

**ECONOMIC ANALYSIS OF VANILLA PRODUCTION AND
MARKETING: A CASE STUDY OF BUKOBA DISTRICT, KAGERA
REGION, TANZANIA**

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BY

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**A DISSERTATION SUBMITTED IN PARTIAL FULFILMENT OF
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ABSTRACT

This study analyses the economics of vanilla production and marketing in Bukoba District. The survey was conducted on a sample of 120 vanilla growers and complimented by secondary data collected from key organizations in the industry. Pre-tested questionnaires were used to interview farmers and key organizations. The data obtained was used to describe the structural and socio-economic factors that influence or motivate farmers to produce vanilla and examined the role of institutions in production and marketing of vanilla. By means of gross margin analysis the study further examined the relative competition of vanilla with the most important crop enterprises in the district. It also determined the potential profitability of vanilla in terms of cost efficiency in both production and marketing activities. The estimation of cost efficiency for vanilla profitability was done by the limited dependent variable (LIMDEP) VERSION 8.0 computer program developed by Greene (2002) using stochastic cost frontier function Cost efficiency was estimated using translog cost function. The results showed that vanilla growers in Bukoba District have household characteristics common to most rural household settings elsewhere in Tanzania. Gross margin analysis indicated that the vanilla enterprise was far more profitable than any other crop enterprises such as coffee, tea, banana and maize production. Vanilla production involved few participants. These included farmers, NGOs and private buyers. In this situation, price setting mechanism resulted into monopolistic rather than competitive prices. The results from the estimation of translog cost frontier showed that farmers were inefficient by Farrell's measure of cost efficiency. The average level of inefficiency was 11.4%, and ranged from 41.2% to 3.0% for individual farmers. On the average, capital inputs, hired labour, and land are slightly

under-utilised. The results indicate that providing rural education, expansion of farm size and the use of modern capital inputs of production can reduce cost inefficiency. However, vanilla production and marketing is cost efficient to enhance profitability. Based on the study findings, three areas aimed at improving vanilla production and marketing need to be addressed. These are development/improvement of extension services, development of better research and development facilities, and strengthening of business and marketing networks.

DECLARATION

I, Venance Mutayoba, do hereby declare to the Senate of Sokoine University of Agriculture that this dissertation is my own original work and that it has never been submitted for a degree award in any other University.

Signature.....*Mutayoba*.....

Date.....*21/7/2005*.....

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As always however, the author remains fully responsible for all errors in content and misinterpretation of this work.

DEDICATION

I dedicate this dissertation to my father John Rwegoshora and my mother Maria Kokugonza who laid the foundation of my education.

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LIST OF ABBREVIATIONS AND ACRONYMS

ARDI	Agricultural Research Development Institute
BDRDP	Bukoba District Rural Development Programme
ESCO	Edm. Schluter & Company
ESRF	Economic and Social Sciences Research Foundation
FSR	Farming System Research
IMF	International Monetary Fund
IVA	Ieder Voor Allen
KAEMP	Kagera Agricultural and Environmental Management Programme
LIMDEP	Limited Dependent variables
MAYAWA	Maendeleo ya Wakulima (Farmers' Development)
PSDP	Private Sector Development Programme
TARP II	Tanzania Agricultural Research Programme Phase II
TIC	Tanzania Investment Centre
TIDESO	Tweyambe Ishozi Development Society
URT	United Republic of Tanzania
BDRDP	Bukoba District Rural Development Programme
RALDO	Regional Agriculture and Livestock Development Officer
MAFS	Ministry of Agriculture and Food Security
KVFA	Kagera Vanilla Farmers' Association

CHAPTER ONE

1.0 INTRODUCTION

1.1 Background

In Bukoba District (Urban & Rural); coffee has been the most important and traditional cash crop. In the last five years, the current prices of coffee in Kagera have dropped from US\$ 0.30 to the current US\$ 0.09 per kilogram (Kaiza et al., 1999). This is equivalent to 322% drop in price. Due to these low coffee market returns, most farmers in Kagera region in general (including Bukoba District) no longer either establish or maintain their coffee plots and instead they have reverted to production of vanilla as an alternative cash crop. Although rural families are attracted to off-farm activities, the vast majority of the Bukoba District population remain economically dependent on agriculture (Ndege, 2002). But according to MAYAWA (2002a) (Maendeleo ya Wakulima or Progress for Farmers) farmers see no hope anymore with coffee.

In order to stimulate the process of sustained agricultural production in Bukoba District; the Tanzania government and non-governmental organizations (NGOs) such as MAYAWA and Kagera Agricultural and Environmental Management Programme (KAEMP), among other initiatives have started to support vanilla growers in order to promote it as an alternative cash crop alongside coffee production in the area. This initiative is in line with the Tanzania policy framework for poverty reduction strategies as defined in the Tanzania Development Vision (TDV) to 2025, the National Poverty Eradication Strategy (NPES), the Poverty Reduction Strategy Paper (PRSP), the

Agricultural Sector Development Strategy (ASDS) and the Tanzania Assistance Strategy (TAS).

Preliminary studies indicate that the cost-benefit ratio of vanilla crop is about US\$ 17,800.00/ha for green beans as compared to that of coffee crop which is about US\$ 13.11/ha (MAYAWA, 2001). Therefore enhancing vanilla production and marketing will improve living conditions of vanilla growers in Bukoba District.

The vanilla plant (*Vanilla fragrans*) is a large, climbing tropical vine that belongs to the orchid family. The vanilla orchid is the only one of the 35,000 species in this family to produce an edible fruit (Purseglove, 1972). The high value plant is cultivated for its sweet, exotic flavour, which is added to dairy products (yoghurt, ice cream, chocolate, and pudding), beverages (sodas, liqueurs), baked goods (cakes, biscuits), confections, perfumes, soap, shampoos and cigarettes (Anand et al., 1986).

1.2 Problem statement and justification

In Kagera Region agriculture contributes about 50% of the regional economy (Bureau of Statistics, 1997). The total arable land amounts to about 1 868 750 ha, while an average of 15 percent of this (285 045 ha) is cultivated annually. About 116 782 ha are under permanent crops namely banana, coffee, tea, cassava and other non-traditional crops such as vanilla. Some 168 263 ha are annually planted with seasonal crops namely beans, maize and sorghum. Traditional major export crops in Kagera Region and particularly Bukoba District are coffee and tea. Banana and beans are principle food crops. In some parts maize and cassava are used as food crops due to poor performance of banana (KAEMP, 2000).

The search for alternative agricultural crops has been a persistent challenge facing smallholder farmers in Bukoba District. This problem has prompted farmers to start vanilla cultivation due to the fall in price of coffee, a traditional cash crop for more than half a century. Coffee serves as the source of income for about 70,000 families, more than a third of the families in Kagera that depend on the crop for existence (RALDO, 1994). Vanilla has been introduced recently and farmers are now showing great interest due to the high price incentives. Vanilla beans are now sold at around USD 10 per kilogram for first grade green whole beans (beans longer than 12 cm) and US\$ 2 per kilogram for second grade bean (beans shorter than 12 cm).

The first attempts to introduce vanilla production in Kagera Region were made by MAYAWA an NGO in 1997 under the leadership of Juhudi Development Association (JUDEA) and a Belgian NGO Ieder Voor Allen (IVA). In 1999 KAEMP made other attempts. Currently both projects cover a total of 19 villages within 38 farmers' groups with a total of 2,000 vanilla farmers (MAYAWA, 2002).

The emerging importance of vanilla as an alternative cash crop is not limited to Tanzania alone. In recent report, Sabodo (2004) estimated that during 2001 the global trade of natural vanilla accounted for USD 103.18 million giving direct and indirect employment to many thousands of persons both in the producing and consuming countries.

Bukoba District appears to be a high potential area in production of vanilla owing to favourable climatic conditions. Despite its importance to the economy, it is evident that its potential remains to be exploited. Developing agriculture requires endless efforts to get

alternative crops to substitute traditional cash crops whose prices are falling. Little economic research has been conducted on vanilla in Tanzania. This is because of the high concentration of research work and funds on coffee. This study concentrates on the economics of vanilla production and marketing as the alternative cash crop for coffee that has great prospects to increase income for rural people in Bukoba District.

1.3 Objectives

1.3.1 General objective

This study seeks to determine to what extent is the shift from coffee to vanilla production in Bukoba District is profitable.

1.3.2 Specific objectives

- i. To describe the structural and socio-economic factors of the household that influence or motivate farmers to produce vanilla.
- ii. To examine the role of institutions in production and marketing of vanilla.
- iii. To examine the relative competitiveness of vanilla with the most important crop enterprises.
- iv. To determine the potential profitability of vanilla in terms of cost efficiency of production and marketing.

1.4 Hypotheses

The study builds on three basic hypotheses

- i. Structural and socio-economic factors of the household have no influence on farmers' crop choice.

- ii. Institutions have no significant influence on vanilla production and marketing.
- iii. Vanilla enterprise is not competitive with other most important crop enterprises
- iv. There exists no significant influence of cost inefficiencies on profitability of vanilla enterprise.

1.5 Organization of the study

This thesis is organised into five chapters including this introduction. Chapter two is a review of relevant literature. Chapter three describes the theory and methodological framework. Chapter four gives the major findings and discussion of the study. Finally, chapter five evaluates and presents the economic implications of vanilla production and marketing on smallholder farmers and summarises concluding remarks and policy recommendations.

CHAPTER TWO

2.0 LITERATURE REVIEW

2.1 Overview

Agriculture is the leading economic sector in Tanzania. It accounts for about 50% of GDP, 75% of merchandise exports and is source of food and provides employment opportunities to about 80 percent of Tanzanians. It has linkages with the non-farm sector through forward linkages to agro-processing, consumption and export; provides raw materials to industries and a market for manufactured goods. The sector is well focused with a strong position in several major export markets.

The country is covered by 88 million hectares of suitable agriculture land of which 60 million hectares are suitable for livestock production. Only 5.5% of the Tanzania's arable land is utilized, mainly by small-holder farmers. With irrigation, Tanzania can become a dominant grain exporter.

A future vision for Tanzania agriculture sector is to have a highly efficient and economically viable market-driven large scale farming sector, characterised by a wide range of farming enterprises of varying sizes having a positive influence to the rest of the economy (TIC, 2003).

Tanzania produces both arabica and robusta coffee on a commercial scale. Since the 1930s, coffee has been the most important cash crop in Bukoba District. In 1995 to 1999 the export producer prices per kilogram of coffee have dropped from Tshs 2846 to 1000 for Arabica coffee and Tshs 929 to 250 for Robusta coffee (MAFS, 2000) (Appendix 3). This is equivalent to a 184.6% and a 271.6% respectively drop in price. Due to these low coffee

market returns, most farmers in Kagera region in general (including Bukoba District) no longer either establish or maintain their coffee plots (Kaiza et al., 1999) and instead they reverted to production of food crops such as banana, yams, sweet potatoes and cassava. In addition, farmers started to grow vanilla as a cash crop.

In neighbouring Uganda, estate vanilla production began in the 1950s, but small growers, mainly in Mukono District, began planting Vanilla for export in the late 1980s. The apparent success of the Vanilla growers as a cash crop in that part of Uganda encouraged farmers in other parts of the country and outside the country including Bukoba District to start growing the crop (International Horticulture, 2003).

2.2 Vanilla: description, agronomy and uses

2.2.1 Crop description

Vanilla, an important and popular flavouring material and spice of the fully-grown fruit of the orchid *Vanilla fragrans* [Salisb.] Amens [syn. *V. planifolia* Andrews] (Vanilla Consumer Trends, 2004). It is harvested before it is fully ripe, after which it is fermented and cured. There are two important species of Vanilla viz. *V. planifolia* and *V. pompana*. The *V. planifolia* has opposite, sessile leaves of 10 to 23 cm long which are oblong in shape, while the *V. pompana* has large, flat sub-sessile leaves that are alternate. The adventitious roots produced along the stem permit the vine to cling on a supporting tree or other supports to a height of 10-15 m. The crop is indigenous to South-Eastern Mexico, Guatemala and other parts of Central America. Its fruits are usually referred to as vanilla beans (Purseglove, 1972; 1981, Crop Distribution, 2003). The crop is currently grown in many other parts of the tropical-world, especially in the Malagasy Republic [Madagascar],

Reunion, and Comoro Islands (Purseglove, 1981). In Uganda mainly small-scale farmers grow the crop as a good source of income in the area (Acland, 1971; Official Website Uganda Vanilla Industry, 2002). In Tanzania the crop is now grown in Bukoba District and Zanzibar (Crop Distribution, 2003). To-date, the most important exporters are Madagascar and Reunion [formally called Bourbon] (Purseglove 1972, 1981, *Vanilla Fragrans*, 2003).

2.2.2. Agronomy

Vanilla requires a warm climate with frequent rains and prefers an annual rainfall of 1500-3000 mm, but with two drier months to check vegetative growth and bring the vines to flowering. The optimum temperature for the crop is 21-32°C with an average of around 27°C (Purseglove, 1981, www.iniaagronet.com, 2003). Vanilla grows best on gently slopping land with light friable and free draining soils, and thick surface layer of humus and mulch. Land preparation for vanilla crop should take into account the need for support or stake upon which the crop can climb. This can be either non-living or living. The living supports (trees) are the most preferred since the non-living structures such as woodworks are subject to decay and damage by termites, necessitating their replacement at regular intervals. Furthermore, such structures do easily damage the succulent vines, especially under strong winds. The crop is preferably established by planting shoot cuttings with 18-24 internodes to allow early flowering than shorter cuttings. Cuttings less than 30 cm in length should be avoided; as such cuttings will take 3-4 years to flower. If possible 2-3 m cuttings should be used as these will flower in 1-2 years (Purseglove, 1972). Vanilla crop should be planted at a time when the weather is not too rainy or too dry [www.iniaagronet.com, 2003]. If the crop is mono-cropped, vanilla cuttings may be spaced at 3.0 m between plants and 1.5 m between rows in pits of size 40 x 40 x 40 cm.

Decomposed mulch or other decomposable organic materials mixture of grasses and leguminous species should be the main source of nutrients to vanilla crop. Animal manures should not be applied, as the orchids do generally not favour them. However, due to the lack of financial ability, farmers in Bukoba District cannot buy and apply artificial fertilizers and pesticides (MAYAWA, 2002). Therefore, the vanilla crop in this area is mainly produced organically, which may be an added advantage to the crop growers who intend to grow the crop for export.

Due to the peculiar structure of flowers, self-pollination is impossible hence artificial (hand) pollination has to be practiced for proper fruit set. Under proper agronomic care the vanilla crop starts to produce beans after 3-4 years and may continue the commercial production up to 9-10 years (Vanilla Production, 2004). Although not practiced in Tanzania, growth regulators such as 2,4-D [2,4-dichlorophenoxyacetic acid], dicamba [2-methoxy-3, 6-dichlorobenzoic acid] and IAA-IBA [indoleacetic acid-indolebutyric acid] does induce the development of parthenocarpic fruits and give a high percent of fruit-set. Vanilla beans produced by application growth regulators are of high quality in terms of their sizes and vanillin content. Thus from such studies it has been proposed that application of growth hormones in vanilla production can substitute hand-pollination, and therefore save time in pollinating, picking and handling (Gregory et al., 1967). Vanilla yields vary depending upon the age of the vines, environmental factors, agronomic factors and the cropping system used in the area. The time between flowering and harvesting is 6-9 months (Purseglove, 1981). The pods should be harvested when they are fully grown and as they begin to ripen, when the tips become yellow. After the vine starts bean production (from the third year), the yields continue increasing till the seventh or eighth year.

Thereafter, the production starts to decline till the vines are replanted. This is usually within another 7-10 years. At 3.0 m by 1.5 m spacing about 2200 vanilla plants can be planted in one hectare (under monoculture system). Under appropriate agronomic and ecological factors each plant is expected to yield about 500 g of green beans per year. A good vanillery, however, can yield between 500 and 800 kg of cured beans per hectare per annum during a crop life of about 7 years (Purseglove, 1972 and 1981, Crop Agronomy, 2003; Spices, 2003). Much lower vanilla yields are reported in Bukoba District due to agronomical reasons and probably due to use of low yielding vanilla varieties and inadequate extension services (MAYAWA, 2002).

Vanilla is affected by a number of pests and diseases. But diseases are more serious than pests attack. The diseases include root-rot [*Fusarium oxysporum f.sp. vanillae*], anthracnose [*Colaspora vanillae*] and leaf spot [*Colletotrichum vanillae*]. Among the pests, chicken sometimes cause damage by scratching the mulch kept around the vines and cause injuries to the roots. Latest studies by Woomer [1997] indicate that the crop is also attacked by water hyacinth weevil [*Neochetina eichhornia*].

Trees such as *Jatropha carcus*, *Gliricidia septium*, *Erythrina abyssinia* and *Bauhinia variegata* are widely used to support climbers such as vanilla, to provide shade to crops and maintain soil fertility (MAYAWA 2001). In addition to lack of knowledge of the silvicultural management of *E. abyssinia* and *B. variegata*, these indigenous tree species are very slow growing which cannot adequately support vanilla crop in a given time. In contrast, *G. septium* a very fast growing tree improves soil fertility and leaves are suitable for animal fodder. In addition, its silvicultural management is well documented. Although

Jatropha is fast growing and has many uses, its silvicultural management in its areas of introduction is not well known.

2.2.3 Marketing and utilization

Cured whole beans are not processed and sold at village level. In Bukoba District, MAYAWA is a sole buyer of vanilla grown in the area (thus vanilla marketing is monopolistic). The NGO buys vanilla whole beans and uses the "Bourbon type" (one of the traditional methods) for curing vanilla (MAYAWA, 2002). In countries such as Madagascar, the largest producer of vanilla, the market prices of one kilogram of traditionally cured beans rose from US\$ 72 in 1992 to a record high of US\$ 150 in 2002. According to the Trade Fair (2002), the world vanilla market, there is still considerable room for new suppliers who produce beans of superior quality and provide consistent quantities.

According to MAYAWA (2002) vanilla can be used as flavouring agent for some foodstuffs prepared at village level. But in general terms vanilla extract (vanillin) usually develops during the curing process. The vanilla beans, extract, tinctures, and resinoids are used as food flavours for ice cream, pudding, cakes, chocolates, baked goods, syrups, candies, liqueurs, tobacco, soft drinks, etc (Markets of Vanilla, 2003).

2.3 Overview of non-traditional exports

Non Traditional Agricultural Exports have been seen as an ideal complement to the falling traditional agricultural exports in most developing countries (Kasente et al., 2000). In Gutierrez (1999), it is reported that policy makers in developing countries like Tanzania

tend to enact macroeconomic policies designed to ignore the diversity of agriculture and its potential to increase long run growth rate by enhancing country's export base. Employing a theoretical model dynamics of two non-traditional sectors and long-term economic growth of a developing country, Gutierrez's work illustrates that, growth in highly perishable agricultural exports and not domestic production of manufactured goods, can potentially lead to higher economic growth rates. The model was employed to fruit and flower industries in Colombia. In analysing the impact of trade agreements and multinational companies in the Chilean economy, Becker (1998) reports that the non-traditional agricultural sector (fruits, vegetables, spices) became an important sector of the national economy while traditional sector of small farmers has weakened considerably partly as a result of lack of government support. Although very important, however the sector had no dominance in agricultural sector. This could closely relate to Tanzania where growth in contribution of non-traditional exports has increased over a ten-year period raising from 24% in 1993 to 49% in 2001 as contribution to total exports. Non-traditional agricultural products envisaged in the "other exports" has grown from 6% in 1993 to 31% in 2001 as contribution to total exports (Bank of Tanzania, 2001).

In finding out solutions to rural crisis in Mexico Torres (1998) reported that expansion of the existing non-traditional export base given available market would resolve the crisis significantly through improved income and enhanced employment level. Gonzalez (1997) studied on possibilities of survival of small-scale agriculture in an adverse economic and social realm in Costa Rica. Findings suggest a shift of attention towards promotion of non-traditional export products, which are less capital intensive as a means to sustain the

majority in small farm sector in the face of the new open trade and global economy scenario.

Non-traditional crops have certain market characteristics and other properties that provide prospects for favourable expansion of future trade (Townsend, 1999). Several of these have been highlighted by Jaffe and Morton (1995) as: high income elasticities of demand, greater potential for the development of domestic markets, intra regional trade and more favourable international markets.

2.4 The role of crop diversification in agriculture

Crop diversification is supposed to be a step towards agricultural development. It has the effect of reducing the risk in crop production caused by fluctuations in market related variables. For example; agriculture supports diversification because prices of traditional export crops are low. Diversification is also a step towards market-oriented production which means farmers will not only be producing for their family's consumption but for the market as well (World Bank, 1994; URT, 2001). Andrew et al., (2001) summarized the roles of crop diversification as to ensure security in basic food items, to increase and stabilise earnings from agricultural exports and lastly to reduce import dependence on products where a country has a comparative advantage without losing insight of the primary objective of increasing farm income. It is in this context that KAEMP and MAYAWA promote vanilla plants for crop diversification in Kagera region.

2.5 The theory of production

In Encyclopædia Britannica (2004) the theory of production has been defined as an effort to explain the principles by which a business firm decides how much of each commodity that it sells (its “outputs” or “products”) it will produce, and how much of each kind of labour, raw material, fixed capital good, etc., that it employs (its “inputs” or “factors of production”) it will use. We have the assertions that we have a producer who seeks to maximize profits or minimize costs subject to producing a given output level in a production process. (Henderson et al., 1995). The Production process is the transforming of inputs into output. In most cases a producer uses several inputs such as capital, labour, land etc. to produce an output. Apart from profit or return maximization, Boehlje et al., (1984) added that other goals of the farmer are increasing net worth, controlling a larger business or farm, reducing borrowing needs, increasing family living and leisure time, having a neat and well kept farmstead and providing community service.

A production process is cost efficient if it costs less of the inputs by producing more of the output (Ibid). This can be explained by the optimisation behaviour of the producer (Koutsoyannis, 1992). The behaviour is under the assertion that a producer wants to maximize output for a given cost or minimize cost for a given output level. The maximization of output is a proxy for profit maximization. Output maximization is constrained since resources are limited, and if available there could be a problem of improper input combination as a result of poor decision-making. In this case it could be worth noted that fixed costs do not play a direct role in optimising decisions. Once the production unit established, fixed costs must be paid for.

To determine the profitability of alternative production opportunities, the physical data must be combined with price and cost information as well as data on the availability of various land, labour, and capital resources. Thus, it is necessary to combine the information provided by the appropriate physical and biological sciences with price information and the appropriate decision making procedures in making production decisions for the farm firm (Boehlje et al., 1984). To get reliable and meaningful estimates it is essential to include all the relevant variables used in the production process. Factors to be considered in this study are as follows:

Labour is one of the factors of production considered to influence production. Whatever output is produced i.e. vanilla, labour must be applied. In many instances labour is measured in Mandays, i.e. the amount of work done in a day usually for 8 hours by an average adult man. Considering a lot of agronomic practices of vanilla like careful planting, mulching, manuring (compost), hand pollination and attentive cultivation the crop could be labour demanding.

Capital. The non-availability of capital for the purchase of physical inputs such as farming tools and low levels of technology are among the major factors facing production in developing countries leading to underdevelopment of agriculture (Senkondo, 1980).

Land. According to Kaiza et al., (1999) agricultural land ownership is still guided by the traditional system of land ownership. Individual rights to agricultural land in the village are well recognised and respected. In this system an individual may occupy a piece of land provided that the piece of land is not occupied by anyone else. Another possibility is the

acquisition through inheritance or purchasing. Farmland/plots are normally unsurveyed and lease system is not widely in use yet. Plans for village boundary demarcation exercise are necessary to enable and help villagers make and adopt their own land use.

2.6 Farmers' incentives and motivation to crop production

Most of the studies emphasize more on the price, price policy and market opportunity factors as the main reasons in the decline in the crop production trends in Tanzania. Theory suggests that there is no single factor, which determines the farmers' decision in the production and resource allocation process (Jones and Mutuura, 1989).

Smith (1989) reported that, there are two ways to motivate farmers to divert labour and resources to production of a cash crop; state directives or material incentives. In the study of the cost of differential roles in African agriculture, Tibaijuka (1994), reported that, due to either economic pressure or profit motivation, 30 percent of the farmers in a random sample of 200 smallholder banana-coffee farms in the Kagera region of Tanzania had adopted a more liberalized division of labour, and engaged in a number of operations including attending horticultural farm enterprises.

2.8 Vanilla production

World production of cured vanilla beans averages between 2000-2400t per year (Vanilla Consumer Trends, 2004). Madagascar is the largest producer, with 1000-1200t per year, followed by Indonesia, which has just expanded its production to 700-800t from 400t in the late 1980s. The third and fourth largest producers are Comoros, with average production of 200t per year and Uganda (100t) respectively. Small producers include

Tonga (40t), Re-union (20t), French Polynesia (20t) and Mexico (10t). In MAYAWA Annual Report (2003), it is reported that average production of vanilla in Kagera region is a mere ton.

2.9 Factors affecting cash crop production

There are a number of factors affecting cash crop production. These include low producer price, institutional bottlenecks, lack of technical knowledge and inputs, inadequate financial services and national policy framework. Others are availability of market and research services and good infrastructure such as communication systems. There are also the influences of weather, world market price, land scarcity, cultural factors and other exogenous events.

2.10 Constraints to vanilla production

Vanilla, like other spices is a very labour intensive crop. Vanilla has to be hand-pollinated to achieve a good yield and the crop has to be harvested over a long period of time. These make them ideally suited to the small producer. However, overstretched extension services are not able to help with agronomic advice. And politically too, it must seem more desirable to concentrate government efforts on food crops which, affect many growers and a much larger acreage. The Ministry of Agriculture and Food Security and other stakeholders do not have enough extension officers to cover the country.

But despite these problems, production of vanilla has some advantages. Vanilla can be grown very successfully intercropped with either other cash or with food crops. In Bukoba District vanilla has almost been introduced as a garden crop. It is intercropped in banana

and coffee plantations. Vanilla can provide a good cash return from an area as small as 5m² (SPORE Bulletin, 1992).

However, small individual producers have some disadvantages in the crop marketing. In Bukoba District three vanilla traders other than MAYAWA have just started buying vanilla. Because MAYAWA has been the only buyer of vanilla it holds a nearly absolute monopsony over the crop. Because farmers are isolated on their remote farms, they easily fall prey to unscrupulous private buyers and middlemen. But growers grouped together either in formal organization or in more informal groups, can exert a much more collective power (CERES, 1994).

2.11 Pricing policies for agricultural crops

In a free market economy the price of a commodity or service will mainly be determined by demand and supply. Kuzilwa and Mmbaga (2000) and Morgan (1994) reported that, the inability of individual developing nations to provide wide scale commodity price support and the continual renegotiation of international commodity agreements have endangered a search for alternative mechanisms to reduce price volatility for soft commodities. One possibility is the use of future markets.

2.12 Agricultural crops marketing

2.12.1 The theory of marketing

The need for price and cost data to make adequate farm management decisions underscores the necessity for expertise in the field of marketing (Kohls et al., 1980). To maximize income or even to survive, farmers must not only produce the crop or livestock production

efficiently, but they must also buy the inputs and sell the product at the prices that result in a profit. The ability to analyse the market and to reflect changing market expectations in production schedules, input purchasing and product selling strategies are essential components of profitable farming. Hence the farmer must be aware of the supply and demand relationships for the particular product, the impact of consumer incomes and the availability of substitutes on product prices as suggested by income and cross price elasticities of demand and the expected response of other producers to current prices.

Numerous other decisions require knowledge of market relationships and market phenomena (FAO, 1990). Such choices as which marketing channels to use, whether or not to sell grain at harvest or dry and store it for sale at later date are but a few examples. The evaluation of the profitability of alternative hedging strategies or the potential for contracting part of the corn or any other crop like vanilla for future delivery also requires detailed analysis of market relationships and price expectations.

2.12.2 The marketing concept

Dixie (1989) relates what he described as a definition of marketing, as the series of services involved in moving a product (or commodity) from the point of production to the point of consumption. However this definition omits two key elements i.e. a customer orientation and in-built sustainability. Gaedeke, et al., (1983) offers an alternative definition, which overcomes problems caused by these two omissions: Marketing is a management orientation focusing on all the activities of the organization on satisfying customer needs and wants, thereby helping achieve the organization's long range objectives. This definition promotes a customer orientation and since the organization's

long long-term objectives will include its own continued existence it takes account of the need for sustainability.

The marketing concept must be adopted throughout not only the entire organization, but also the entire marketing system. Marketing system has two distinct dimensions (FAO, 1990). One of those dimensions involve the institutions, organizations and enterprises, which participate in a market. Regional/District authorities, MAYAWA, World Vision Tanzania and KAEMP and ARI-Maruku are few examples under this dimension. The second entails the functions that those participants perform. Kohls et al., (1980) have classified the functions involved in agricultural and food marketing processes as under three sets of functions of a marketing system.

- i. Exchange functions
- ii. Physical functions
- iii. Facilitating functions

Each of these functions adds value to the product and they require inputs, so they incur costs. As long as the value added to the product is positive, most firms or entrepreneurs will find it profitable to compete to supply the service.

2.12.2.1 Exchange functions

Buying: The marketing concept holds that the needs of the customer are of paramount importance. A producer can be said to have adopted a market orientation when he strives to meet the quality needs of a food processor manufacturing vanilla based drinks. He/she will avoid any inputs likely to adversely affect the processing properties of the vanilla and

continually seek new and better inputs, which will add further value to his/her product in the eyes of the customer.

Selling: Of the nine functions listed, this is probably the one which people find least difficulty in association with marketing. Indeed to many the terms marketing and selling are synonymous. Kotler (1988) suggests that most firms practice the selling concept when they have over capacity. Most farmers' immediate aim is to sell what they can produce rather than to produce what they can sell.

2.12.2.2 Physical functions

Storage: Two most important physical functions related to vanilla production and marketing are transportation and processing. This is because vanilla growers do not practice storage functions as they sell fresh beans immediately to the processor.

Transportation: The transport function is chiefly one of making product or crop available where it is needed, without adding unreasonably to the overall cost of the produce. Adequate performance of this function requires consideration of alternative routes and types of transportation, with a view to achieving timeliness, maintaining produce quality and minimising shipping costs. Vanilla processing plant, which is situated in Bukoba town, is the selling point for the crop. Since they produce small volumes of the crop, transportation is relatively easy.

Processing: Most agricultural produce is not in a form suitable for direct delivery to the consumer when it is first harvested. Rather it needs to be changed in some way before it

can be used. Kohls et al., (1990) observe that, the processing function is sometimes not included in a list of marketing functions because it is essentially a form changing activity. However, it is for this very reason that the processing ought to be included as a marketing function. The form changing activity is one that adds value to the product. Changing green fresh vanilla beans into cured beans increases the value of the product because the converted product has greater utility to the buyer. Processing of vanilla is limited to the plant of MAYAWA. This could be attributed to the high technological requirements of the processing plant.

2.12.2.3 Facilitating functions

The facilitating functions include product standardization, financing, risk bearing and market intelligence. Facilitating functions are those activities, which enable the exchange process to take place. As with standardization, vanilla is sold in standard weights usually in kilogrammes. Like in any parts of Tanzania facilitating functions institutions are either weak or are not in place.

2.13 Vanilla marketing

In Bukoba District Vanilla growers sell green beans. Cured whole beans are not processed and sold at village level. As noted earlier before 2001, MAYAWA was a sole buyer of vanilla grown in the area. Later on, other actors such as Kagera Vanilla Farmers Association (KVFA) and individual and unregistered private traders have engaged themselves in marketing vanilla. Vanilla whole beans are processed using the “Bourbon type method” (one of the traditional methods) for curing it. The cured beans are sold to private export companies in Uganda, in particular ESCO Uganda Ltd. On the other hand

private traders and KVFA have no regular market outlets. Generally, at the moment the domestic market for home consumption is very limited (MAYAWA, 2002).

2.14 World demand for vanilla

Vanilla is the second-most expensive spice (after saffron) and the spice most subject to competition from imperfect substitutes (low-cost artificial flavourings) (Encyclopaedia of Spices, 2004). The aggregate global demand for natural vanilla is estimated at 2,500 to 3,000t per year, primarily for high-quality vanilla flavouring. Between 1965 and 1989, world consumption grew at an average annual rate of two percent. Between 1980 and 1989, demand expanded rapidly particularly in the United States, where it grew at seven percent a year in volume. In Europe, the rate of consumption was more modest: 2-3 percent. Highest consumption per capita is found in Denmark (4.57 grams), the United States (3.85 grams), France (2.54 grams), and Canada (1.00 grams) (International Horticulture, 2002).

2.15 Market problems facing smallholder farmers

The marketing of agricultural products in many developing economies, is a major determinant of development generally and agricultural development in particular (Ashimogo et al., 2003). Enumerating problems of smallholder farmers in marketing their produce, TARP II-SUA (2002) listed them as low quality of produce, producing without regard to market situation, poor infrastructure, lack of processing skills, lack of farmers' groups, lack of marketing promotion and cynical disregard of local products.

2.16 Description of analytical techniques

2.16.1 Gross margin analysis

Most often new technologies in smallholder agriculture are aimed at increasing the farm production by the fact that increased income is one of the immediate objectives of the overall enterprise of the farmers. Johnsen et al (2003) stated that the costs involved might hinder the adoption of production increasing technologies. It was found useful to compare the gross margin of vanilla to other competing crops particularly coffee, tea, banana and maize) in the area, so as to establish the relative economic profitability of vanilla. Producers usually tend to allocate more resources to enterprises giving higher returns per unit of each resource utilised. Thus high returns will warrant future production of a more competitive crop, as transferable resources are switched from the low paying enterprise to it.

To define the concept of gross margin, we first have to distinguish between variable and fixed costs. Variable costs are those costs that increase or decrease as output changes, while fixed costs do not change as output is changed (Cramer et al., 2001). Common examples of variable costs in crop production include seeds, fertilizers, and pesticides. The most important fixed costs in agricultural production are owned land, family labour, farm buildings and farm machinery and implements.

The gross margin of a farm activity is the difference between the gross income earned and the variable costs incurred (Makeham et al., 1986). Gross margin analysis is thereby a simple, but in many cases a sufficiently powerful tool for economic analysis of introduced

technologies. In this study gross margins for the different enterprises were calculated as follows:

$$GM_i = TR_i - TVC_i \quad (1)$$

Where;

GM_i = Average gross margin (Tshs/ha)

TR_i = Average total revenue (Tshs/ha)

TVC_i = Average variable total costs (Tshs/ha).

2.16.2 Econometric analysis

Using cross-section data the profitability of vanilla production in terms of costs incurred was estimated. The stochastic cost frontier function was applied to estimate cost inefficiency by farms whereas the cost inefficiency function in terms of farm outputs was estimated to explain the sources of cost inefficiency. The estimates for both the cost inefficiency function and the parameters of the stochastic cost function frontier were computed using LIMDEP VERSION 8.0 software program.

2.16.2.1 The concept of stochastic frontier models

The stochastic frontier regression model is a linear regression model with a non-normal, asymmetric disturbance (Greene, 2002). It has been used variously in studies of production and cost. The model was originally developed by Aigner, Lovell and Schmidt (1977), as well as Battese and Corra (1977) and Meeusen and van den Broeck (1977). The canonical formulation that serves as the departure point for later variations is ASL's (Aigner, Lovell and Schmidt) model,

$$y_i = \alpha + \beta X + \varepsilon_i, \varepsilon_i = v_i + u_i \text{ (for a stochastic cost frontier)} \quad (2)$$

where v_i and u_i are normally distributed with zero means and constant variances σ_v^2 and σ_u^2 .

The difference of the two variables is asymmetric and non-normal. The asymmetric of the distribution of ε_i is a central feature of the model. The degree of asymmetry can be characterized by the parameter $\lambda = \sigma_u / \sigma_v$. The larger λ is the more pronounced the asymmetry will be. Conversely, if λ equals zero, then $\varepsilon_i = v_i$, which has a normal distribution. The expected value of ε_i is

$$E[v_i + |u_i|] = \mu_E = -\left(\frac{2}{\pi}\right)^{1/2} \sigma_u \quad (3)$$

The model can be written as

$$\begin{aligned} y_i &= (\alpha + \mu_E) + \beta X_i + (\varepsilon_i + \mu_E) \\ &= \alpha^* + \beta X_i + \varepsilon_i^* \end{aligned} \quad (4)$$

where ε_i^* has zero mean and constant variance, but a non-normal and asymmetric distribution. A test of the model can be based on the least squares residuals.

The components of the disturbance are assumed to be independent. The estimator in LIMDEP VERSION 8.0 econometric software by Green (2002) computes parameter estimates for numerous single equation variants of stochastic frontier model. The preceding is termed the 'stochastic' frontier model as opposed to a 'deterministic' frontier, which would result if all of the disturbances in the model were strictly one sided (Greene, 2002).

The deterministic nonparametric frontier models are also known as Farrell's models. These attribute any deviation from the frontier as inefficiency and assume no functional form on

the data. The major deficiency in Farrell's and all other deterministic models is their sensitivity to extreme observations (Bravo-Ureta, et al., 1991). However, the problem of extreme observations has been ameliorated by recent developments in efficiency measurements using the stochastic frontier model developed by Aigner, Lovell and Schmidt (1977). The stochastic frontier model assumes an error term with two additive components—a symmetric components accounting for pure random factors and a one sided component which capture the effects of inefficiency relative to the stochastic frontier. An extension by Jondrow *et al.*, (1982) demonstrated the derivation of individual firm efficiency measures from stochastic frontiers. A large number of variants of the stochastic frontier model based on variations of the distribution of the 'inefficiency' term, u is available in LIMDEP. This technology centres on cross section modelling.

Subal et al., (2000) pointed out that cost frontiers are stochastic due to random variation in the operating environment. These stochastic frontiers are one sided due to various types of inefficiency. The retention of symmetric error components is designed to capture the effects of random variation in the operating environment in line with requirements of the older least squares based approach to the estimation of cost function. The introduction of one-sided error components designed to capture the effects of inefficiency is new and constitutes the econometric contribution to the estimation of cost frontiers. Consequently the formulation is referred to as stochastic cost frontier analysis.

2.16.2 Advantages and Limitations of analytical techniques

2.16.2.1 Gross margin analysis

According to Ferris et al., (2000), gross margin analysis has the following limitations:

- Gross margin is not a profit figure. Fixed costs have to be covered by the gross margin before arriving at a profit figure.
- Gross margins can vary widely from one year to the next. This is due to differences in market prices, weather condition and efficiency. Gross margins can also differ considerably from farm to farm. This can result from differences in performance levels or differences in the overall system of production or method of recording. Comparison to average gross margins can be useful but it should be done over a number of years. However, it gives the starting point in the assessment of the enterprise.

2.16.2.2 Cost function approach

The cost function method is preferred due to several reasons:

- The approach does not suffer from simultaneous equation bias since the input levels are endogenous (Adesina, 1997).
- The approach has merit because in principle it provides more parameters of interest than do production function estimates and is best applied to combined cross-section time series data where good price series are available (Evenson, 1994).

Though preferred however, the method has also the following limitations:

- Its use is not widespread because it is more demanding in terms of good quality price data than are other approaches, where prices are used only for aggregation purposes (Evenson, 1994).

CHAPTER THREE

3.0 METHODOLOGY

3.1 Description of the study area

3.1.1 Location

Bukoba District is one of the six districts in Kagera region situated in the North-West of Tanzania (1° - 1° 25' S; 31° 30'- 2° E). The district covers a total area of 11,465km² of which 5,932km² is under water. Bukoba town, the district headquarters is some 1,245km from the main port of Dar-es-Salaam (FSR-Diagnostic Survey Working Paper, 1995). It is bordered in the North by Uganda, in the East by Lake Victoria, in the West by Karagwe District and in the South by Muleba district. Other districts that make-up Kagera region are Karagwe, Biharamulo and Ngara.

3.1.2 Climate and topography

The district gets enough rains for most of the year in two seasons, between October and November and between March and May. Rainfall is between 1,400-2,000 mm a year. The highland belt gets between 1,000-1,400 mm of rain a year while the western zone gets between 600-1,000 mm of rain a year. Average temperature is 20°C with minimum and maximum extremes of 15°C and 28°C respectively. The soils are predominantly, ferralsols, gleysols, arenosols and vertisols. These soils are, however, highly leached and of very low fertility (Rugalema et al., 1994). But the ferralsols are the most important agricultural soils in the district.

3.1.3 Human population

According to the population census of 2002 (United Republic of Tanzania, 2003) Bukoba District has a population of 476,351 people with 109,761 households with the average size of 4.3 people per household. More than 80% of the total population live in rural areas.

3.1.4 Farming systems

Farming systems are mainly rainfed and dominated by banana plantain intercropped with coffee, maize and beans. Some few cassava are also part of the farming system. There is very little vegetable production, however, and the system is just getting started with cabbage being the leading vegetable. Currently also farmers have grown a lot of interest on pineapple growing. The majority of the farms are less than 2 ha. Most important food crop is banana mixed with beans and the same crops are also the important commercial crops mostly for domestic market. Coffee was the only commercial crop that fetched external market but due to the price drop in the world market the crop has now being given less attention by farmers. Vanilla has also been introduced recently and farmers are now showing a lot of interest due to high price promises (www.ciat.cgiar.org/, 2003). Livestock keeping is also of very little significant with few instances of zero grazing mainly for cattle keeping.

3.1.5 Infrastructure

There is a moderately well developed infrastructure of roads (earth roads) linking Bukoba District to other districts in the region. Today, there is a project for construction of trunk roads linking the region to the rest of Tanzania and the neighbouring country of Uganda.

Other reliable means of transport is by boats and airplanes services plying between Mwanza and Bukoba across Lake Victoria.

3.1.6 Economic services

In the focus of Kagera Region (Quarterly Economic Review, 2002), agricultural production is reported as the most important economic activity contributing about 50% to the region's Gross Domestic Product. It is estimated that about 90% of the region's population derives its livelihood from agricultural production. Agriculture is carried out mostly under smallholder farming, as there is very little commercial farming. These estimates can be used to explain the livelihood of Bukoba District. Employment opportunities are rather limited due to the small size of Bukoba town. However, off-farm employments are booming. These are fishing in Lake Victoria, clay brick making, pit sawing, masonry and carpentry. The tea estate and factory at Maruku, the Kagera Sugar Company, Bukop coffee factory are the only institutions, which can offer sizeable off-farm employment.

3.2 Study design

The study involved a cross sectional single visit survey. This design allowed collection of data at one point in time i.e. during December and January 2003/04.

3.3 Sampling technique

3.3.1 Study population

The study population included a representative sample of vanilla growers residing in Kiziba, Kyamtwara, Bugabo, Maruku and Kashai Divisions of Bukoba District.

3.3.2 Sample size

Random sampling was used to obtain vanilla growers. The total sample size of the study was 120 vanilla growers (9% of all vanilla growers). Although the sample size was limited to 120 (due to time and budget constraints), it was large enough to allow for statistical analysis.

3.4 Data collection

Primary data for this study were collected through informal and formal surveys. Informal surveys were carried out to get an in-depth understanding of issues related to vanilla agriculture. The formal surveys involved personal interviews using a pre-tested questionnaire. The information collected included socio-economic data, input distribution, crop outputs and outlets as well as crop marketing and profitability. The researcher and two-trained enumerators conducted the interviews. To ensure a higher rate of response for the interviews, the team conducted interviews with the respondents at their homesteads.

Secondary data were extracted from reports and other documentary materials from the relevant institutions and organizations such as MAYAWA, ARDI-Maruku, KAEMP and Sokoine National Agricultural Library (SNAL).

3.5 Data analysis

A substantial part of the analysis is based on descriptive statistics to describe the responses, characteristics and trends of some of the data and information. Responses from the interview were coded, summarized and entered in a computer. The data were analysed using Statistical Package for Social Sciences (SPSS) computer package.

Gross margin and econometric analyses are analytical techniques that were put into use. Gross margin analysis employed to examine the relative competition of vanilla with other important crops and econometric analysis for determination of the potential profitability of the crop in terms of cost efficiency of production and marketing.

3.6 Model specification

This study applied an approach based on cost function. Advances have been made in the frontier cost function literature using flexible functional forms (Bauer, 1990; Greene, 1980; Forsund et al., 1980; Schmidt, 1977). Any errors in the production decision translate into higher cost for the producer. At the same time, the stochastic nature of production implies that the theoretical cost function is stochastic. Jaume (2000) in the study of technical inefficiency and public capital in US States reported that to limit restrictive properties imposed on the production process, translog functions are chosen against restricted Cobb-Douglas function forms. In this approach, translog cost function is specified and estimated with single output equation. The derived measure of inefficiency is then related to socio-economic, demographic and farm variables.

Consider the cost function based on the composed error model (Aigner, et al., 1977; Meeusen, 1977; Forsund et al., 1980)

$$\begin{aligned} \ln C = & \alpha_0 + \alpha_Q \ln Q + \sum_{i=1}^n \alpha_i \ln P_i + \frac{1}{2} \gamma_{QQ} (\ln Q)^2 + \frac{1}{2} \sum_{i=1}^n \sum_{j=1}^n \gamma_{ij} \ln P_i \ln P_j + \sum_{i=1}^n \gamma_{Qi} \ln Q \ln P_i \\ & + \gamma_L \ln L + \frac{1}{2} \gamma_{LL} (\ln L)^2 + \sum_{i=1}^n \gamma_{Li} \ln L \ln P_i + \gamma_{LQ} \ln L \ln Q + \varepsilon_i \end{aligned} \quad (5)$$

where C is total cost (Tshs), Q is the total value of output (kg), P_i is the price (Tshs/measuring unit) of variable inputs (hired labour, cuttings of vanilla/jatropha, sisal rope, poles and mulch) capital and transport inputs in Tshs, L is the land input (Tshs/ha), γ and α are unknown parameters to be estimated and ε_i is a disturbance term consisting of two independent elements as follows:

$$\varepsilon_i = V_i + U_i. \quad (6)$$

The symmetric component, V_i , accounts for random variation in cost due to factors outside the farmer's control, such as crop diseases, flood and weather. It is assumed to be independently and identically distributed as $N(0, \sigma_v^2)$. A one sided component $U_i > 0$ reflects cost inefficiency relative to the stochastic frontier. Thus, $U_i = 0$ for a farm whose cost lies on the frontier, and $U_i > 0$ for one whose cost is above the frontier. The maximum-likelihood estimates (MLE) of the cost frontier equation were computed by LIMDEP (Greene, 2002).

3.7 Measures of cost inefficiency

Various factors could be responsible for the observed inefficiency in agriculture.

Inefficiency may arise from socio-economic, demographic or environmental factors. Factors like age, marital status, education, employment; family size, extension and ownership of capital inputs were introduced to explain inefficiency (Flinn, and Kalirajan, 1983 and Lingard et al., 1983 and Shapiro and Muller, 1977). Ali and Flinn (1989) in the study of cost efficiency added holding size as explanatory variable.

In this study, estimated cost inefficiency (CI) was related to various explanatory variables using data from the 120 respondents. We estimated the following equation:

$$CI_i = \beta_0 + \beta_1 AGE_i + \beta_2 EDU_i + \beta_3 FSZ_i + \beta_4 HLD_i + \beta_5 EXT_i + \beta_6 CPI_i + \beta_7 D_7 + \beta_8 D_8 + \beta_i \quad (7)$$

where

CI=Cost inefficiency

AGE=Age of the respondent in years

EDU=Education level of the respondent in number of years in school

FSZ=Family size of the respondent in number of family members

FMS=Farm size of the respondent in hectares.

EXT=Extension visits to the respondent

CPI=Capital inputs of by the respondent in Tshs/ha

D₇=Marital status dummy (1 for married and 0 otherwise)

D₈=Employment status dummy (1 for employed and 0 otherwise)

$\beta_0 - \beta_8$ =Parameter estimates

Gujarati (1995) reported that in estimating linear and non-linear regression models, Ordinary Least Squares estimation (OLSE) technique is commonly used. This technique is appropriate for single equation models. The OLS estimation approach requires selecting a population parameter estimator such that the ordinary sum of squares of errors is minimized. Errors are defined as the difference of observed values; say X_i and the expected value of the random variable X or the population parameter.

$$E_i = X_i - E(X_i) \quad (8)$$

By OLS assumption the expected value of random error, $E(U) = 0$.

The OLS estimation technique is simple to use, eloquent and gives the best estimator and it does not require the knowledge of the probability distribution of the underlying population being studied. Of all estimation rules, ordinary least square estimation (OLSE) leads to best linear unbiased estimator and hence its popularity in applied econometrics (Gujarat, 1995).

3.8 Limitations of applying OLS estimation technique

Mukras (1993) stated three limitations of applying OLS in estimating models:

- i. Although parameter estimates for econometric models can be obtained by OLS, they are generally biased.
- ii. With non-linear models, variances of the parameter estimates cannot be obtained easily and the estimates do not have well behaved statistical properties that lend themselves to statistical theory.
- iii. Testing of the parameter is not possible because the sampling distributions of the parameter estimates are in most cases unknown.

It should be noted that since the variable explained by the cost inefficiency function is the mode of inefficiency, a positive sign on a parameter indicates that the associated variable has a negative effect on efficiency and a negative sign indicates a positive efficiency effect (Jaume, 2003)

Since we are dealing with cross-section data, with one observation for each farm, farm specific factors cannot be introduced. Unobserved farm effects are confounded with cost inefficiency. As a result, those farmers who are identified as inefficient by this method might not really be so, if individual effects are controlled (Kumbhakar et al., 1993). Individual farm effects might include the soil type and/or location.

Non-physical inputs like experience, information and supervision might influence the ability of a producer to use the available technology efficiently. If the cost function had

incorporated all of these effects, we would have to estimate a large number of parameters and our estimate might have suffered from the problem of multicollinearity.

3.9 Limitations of the data

- a) Using cross-section data limits observation over time. This makes it difficult for the study to account for changes due to time difference.
- b) The small sample size may affect the representativeness of the population parameters. However, the sample was large enough to allow for statistical analysis.
- c) Prices and costs involved have been limited by the availability of household data at village level where vanilla production and marketing take place.
- d) A case study approach as used by this study limits observation to only one location. Hence the conclusion reached may not hold for other similar farming activity.

However, inspite of the above limitations, it is expected that the data collected was reliable and adequate to address the objectives set forth for the study.

CHAPTER FOUR

4.0 RESULTS AND DISCUSSION

4.1 Introduction

This chapter presents results and discussion for the data obtained from the formal and informal survey. The results are divided into three sections; the first section presents descriptive statistics showing characteristics of sampled vanilla growers. This is followed by results and discussion of enterprise budget in which gross margin for vanilla is computed. Lastly the chapter addresses the empirical results and discussion from the econometric analysis.

4.2 Sample profile and household variables

4.2.1 Sample profile

The study covered 14 wards namely Bwanjai, Kashai, Katoma, Buhembe, Rwamishenye, Bugandika, Buyango, Ruzinga, Kitobo, Mafumbo, Maruku, Kabale, Kanyigo and Kishanje. A total of 120 farmers were sampled and considered to represent the rest of the farmers in Bukoba District. About 72.4 percent of the farmers were from the wards around Bukoba township. These wards are; Kashai (6.7%), Katoma (3.3%), Buhembe (22.5%), Rwamishenye (4.2%), Mafumbo (8.3%), Maruku (26.6%) and Kabale (0.8%) (Appendix 4). And about 27.6 percent of the farmers were from the wards situated far away from Bukoba township. The large number of respondents from wards around Bukoba township was due to the fact that MAYAWA, vanilla promoting and marketing organization is situated in Bukoba town.

Of the 120 respondents 88.5 percent were males and the remaining 11.5 percent were females. The smaller percentage of female respondents can be explained by the fact that in Bukoba District in particular and in Tanzania in general men still control most resources of the family

4.2.2 Household variables:

4.2.2.1 Age

The range of age of the respondents was from 20 years to a maximum of 82 years. About 57.5 percent of the respondents were above the age of 50 years, 34.2 percent between 36 and 50 years and 8.3 percent were between 20 and 35 years (Table 1). The large percentage of the respondents above the age of 50 years was due to the fact that old people are the ones who own resources. Youths either migrate to urban areas or engage in off-farm activities.

Table 1: Age of respondents (n=120)

	Frequency	Percent
Between 20 and 35 years	10	8.3
Between 36 and 50 years	41	34.2
Above 50 years	69	57.5
Total	120	100.0

4.2.2.2 Marital status

About 89 percent of the respondents were married. This shows that the society is stable; divorce rate was low at only 0.8 percent. A stable family can concentrate more on production than an unstable one thus may influence agricultural production. It can be seen in Table 2 that only 4.2 percent of the respondents were single.

Table 2: Marital status of respondents (n=120)

	Frequency	Percent
Married	107	89.2
Single	5	4.2
Divorced	1	0.8
Widowed	7	5.8
Total	120	100.0

4.2.2.3 Education level

Table 3 presents the frequency and percentages of sample vanilla growers against their education levels. The majority of the respondents (93.3%) reported to have formal education, 48.3% primary education and 45% secondary education. Only 2.5 percent attended adult education classes while 4.2% attained standard four of primary education. The formal education attained by the majority of the respondents can be explained by the adoption of vanilla production as the new crop.

Table 3: Education level of respondents (n=120)

	Frequency	Percent
Adult education	3	2.5
Primary education	58	48.3
Secondary education	54	45.0
Others	5	4.2
Total	120	100.0

4.2.2.4 Employment status

The employment status of an individual affects ones income and hence his/her productivity. About 78.3 percent of the respondents were farmers. The remaining were permanent wage employees (12.5%), own business (8.3%) or casual labourers (0.8%) (Table 4).

Table 4: Employment status of respondents (n=120)

	Frequency	Percent
Farmer	94	78.3
Permanent wage employee	15	12.5
Casual labourer	1	0.8
Own business	10	8.3
Total	120	100.0

4.2.3 Land acquisition

The ownership of land is the precondition to plant vanilla in the study area. This is attributed by the fact that landowners do not accept other farmers to plant permanent crops on their land. The average total land area under cultivation owned by the respondents was 0.8 ha. This is above the average land area of landownership and occupation in accordance with the villagisation programme of 1960s and 1970s, which require household to have a homestead plot of about 0.5 ha (Environmental Information Centre of the National Environment Management Council, 1998). One has to acquire land through inheritance, purchasing or given by village government to be able to grow vanilla. The villagisation programme empowers village governments to hold or give communal agricultural land, grazing areas, forests and unutilised reserved land to any person who needs land. Table 6 presents the various modes of land acquisition from the sampled vanilla growers in Bukoba District. The survey revealed that 65.8 percent of the respondents inherited land, 33.3 percent acquired land through purchasing and only one respondent (0.8 %) was offered land by village authorities (Table 5).

Table 5: Land acquisition (n=120)

	Frequency	Percent
Inherited	79	65.8
Bought	40	33.3
From village government	1	0.8
Total	120	100.0

4.2.4 Major sources of income

Table 6 shows activities providing major sources of income to vanilla farmers. It is clear that 90.8 percent of the respondents' major source of income is farming. The remaining percentage is accounted for by respondents whose major source of income is from salary (5.0%) and livestock keeping (2.5%) and from informal sector (1.7%) that include; masonry, tailoring, carpentry, gardening and local brew making.

Table 6: Major sources of income (n=120)

	Frequency	Percent
Farming	109	90.8
Salary	6	5.0
Livestock	3	2.5
Informal sector	2	1.7
Total	120	100.0

4.2.5 Problems encountered in vanilla production and marketing

The respondents raised a number of problems as far as production of vanilla is concerned.

Table 7 shows a summary of the problems that were reported.

Table 7: Problems encountered by farmers in vanilla production (n=120)

	Frequency	Percent
Lack of irrigation facilities	36	30
Shortage of planting materials	19	15.8
High production costs	17	14.1
Shortage of labour	17	14.1
Lack of adequate capital	15	12.5
Theft	8	6.6
Poor extension services	6	5.0
Pests and diseases	2	1.6
Total	120	100.0

From Table 7, the major problem pointed out by the majority of the respondents (30%) is that of lack of irrigation facilities to sustain production during dry period. Shortage of planting materials (15.8%), high production costs (14.1%) and shortage of labour (14.1%) were reported by the respondents. While 12.5 percent of the respondents complained on lack of adequate capital, since in Bukoba District there is no credit facility providing loans to vanilla growers, a few farmers complained on poor extension services (5%) and (1.6%) pests and diseases.

The respondents raised a number of problems; in as far as vanilla marketing is concerned.

Table 8 shows a summary of these problems.

Table 8: Problems encountered by farmers in vanilla marketing (n=120)

	Frequency	Percent
Low price	65	54.2
Few buyers	25	20.8
Long distance and poor transport to selling point	21	17.5
Limited market knowledge	9	7.5
Total	120	100.0

From Table 8, it is evident that the major problem encountered by the majority of the respondents (54.2%) is that of low price of vanilla offered by buyers. Although actual

prices of vanilla to producers appear to be high and attractive, purchasers retain the larger portion of retail price. For instance, in 2003 season (Appendix 5) MAYAWA and Kagera Vanilla Farmers' Association (KVFA) each offered an average buying price per kg of fresh beans of the crop of 10 000 Tshs while an average selling price per kg of cured beans for MAYAWA was 200 000 Tshs (Appendix 6). This is equivalent to about 33 000 Tshs per kg of fresh beans. KVSA sold fresh beans at 18 000 Tshs per kg. MAYAWA enjoys better price because it sells the crop to companies exporting the crop abroad, while KVSA sells the crop to other marketing agents.

The problem of few buyers was reported by 20.8 percent of the farmers interviewed. While 17.5 percent of the respondents complained on long distance and poor transport to selling point a small group (7.5%) cited limited market knowledge as being a major problem. As far as marketing is concerned, the majority of the farmers are still not satisfied with prices offered by vanilla buyers. There were only two potential buyers of vanilla in Bukoba District in 2002/2003 season namely; MAYAWA and Kagera Vanilla Farmers' Association. Thus with few buyers marketing of vanilla could be characterized by a monopsonistic behaviour. Since vanilla growers are scattered across the district in remote areas, market information is a problem. For sample farmers interviewed, the average distance from the homesteads to selling points was 25 km. This is an indication that on average, selling points are far from farmers.

4.2.6 Roles of institutions in production and marketing

The existence of production and marketing of vanilla depends on the institutional and organizational arrangements that promote the crop. The efficiency of production and

marketing operations of vanilla depend much on non-governmental organizations. Several organisations engaged in production and marketing of vanilla were identified (Appendix 7). The major ones are MAYAWA, KAEMP and World Vision Tanzania. MAYAWA provides strong marketing support to the vanilla farmers in Bukoba District. It buys the fresh vanilla beans from the farmers and cure beans at her processing plant in Bukoba.

The Kagera Agricultural and Environmental Management Programme (KAEMP) had been designated a loan and grant by International Fund for Agricultural Development (IFAD) amounting to about USD 15M (Maganga et al., 2002). This multilateral assistance meant to support agriculture, forestry, fishery and livestock sectors. In agricultural sector KAEMP is the sole implementing agent.

According to Nkyeganaki (1998) KAEMP is a six-year regional project with coverage of the five districts in the region. Its objectives include improving household food production, health facilities and accessibility of safe drinking water and roads so as to ease marketing of agricultural produce. It also seeks to improve the management of natural resources and help to strengthen the capacity of the districts participating departments. Agricultural development is the major component of the project. This component entails the multiplication of seeds and planting materials and facilitates the availability and retailing of inputs such as fertilizers and pesticides. The activities of this component also include cash and food crop diversification trials and demonstration so as to improve crop management. The main crops involved are banana, beans, maize, cassava, coffee and vanilla.

World vision Tanzania is an international religious NGO operating in three of the region's five districts; Mulcaba, Karagwe and Bukoba (Environmental Information Centre of the National Environment Management Council, 1998). Since establishing a branch in the region in 1991, the NGO has undertaken numerous projects aimed at poverty alleviation. The projects have been multi-sectoral. Its activities are targeted at no particular religious sect as the NGO is ecumenical and the Kagera society at large has benefited from its socio-economic interventions on which the profile is centred. The overall objective of the NGO is an integrated holistic commitment to the improving the socio-economic life of the society. Currently the organization is implementing several micro projects in education, agriculture, water and health. These activities cover 100 villages and a catchment population of about 350 000 persons. In agriculture, the interventions include the provision of improved seeds, fertilizers, dairy cattle husbandry and training farmers on modern farming methods. In this case World Vision has been funding the exercise of formation of vanilla production farmer groups and distribution of vanilla cuttings to starting farmers. The total amount of USD 3M fund has been released to support ongoing micro projects in Bukoba district.

4.3 Crop enterprises competition

Farmers in Bukoba District grow various food and cash crops alongside vanilla. For the purpose of this study, four major crop enterprises that compete with vanilla in resource use were considered. These were coffee, tea, maize and banana. Using budgeting techniques, gross margins for vanilla and the competing enterprises were established (See Table 9, Appendix 8 and Appendix 9).

Table 9: Gross margin analysis for vanilla, 2002/03 season

Item	Amount
Gross average yield (kg/ha)	2 300
Average price per kg (Tshs)	10 000
Gross return (Tshs/ha)	23 000 000
Costs for physical inputs (Tshs/ha)	878 100
Gross margin (Tshs/ha)	22 121 900
Total mandays	270
Cash returns per manday (Tshs)	81 930

The results indicate that vanilla is the most profitable enterprise with a gross margin per hectare of Tshs 22 121 900. From the survey carried by DRDP (2003) coffee, tea, maize and banana had gross margins per hectare of Tshs 118 900, 408 100, 95 000 and 225 000 respectively. However, considering labour requirements, vanilla was found to be labour demanding crop with a total of 270 mandays and cash returns per manday of Tshs 81 930 (Table 9). In coffee, which has been the cash crop for decades, this high demand for labour far outweighs its relative profitability. When hired labour was considered, negative net returns per hectare of coffee obtained was Tshs 131 100 (Appendix 9). Thus it is a clear indication that vanilla enterprise is more desirable venture to undertake as an alternative cash crop to coffee.

4.4 Cost frontier and cost inefficiency estimates of vanilla growers

Maximum likelihood estimates (MLE) of the cost frontier equation (5) and the OLS estimates of the cost inefficiency function are presented in Table 11 and Table 12 respectively.

Table 10: Maximum likelihood estimates for the parameters of Translog Stochastic**Cost frontier function for vanilla growers**

Name of variables	Parameters	Coefficients	S.E	t-ratio
Constant	α_0	-0.07681	0.2016	-0.381 ^{***}
Land	α_L	-1.3421	0.6932	-1.936 [*]
Cuttings (seeds)	α_C	2.3893	0.2358	10.133 ^{***}
Hired labour	α_H	0.4492	0.8029	0.560 ^{**}
Vanilla staking	α_S	0.2195	0.2432	0.903
Banana staking	α_B	-0.2327	0.6462	-0.365
Mulch	α_M	0.2034	0.0415	4.901 ^{***}
Capital inputs	α_{Ci}	-0.2374	0.9742	-0.244 ^{***}
Transport	α_T	0.1054	0.4614	0.228
Output	α_{Ou}	0.2147	0.0230	9.334 [*]
Sigma	$\sigma = \sqrt{\sigma_u^2 + \sigma_v^2}$	18.9122	167.6698	0.113
Lamda	$\lambda = \frac{\sigma_u}{\sigma_v}$	9289.0466	255215.55	0.036

Notes: Log likelihood=177.03. The estimates based on exponential distribution of U were

$\sigma_v=0.0020$, $\sigma_u=18.9123$ and ^{***} $p<0.001$; ^{**} $p<0.05$; ^{*} $p<0.01$.

The estimated value of λ is 9289.0466, implying that the one sided error term U dominates the symmetric error V. The discrepancy between observed cost and frontier cost might be due both to technical and to allocative inefficiencies.

Table 11: Frequency distribution of cost inefficiencies in Stochastic Translog Cost**Frontiers**

Inefficiency index (%)	Number of farmers	Percent
1-10	61	50.8
10-20	41	34.2
20-30	11	9.2
30-40	6	5.0
40-50	1	0.8
50-100	120	100

Note: Mean=11.4, STD=6.3, Min=3.0, Max=41.2

The results from Table 11 indicate that, average inefficiency was 11.4%, implying that, on average, 11.4% cost incurred can be avoided without any loss in total output. The maximum and minimum estimated inefficiencies were 41.2% and 3.0% respectively. It is observed that, most farmers (85%) have an inefficiency index of about 11.4%, which is similar to efficiency index of 88.6%. It is evident therefore vanilla production and marketing is profitable in terms of costs incurred.

The sources of inefficiencies are determined by cost inefficiency function. The estimated parameters and t-ratios of cost inefficiency function are presented in Table 12.

Table 12: OLS estimates for parameters of the cost inefficiency function of vanilla growers

Variable name	Coefficient	t-ratio
β_0 (Constant)	1.014	0.421 ^{***}
AGE	0.0239	0.810
EDU	-0.273	2.175 [*]
FSZ	-0.0027	-0.014
FMS	-0.117	0.383 ^{**}
EXT	0.0052	-5.02 [*]
CPI	-0.0006	-1.263 [*]
D ₇	-0.562	-0.444
D ₈	1.863	-1.574

Notes:

1. The t-ratios are asymptotic t-ratios
2. ^{***}p<0.001; ^{**}p<0.05; ^{*}p<0.01

The results indicate that the age of the household head, family size, marital status and employment have no effect on efficiency. As was reported by Jaume, (2003) a positive

sign on a parameter indicates that the associated variable has a negative effect on efficiency and a negative sign indicates a positive efficiency effect. It is therefore education (EDU) with a larger number of years in school, farm size (FMS) with a larger number of hectares and higher capital inputs (CPI) that tend to increase efficiency. On the other hand, extension (EXT) with the larger number of visits tends to be less efficient.

According to the results of the inefficiency effects presented in Table 12, two main conclusions can be drawn: First, vanilla production is more cost efficient accounted for education, farm size and capital inputs. The results indicate that the given output level is produced with a lower cost among the farmers. It could be interpreted as meaning that, given the importance of education in farming skills, particularly for the new crop like vanilla, farms of educated farmers are likely to be well managed. The role of education toward improving farmers' efficiency is widely accepted, in that it enables farmers to acquire and process relevant information more effectively (Ram, 1980). A similar conclusion for education was reached by Kumbhakar and Bhattacharya (1992). They concluded that the level of education improved allocative performance of output as well as inputs. Cost efficiency associated with the increase in farm size and capital inputs could indicate lower cost per unit of output.

Second, extension education exposes farmers to improved techniques. Contrary to expectations, the parameter associated with the extension visits is not efficient. Possibly, this result could be attributed to the fact that extension services are provided with some costs.

CHAPTER FIVE

5.0 SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

The general objective of this study was to undertake economic analysis of vanilla production and marketing in Bukoba District. It aimed at describing the structural and socio-economic factors of the household that influence or motivate farmers to produce vanilla, and examining the role of institutions in production and marketing of vanilla, examining the relative competition of vanilla with the most important crop enterprises. It also aimed at determining the potential profitability of vanilla in terms of cost efficiency, production and marketing activities.

5.2 Summary of major findings

The study found that vanilla growers in Bukoba District have household characteristics common to most rural household settings elsewhere in Tanzania. Vanilla production is very important because of cash earnings realized from the crop. However, the crop competes with other crops for resources. Farmers are faced with some problems in their production activities. Lack of irrigation facilities, shortage of planting materials and lack of credit facilities were the most prominent ones. Low price of the produce, long distance and poor transport to selling points were found to face farmers in marketing of vanilla.

In terms of resources, land is acquired free by the majority of farmers through inheritance. Land therefore, as a domestic resource is not yet a problem. In terms of labour, the family is still the major source in vanilla production. From institutional point of view, vanilla production involved few participants. These included farmers, NGOs and private buyers.

Gross margin analysis indicated that vanilla enterprise was far more profitable compared to maize, tea, banana and coffee since it had a higher GM due to the use of family labour.

In this study, we have used survey data on input costs and outputs to measure farm level inefficiency using cost frontier approach. Cost inefficiency was estimated using a translog cost frontier. The results showed that farmers were inefficient by Farrell's measure of cost efficiency. The average level of inefficiency was 11.4%, and the level of inefficiency ranged from 41.2% to 3.0% by individual farmer. The estimated values of inefficiency were then regressed on variables assumed to be independent of input decisions such as education, age, farm area, family size, and capital inputs and marital and employment status.

The results indicate that cost inefficiency can be reduced by providing rural education, expansion of farm size and modern techniques of production in application of capital inputs. However, vanilla production and marketing is cost efficient to enhance profitability.

5.3 Conclusions

The results of the study indicate clearly that vanilla production is potentially a profitable enterprise. However, it is evident that growers in Bukoba District have not captured the full potential benefits of production. Production and marketing of vanilla is promoted mainly by NGOs such as MAYAWA and individual private buyers. However, their production and marketing arrangements do not provide adequate incentives to vanilla growers in terms of input and pre-harvest services in general. Some problems have been noted from the study, which indicated some inefficiency in the entire production-marketing system. These

problems increase costs and reduce revenues in the input/output markets and prevent the realization of potential income gains by vanilla growers. As a result, some farmers use some of their production resources to other alternative crop enterprises. In the absence of studies indicating the relative profitability of vanilla to which resources are switched, shifting of resources is often unguided. However, farmers' decision to reallocate resources confirms the rationality assumption embedded in the theory of production. Intervention is necessary in vanilla production and marketing to increase incentives and comparative advantage in costs, revenue and efficiency of resource use.

5.4 Recommendations

Based on the study findings, the following recommendations aimed at improving vanilla production and marketing are made.

i) Development/improvement of extension services

Technical assistance to vanilla growers is an important component in rationalizing production and marketing of the crop. Increase in yield per hectare can be achieved through improved growing techniques. Improved quality can also be achieved through better handling, grading and advanced marketing techniques. Provision of adequate and quality extension services is therefore vital.

ii) Development of better research and development facilities

In order to function properly a farmer service centre has to be constantly aware of the farmers' problems and predict what kind of research services is most beneficial to them. To improve vanilla enterprise in Bukoba District stakeholders have to

invest more in research and development facilities (R&D). In order to fill the gap of the farmers, extension services have to rely on profound research and expertise. When the farmers are not technically supported, they tend to lose their interest in the cultivation of newly introduced crops as might be the case for vanilla.

iii) Strengthening of business and marketing network

Much of the Bukoba District has very significant agricultural resources. The challenge is to empower poor rural people to access and exploit them better. Fundamental to this process is improving the business framework of small farmers and strengthening their capacity to compete in the market they increasingly depend on for their social and economic needs. The future challenge for vanilla stakeholders is to create and sustain a broad international network for the marketing of cured vanilla.

iv) Areas for further research

In order to enrich the findings of this study further work is necessary especially on actual world demand and supply of natural vanilla; potential barriers to entry of the vanilla international market; and effects of vanilla cultivation on the income and social welfare of Bukoba District.

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APPENDICES

**Appendix 1: Farmers' questionnaire for production and marketing of vanilla
Economic Analysis of Vanilla Production and Marketing: A Case Study
of Bukoba District, Kagera Region, Tanzania.**

Questionnaire No.....Date of interview.....

Division.....Ward.....Village.....

Interviewer's name.....

Name of respondent.....

A. Household Identification Variables

1. Name of household head.....

2. Age..... (years)

3. Gender.....1=Male, 2=Female

4. Marital Status of household head.....

1=Married, 2=Single, 3=Divorced, 4=Widowed

5. Level of education.....

1=None

2= Adult education

3=Primary education

4=Secondary

5=Others (Specify)

6. Household composition

Name of person	Sex	Age (yrs)	Marital status	Relation to Head	Education	Main Occupation
	1=Female 2=Male		1=Single 2=Married 3=Divorced 4=Widowed	1=Head 2=Head (M) 3=Head (F) 4=Wife 5=Son 6=Daughter 7=Mother 8=Father 9=Other	0=No Educ. 1=Class I-IV 2=" V-VIII 3=Form I-IV 4=Form V-VI 5=Higher Educ. 6=Adult Educ.	1=Pre-school 2=At school 3=Farming 4=Permanent (wage) labour 5=Casual labour 6=Own business 7=Unemployed 8=Looks after cattle 9=Others

B. Farm activities

7. What persuaded you to cultivate vanilla?

.....

8. Who persuaded you to cultivate vanilla?

1=Neighbor, 2=Extension officer, 3=Relative, 4=Politician, 5=Others (Specify)

9. When did start vanilla cultivation?.....

10. Besides vanilla, what other crops do you grow? Rank your crops according to the order of importance:

(i) Food crops

(1).....(2).....(3).....

(ii) Cash crops

(1).....(2).....(3).....

11. Give criteria used for the ranking

.....

12. State the harvesting and marketing periods of crops you mentioned in question 10

<u>Crop</u>	<u>Harvesting</u>	<u>Marketing</u>
.....
.....
.....
.....
.....
.....

13. How far is the selling point from the home stead?

- Vanilla.....km
- Coffee.....km
- Beans.....km
- Banana.....km
- Others (Specify).....km

14. (a) What is the most critical problem in:

(i) Vanilla production?
.....
.....

(ii) Vanilla marketing?
.....
.....

14 (b) How do you think these problems can be solved?

(i) Vanilla production

.....
.....

(ii) Vanilla marketing

.....
.....

C. Farm Resources and Input Availability and Use

I. Land Availability Use

15. What is the total area owned by the family?

.....(Hectares
.....(Acres)

16. How did you acquire this land?

- 1=Inherited
- 2=Bought
- 3=Hired
- 4=Given by the village government
- 5=Accessed a free land
- 6=Others (Specify

17. Give actual hectares allocated to the different enterprises last season

<u>Enterprise</u>	<u>Hectares</u>
Vanilla
Coffee
Banana
Beans
Others (Specify)

II. Labour Availability and Use

18. Give the number, age and sex of household members and who were available for the farm activities in 2002/2003 season.

Age group	Males	Females	Total
Below 10 years			
10-14 years			
15-18 years			
19-50 years			
Above 50 years			

19. Indicate labour used for vanilla enterprise in 2002 03 season

Activity	Family labour (Mondays)	Exchange labour (Mondays)	Hired labour (Mondays)	Total payment (Tshs)	
				Cash	In kind
Land preparation					
Fencing					
Jatropha planting					
Manure/compost application					
Planting					
Vanilla training					
Mulching					
Irrigation (if applicable)					
Weeding					

Pesticide application					
Stimulation					
Pollinating					
Jatropha pruning					
Bean pruning					
Harvesting					
Sorting, grading and marketing					
Others (specify)					

Note: One day=8 hours

D. Investment and Equipment costs

20. Indicate the number, acquisition price, year of acquisition and expected lifespan of the following items:

Item	Number	Lifespan	Acquisition	
			Original price	Year
Fork jembe				
Hoe				
Panga				
Sprayer				
Bicycle				
Others (Specify)				

E. Farm Input Information

21. Indicate inputs, sources, prices and cost

Inputs		Source	Quantity	Unit price	Costs
Fertilizers	Inorganic	SA			
		Urea			
		TSP			
		Others			
	Organic	Compost			
		FYM			
		Cow's manure			
		Goat's manure			
		Others			
	Pesticides				
Hired labour					
Seedlings/cuttings					
Organic manure					
Jatropha					
Sisal rope					
Poles for banana staking (Mixed cropping)					
Mulch					
Others					

F. Output, consumption and marketing

22. (a). (i). Has output (yield) of vanilla increased since 1998?

1. = Yes 2. = No

(ii). If yes, what was the most important reason for the increase?

.....

22 (b). (i). Has output (yield) of vanilla decreased since 1998?

1 = yes 2 = No

(ii). If yes, what was the most important reason for the decrease?

.....

23. How do you collect information on market prices of vanilla?

1=Direct visit to the market

2=Cross checks with fellow farmers

3=Hear from friend

4=From extension officers

5=From NGOs

6=Others (specify)

24. What has been the price trend of vanilla produce for the last five years?

1=Increasing

2=Decreasing

25. From 25 above, if it is increasing /decreasing, why?

1=Few/many buyers in the market

2=Low supply/high production

3=High/low demand

26. Give marketing information as indicated for 2001/02 season

Amount produced	Amount consumed (if applicable)	Amount sold	Unit price (Tshs/kg)		Revenue	Transport cost
			MAYAWA	Private		

27. Do you know different buyers of vanilla in your area?

1=Yes 2= No

28. If yes, mention them

(i).....

(ii).....

(iii).....

G. Inflow and Outflow of Income

29. How much money did you get in 2002/2003 by source of income?

Source of income	Amount sold (bags/kg/no.)	Money obtained
Sale of crops		
a). Vanilla		
b). Coffee		
c). Beans		
e). Other crops (specify)		
Subtotal (crops)		
Livestock sales		
a). cattle		
b). sheep/goats		
c). Chicken/poultry		
Subtotal (livestock)		
Non agricultural income		
a). informal sector		
b). Salary		
c). Remittances		
Subtotal (non agricultural)		
Grand total		

H. Credit Available and Uses

30. Did you take credit for vanilla production during the last season?

1=Yes 2=No

31. If yes, what was the source of credit that you received?

1=Bank 2=traders 3=other farmers 4=cooperative union 5=other
(specify)

32. Indicate the amount of credit that you received.....

33. Did you receive the amount of credit that you requested for?

1=Yes 2= No

34. If no, what were the reasons for provision of the above?

.....
.....

35. Have you returned the credit?

1=Yes 2=No

36. If no, why?

.....
.....

37. If yes, what was the repayment procedure?

1=in cash 2=in kind 3=others (specify)...

38. If in cash what was the amount per year?.....(Tsh)

39. What was the repayment period?.....

40. From question 30, if No, why?

1=Lack of credit facilities 2=High interest rate 3=Not aware of credit
availability 4=High risk 5=Low income obtained from crop

41. In your own opinion do you think that credit is helpful?

1=Yes 2=No

42. If Yes, why?.....

.....

43. If No, why?

44. Do you keep farm records?

1=Yes 2=No If No why?.....

45. Do you have access to agricultural extension officers?

1=Yes 2=No

46. If Yes, how many times?

1=Once per season

2=2-3 times per season

3=4-5 times per season

4=More than 5 times per season

47. Where do you receive extension services?

1=Extension officer

2=Training centre

3=On my farm plot

4=On demonstration plots

5=During meeting

6=Through farmers' groups

7=Others (specify).....

48. What type of advices do you get from a village extension officer?

1=Crop protection

2=Crop management

3=Marketing issues

4= Others (specify).....

49. Plans for vanilla production

1= Expand production

2=Reduce production

3=Continue producing the same

4=Others (specify).....

I THANK YOU FOR YOUR COOPERATION

Appendix 2: Buyers' questionnaire for the marketing of vanilla

Organization Name:.....Date of interview.....

A. General Information

1. For how many years have you been in the marketing business?

.....

2. Where is your major (a) Buying area?.....(b). Selling country?.....

3. How many kgs of vanilla did you buy and sell for the last five years?

Crop/year	Amount bought (kg)	Price kg	Amount sold (kg)	Price/kg	Money obtained
1998					
1999					
2000					
2001					
2002					

4. What is the average selling price?.....Tshs.

5. What is the average distance to these buying placeskm

6. What was the average buying and selling quantity did you handle per transaction?.....kg

7. Do you provide extension services to vanilla growers on production and marketing?

1=Yes 2=No

8. Do you provide inputs to vanilla growers?

1=Yes 2=No

9. If Yes, in 7 above, please specify the inputs

.....

10. Do you provide credits to vanilla growers?

1=Yes 2=No

B. Pre-storage and storage practices

11. What was the average transport cost for a kg of vanilla in 2002/03 season
.....Tshs/kg/km.

12. What was the average drying cost for a bag of vanilla in 2002/03
season.....Tshs/kg

13. How much money do you pay for handling costs in selling a kg of
vanilla?.....Tshs/kg

C. Vanilla market condition

14. During the 2002/03 marketing year did you have any contractual arrangement with:

(a). Your sellers? 1=Yes 2=No

(b). Your buyers? 1=Yes 2=No

15. Did you store the traded vanilla in 2002/03?

1=Yes 2=No

16. If yes, for how long did you store?.....months/days (specify)

17. Why did you store vanilla beans?

1=To assemble larger quantities

2=Lack of transport

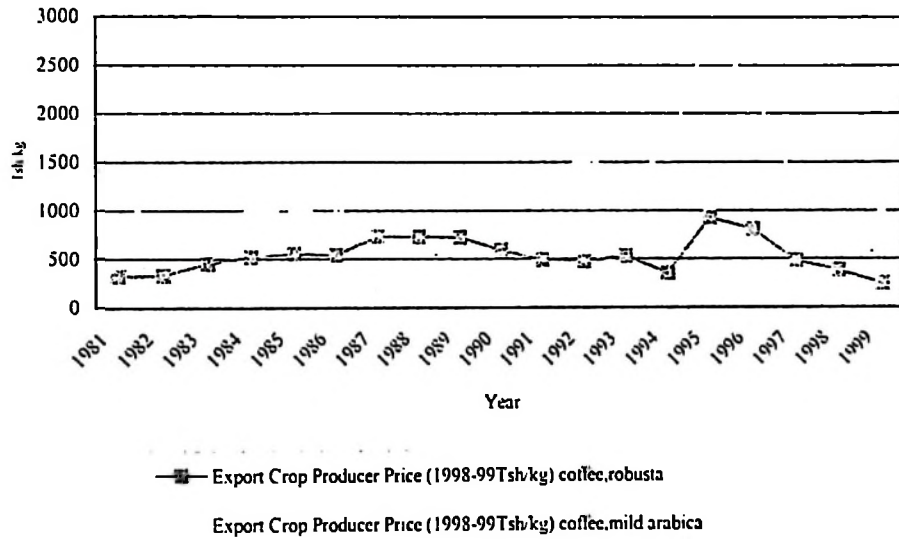
3=To overcome periods of low prices

18. What are the conditions for sale?

1=Cash 2=Credit 3=others (specify)

I THANK YOU FOR YOUR COOPERATION

Appendix 3: Export coffee producer prices (1998-99 Tsh/kg)



Source: MAFS, 2000.

Appendix 4: Ward and gender of farmers (n=120)

Ward	Sex of the respondent (%)		
	Male	Female	Total
Bwanjai	11	-	11
Kashai	5.0	1.7	6.7
Katoma	2.5	0.8	3.3
Buhembe	19.2	3.3	22.5
Rwamishenye	3.3	0.8	4.2
Bugandika	3.3	-	3.3
Buyango	1.7	-	1.7
Ruzinga	1.7	-	1.7
Kitobo	1.7	-	1.7
Mafumbo	7.5	0.8	8.3
Maruku	22.5	4.1	26.6
Kabale	0.8	-	0.8
Kanyigo	0.8	-	0.8
Kishanje	9.2	-	9.2
Total	88.5	11.5	100

Appendix 5: Marketing of vanilla (2003)

Organization	Average buying price in Tshs	Average selling price in Tshs
MAYAWA	10 000	200 000 ¹
KVFA	10 000	18 000 ²

1=price of cured vanilla beans, 2=price of fresh vanilla beans

Appendix 6: Vanilla bought by MAYAWA (1998-2003)

Year	Fresh Beans (kg)	Cured Beans obtained (kg)	Shrinkage
1998	120.0	20.0	6.0
1999	532.8	88.8	6.0
2000	334.3	55.73	6.0
2001	310.8	51.3	6.1
2002	1152.0	192.9	6.0
2003	947.1	172.2	5.5

Source: MAYAWA Development Report (1998-2003)

Appendix 7: Roles of organization in vanilla production and marketing

Item	Organization involved
Marketing	MAYAWA, KVFA
Extension services	MAYAWA, DAED, KAEMP
Distribution of cuttings	MAYAWA, WORLD VISION, TIDESO. KAEMP.
Funding vanilla production	WORLD VISION, BDRDP,
Groups formation training/funding	MAYAWA, HIVOS, AGRICORD, CORDAID, PSDP, WORLD VISION.

Source: MAYAWA General Meeting Report, 2004.

Appendix 8: Costs and returns of vanilla per hectare, (2002/03)

^a Gross average yield (kg)	2 300				
^b Average price per kg (Tshs)	10 000				
Gross returns	23 000 000				
Input requirement and costs					
i) Labour inputs (mandays)^c					
Operation	Mandays				
Land preparation and fencing	20				
Jatropha planting	20				
Manure/compost preparation	20				
Manure/compost application	10				
Planting	20				
Vanilla training	10				
Mulching	30				
Weeding	25				
Stimulation	20				
Pollination	50				
Jatropha pruning	5				
Vanilla pruning	5				
Bean pruning	5				
Harvesting	20				
Sorting, grading and marketing	10				
Total	270				
ii) Physical inputs costs^d					
Item	Unit	Qty	Lifespan (yrs)	Unit cost (Tshs)	Total cost (Tshs)
Vanilla cuttings	cuttings	1 300	1	500	650 000
Organic manure	Tons	5	1	5 000	25 000
Jatropha	cuttings	1 300	1	100	130 000
Sisal rope	Pcs	2	1	5000	10 000
Poles for staking banana	Pcs	100	1	200	20 000
Mulch	Bundles	65	1	500	32 500
Fork jembe	Pcs	2	5	3 000	1 200
Hand hoe	Pcs	2	5	2 000	800
Panga	Pcs	2	5	1 500	600
Bicycle	Pcs	1	10	80 000	8 000
Total					878 100

Total costs of physical inputs (Tshs/ha).....878,100

Gross margin (Tshs/ha)..22,121,900

Returns to labour (Tshs per manday).....81,930

^aGross average yield as computed from survey data

^bAverage price per kg as computed from survey data

^cLabour requirements obtained from survey data

^dPhysical inputs costs as computed from survey data

For farm tools (fork jembe, hand hoe and panga) and bicycle costs associated are for depreciation

Appendix 9: Gross margins for coffee, tea, maize and banana, (2002/03)

Category	Coffee	Tea	Maize	Banana
Gross yearly yield (kg/ha)	1 300	10 000	1 200	4 500
Price (Tshs/kg)	200	65	100	50
Gross returns (Tshs/ha)	260 000	650 000	120 000	225 000
Production costs (Tshs/ha)				
Seeds	111 100	241 900	2 000	0
Labour	250 000	324 000	80 000	50 000
Fertilizer	30 000	0	0	0
Agro-chemicals	0	0	0	0
Total costs (Tshs/ha)	391 100	565 900	105 000	50 000
Gross margins (Tshs/ha)	118 900	408 100	95 000	225 000
Net returns (Tshs/ha)	-131 100	84 100	15 000	175 000

Source: BDRDP/Department of agriculture-Bukoba (June 2003)