	-.448	.655
LNYRSTEA	.333	.171	.185	1.943	.055
LNDISNT1	.053	.107	.041	.493	.624
LNFERTIL	3.790	.730	.491	5.194	.000
LNARETEA	.254	.214	.154	1.188	.238
LNDEPEND	.151	.116	.108	1.301	.197
LNAGE	-1.022	.536	-.190	-1.908	.060
INFOR	-.146	.193	-.062	-.755	.452
LABOR	-.44703	.2106	-.187	-2.121	.0366
EDUC	-.00206	.1065	-.0017	-.019	.9845
GENDER	.16510	.2084	.0662	.7921	.4304

Key to Table 18

Dependent variable (φ) =Total quantity of tea (kgs);

$LnQ_c = In\theta + \alpha_1 In\ \lambda_1 + \alpha_2 In\ \lambda_2 \ldots\ldots \alpha_4 In\ \lambda_4 + \beta_1 In\emptyset_1 + \beta_2 \emptyset_2 \ldots\ldots \beta_4 In\emptyset_4 + \varepsilon$

Lnkilos = f (lnθ, lnld, lnyrstea, lndist1, lnfetl, lnareatea, lndepend, lnage, infor, lb, educ, gender) + ε

Independent variables

LNLAND: Natural log of total farm size (ha)

LNYRSTEA: Natural log of Years spent in tea farming (yrs)

LNDISNT1: Natural log of Distance to tea collection center/market (km)

LNFERTIL: Natural log of Amount of fertilizer applied (kgs)

LNARETEA: Natural log of Total area under tea (ha)

LNDEPEND: Natural log of Total number of dependants (no)

LNAGE: Natural log of Age of household head (yrs)

INFOR: Access to information (dummy: 0= no, 1= yes)

LABOR: Use hired labour or family (dummy; 0= no, 1= yes)

EDUC: Years spent in school ()

GENDER: Gender of household head (dummy: 0= male, 1= female)

The physical factors used in the model, farming experience, distance and fertilizer application statistically determined the technical efficiency in smallholder farms (Table 18). Age and gender were the only two non-physical factors that determined efficiency in tea production.

Non-physical factors including education level of a farmer, family size, hired labor, access to information among others were found to be non-determining factors of technical efficiency in smallholder farms. Most of the non-physical factors had shown positive association with technical efficiency of tea production, but with no statistical significance. The results imply that holding other factors constant, a unit increase of these factors will increase technical efficiency, but with different magnitudes.

Fertilizer (LNFERTIL)

Some of the physical and non-physical factors of production in (Table 18) indicate positive relationship with technical efficiency. The maximum increase of technical efficiency varied with fertilizer application, while the minimum increase varied with the adoption of technology. An

increase of 1 kg of fertilizer per acre will increase technical efficiency by about 3.4%, while a change in adoption (variety of fertilizer or adopting recommended technology such as weeding, pruning, spraying, among others) will result in about 1% increase in technical efficiency. The findings support the determinants of tea production obtained when estimating Cobb - Douglas production function (Edriss, 2003). This also signified increasing marginal productivity to this factor (fertilizer) which was significant at 5% level.

Information (INFOR)

Access to information which was predicted to determine technical efficiency in tea production proved otherwise. In other words, information was not significant at 5% level (0.452), and non-determining at the same time. One explanation for this is that farmers focused more on the major pressing problems like prices at which their tea was being bought by the factory, rather than information.

Distance (LNDIST1)

Distance to the market area had positive coefficients but had no statistical significance. This signifies increasing marginal productivity to distance. In normal production function, the feasible estimated C-D is as shown below:

$\varphi_c = 0.012\ (\text{Distance})^{.624}$ $\mathbf{t}\ (0.05) = 0.493\ R^2 = 0.442$

Labour (LABOR)

Labour in the model is taken as labour that is available to farming. LABOR is a paramount input as all farming activities in the study area are not mechanized. Labour becomes even more important when dealing with labour intensive crops such as tea where more weeding and plucking on time are required (Edriss, 2003). Accordingly, it was expected that households with hired labour would have more labour hence positive effect on tea production. The negative effect implied that the people who were hired on tea plantation were not effective hence a loss in the long run. CPDA (2008) also noted that, the laborers hired in the small scale tea farms were not permanent and were also involved in other activities that made their efficiency in tea plucking lower than that of plantation workers.

Farmer Experience (LNYRSTEA)

Farmers experience with tea production is an important factor that can affect information flow. If the experience of farmers with regard to information dissemination is bad, they adopt the new channel that has been introduced in the area. On the other hand, experience may enhance the speed of information flow if the farmer's experience has been that new information channels enhance profitability. Under these circumstances, experience will reduce the number of years it takes a farmer to cross to that pathway/channel. Information flow was statistically significant with 0.055 at 5% level implying that the more experience one has in tea farming, the more yields they attained.

Age (LNAGE)

Results indicate age having negative coefficients. But although it had a negative relationship with the dependent variable, it was statistically significant (.060). This meant that the older the farmer, the less yields and the younger a farmer is, the more yields. The findings were in agreement with Dimara *et al.* (1998) who reported that younger farmers are more dynamic in the adoption of new technologies, while older farmers are more experienced and skillful but less energetic.

Key to Table 18

Dependent variable (φ) =Total quantity of tea (kgs);

$LnQ_c = In\theta + \alpha_1 In\ \lambda_1 + \alpha_2 In\ \lambda_2 \ldots\ldots \alpha_4 In\ \lambda_4 + \beta_1 In\emptyset_1 + \beta_2 \emptyset_2 \ldots\ldots \beta_4 In\emptyset_4 + \varepsilon$

Lnkilos = f (lnθ, lnld, lnyrstea, lndist1, lnfetl, lnareatea, lndepend, lnage, infor, lb, educ, gender) + ε

Independent variables

LNLAND: Natural log of total farm size (ha)

LNYRSTEA: Natural log of Years spent in tea farming (yrs)

LNDISNT1: Natural log of Distance to tea collection center/market (km)

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CHAPTER FIVE

CONCLUSION AND RECCOMMENDATIONS

5.1 Conclusions

The study found out that although a number of channels were used to disseminate tea knowledge and information to smallholder, only a few were effective.

Factory, fellow farmers and the media (radio and television) respectively were predominant sources/channels of tea knowledge and information. A diversity (formal and informal) channels of information should be used to transfer information. Information on crop management and input supply was more available to farmers compared to that on marketing and record keeping.

Socio-economic factors contributed to the choice and usé of a particular source and channel, but the extent of influence however varied. Factors that influenced the choice and use' of information pathways in tea production included education, farming experience, age, gender, income, marital status of household head, nature of Household head, number of dependants, land tenure system, and farm size. The same factors are generally important for passing on agriculture knowledge and information in the sector as a whole system.

The Cobb Douglas production function indicated that fertilizer applied on tea plantations was highly significant implying that fertilizer is crucial in influencing the level of productivity.

Contrary to the initial speculations, the model indicated that information did not significantly influence productivity probably because of the limited number of extension staff in the region, were a bigger impediment that was experienced by most farmers.

5.2 Recommendations

The study established a number of sources of information as well as the different ways it was delivered to farmers. Most of the printed materials circulated among farmers were in English yet majority of the smallholder farmers had low level of education (primary and secondary). It is recommended that the technologies be disseminated to the small holder farmers through on farm courses based on demonstrations.

Since farmers moved long distances in search for information, there is need for resource centers in the area to serve as a common place for farmers to retrieve the necessary information. This is important to supplement efforts by extension staff.

Tea extension services should be intensified by developing an extension service that ensures that farmers are visited regularly.

Fertilizers turned out to be highly significant among the factors that influence productivity. Farmers however reported that fertilizers availed to them were too costly. If optimum output is to be realized, farmers need to apply more fertilizers on their tea plantations. It is therefore recommended that subsidies be provided on fertilizers to smallholder farmers so as to boost tea production in the sector.

The poor produce prices offered to farmers also strongly contributed to the low yield of tea. Increased producer prices would act as an incentive and motivator for farmers to intensify tea production. This would lead to increased income and improved living standards of farmers.

There is need for further research to critically analyze the production and marketing trends of tea among smallholder producers. This will further provide solutions as to why tea production is not stable among smallholder farmers and the sector at large.

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APPENDICES

Appendix 1: Questionnaire

A SURVEY OF FARMERS' ACCESS TO AGRICULTURAL KNOWLEDGE AND INFORMATION IN VIHIGA DISTRICT

Introduction

I am Victoria Mbigidde a second year student at Egerton University undertaking a master's degree in Agriculture Information and Communication Management. The purpose of the study is to generate knowledge that would be useful to all players in the tea sector. Any information shared will be treated with the necessary confidentiality.

Questionnaire no_____ Name of enumerator_____

Division_____

Banda_____

Name of Respondent_____

Date___/___/___

Section A. (Socio-Demographic Information)

1. Gender of household head
   1=Male ☐ 2= Female ☐

2. Age of household head (years)_____
3. Level of Education
   1=None ☐ 2= Primary ☐ 3= Secondary ☐ 4= Tertiary ☐
4. a) Nature of employment
   1= Formal ☐ 2= Business ☐ 3= Self-employed ☐ 4= Farming ☐
   b) Which one of the above is the main source of income?
   _____
5. Marital status
   1=Single ☐ 2=Married ☐ 3=Widow ☐ 4=Widower ☐
6. Nature of household head
   1= Male ☐ 2= Female ☐
7. a) No of children
   1= Male ☐ 2= Female ☐
   b) No of dependants _____

8. Type of household
   1= Permanent ☐ 2= Semi permanent ☐ 3= grass thatched ☐

9. Land tenure system (Please tick appropriately)

1= Private ☐ 2= Rent ☐ 3= Communal ☐

Section B. Farming experience

1.a)No of years spent in farming _____

b) No of years spent in tea farming _____

2. Land size _____ acres

3. a) Area of land under crops _____ acres

b) Area under tea _____ acres

c) Area of land under pasture _____ acres

4. a) What crops do you grow on your farm?

b) Rank the crops in order of production goal and give reasons

i) Cash Crop

Crop	Yield (last season)

ii) Food crops

Crop	Yield (last season)

4. a) What type and number of livestock do you keep on your farm? _____

b) Rank the livestock in order of importance and give reasons why you keep them.

Livestock	Reasons

Section C

Sources of Agriculture Information about tea and the methods/pathways of delivery

5. What are your sources of new information on how to improve your tea production? (Please tick appropriately)
   a) Fellow farmers ☐
   b) Ministry of agriculture extension workers ☐
   c) Non government organizations ☐
   d) Radio/ television ☐
   e) Printed materials (news papers) ☐
   f) Factory outreach ☐
6. Rank the sources of information (above) in order of importance and indicate what you learn from these sources.

Source of Information	What was Learned last year
1	
2	
3	
4	

Farmers' perception of the services delivery

1. How do you rate the tea extension services in the current system of extension?

1= very good ☐ 2= good ☐ 3= fair ☐ 4= poor ☐

2. Give suggestions on how to improve on the service delivery.

_____

_____

3. What methods do they employ during training? (Please Tick appropriately)
   1= Lectures/discussions ☐ 2= Demonstrations ☐ 3= Field days ☐
   4= Farmer exchange visits ☐ 5= others (Specify) ☐ 6= Printed material ☐

Section D

Farmers' knowledge on the recommended tea practices and how they use the technologies

1. a) Which of the following management practices on how to improve tea production do you know? (Tick)
   b) Which ones are undertaken on your farm? (Ask & observe)
   c) Give reasons for your practice

Recommended	undertaken	Not undertaken	reasons

Management practice			
Spacing/gaps			
clone type			
weeding			
Pruning cycle (period and method)			
Table formation			
Fertilizer type and rate			
Pests and diseases			
Plucking/picking			

Farmers' access to use of agricultural knowledge and information
Flow of agricultural knowledge to farmers

1. What type of information do you get from these sources?
   Table 1: Types of information delivered by various sources (Tick where appropriate)

Source	**Crop management**	**In-put supply**	**marketing**	**Record keeping**	**Others (specify**
Local government					
KARI outreach					
Factory extension					
NGOs					
Radio/TV					
Farmer groups					
Individual farmers					
Others (specify)					

Section E
Tea production

1. a)What is your main objective of growing tea?

1= Financial ☐ 2= Inherited ☐ 3= Government policy ☐ 4= others ☐

b) How many tea bushes do you have on your farm? _____ Bushes

c).How much tea did you deliver to the factory last year?

____ Kgs

d).What is the recommended plant density for tea in this region?

_____

e) How did you come to know about it?

1 _____

2 _____

3 _____

f) Do you apply this recommendation on your farm when planting? Yes ☐ No ☐

g) If no, why?

_____

_____

2 a) Do you hire people to work on your tea enterprise? Yes ☐ No ☐

b) If yes for what practices?

_____

_____

_____

Assessment of extension services and training

1. Do factory extension officers visit your farm? Yes ☐ ☐ No

If yes, how often?

1= Monthly ☐ 2= Quarterly ☐ 3= Twice per year ☐ 4= once a year ☐

2) Number of visits last year _____

3) What type of information did they bring during last visit?

_____

_____

_____

Views of smallholders on the factory extension system

1. How do you get extension staff to visit your farm?

   1= scheduled visits ☐ 2= invitation ☐ 3= random visits ☐

2. How would you rate the existing extension structure in the tea industry?

1= Too many officers ☐ 2= Too few officers ☐ 3= enough ☐

3. Number of field days organized by the factory _____

Adequate ☐ Inadequate ☐ Too few ☐

Smallholder views on additional sources of technology and methods of information transfer.

1. How often should tea production training be done for farmers?

   1= Twice in a year ☐ 2= once in a year ☐ 3= others (specify) ☐

2. Which method of extension is most effective for you?

   1= Single farmer approach ☐ 2= Group /Baraza approach ☐ 3= others (specify) ☐

b) The credit scheme/ factory where you buy inputs? _____

4a) How would you rate the level of contact between your household and KTDA activities?

1= satisfied ☐ 2= fairly satisfied ☐ 3= not satisfied ☐

b) What is the overall level of satisfaction in terms of information you get about tea?

1= satisfied ☐ 2= fairly satisfied ☐ 3= not satisfied ☐

Dissemination pathway preferences

Given a choice of selecting a dissemination pathway for receiving information about tea, indicate in the table below your preferred dissemination pathway

Dissemination pathway	**1=never preferred**	**2=Often preferred**	**5=Always preferred**
Radio			
Farmer field school			
Field days			
Fellow Farmer			
Pamphlets			
Others (specify)			