ECONOMIC EVALUATION OF MARKETING CHANNELS AND THE IMPACT OF TRANSACTION COSTS: A CASE STUDY OF GREEN PIGEON PEA MARKETING IN MAKUENI DISTRICT, KENYA

BY

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DECLARATION

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

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This thesis has been submitted for examination with our approval as University supervisors

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DEDICATION

To my sons, Steve Mbutha and Dennis Murage

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ACRONYMS

ASALs: Arid and Semi Arid Lands

CBK: Central Bank of Kenya

Cif: Cost, Insurance, Freight

DRC: Domestic Resource Cost

EPC: Effective Protection Coefficient

FAO: Food and Agriculture Organization

Fob: Free on Board

HCDA: Horticultural Crops Development Authority

ICRISAT: International Crops Research Institute for Semi Arid Tropics

IFAD: International Fund for Agricultural Development

KARI: Kenya Agricultural Research Institute

KCC: Kenya Co-operative Creameries

KEPHIS: Kenya Plant Health Inspectorate Services

MARD: Ministry of Agriculture and Rural Development

NCPB: National Cereals and Produce Board

NGO: Non- Governmental Organization

NIE: New Institutional Economics

NPC: Nominal Protection Coefficient

PAM: Policy Analysis Matrix

PC: Profitability Coefficient

PCR: Private Cost Ratio

SAPs: Structural Adjustment Programmes

SRP: Subsidy Ratio to Producers

USAID: United States Agency for International Development

ABSTRACT

The agricultural sector dominates the economies of most countries in Sub-Saharan Africa by providing food, employment, income and foreign exchange. The liberalization of domestic markets and globalization have provided new opportunities and challenges, such as better prices, that could benefit poor smallholder farmers in developing countries. To take advantage of these new opportunities and challenges, smallholder farmers must be able to participate in productive activities in which they have a competitive advantage. Unfortunately, smallholder farmers face high transaction costs and uncertainties arising from inadequate input and product markets, market access barriers and cost of information and other market imperfections that restrict market access.

The question then is how smallholder farmers can be integrated into high value markets through interventions that increase productivity and reduce transaction costs. The current study attempts to answer this question by using green pigeon pea as an example. The objective of the study was to assess the effects of transaction costs on the efficiency of green pigeon pea marketing channels. The study also explored opportunities to reduce transaction costs, so that farmers can take advantage of these emerging and promising markets.

The study used the Policy Analysis Matrix (PAM) approach to analyze the efficiencies of different marketing channels of green pigeon pea. Unlike the traditional PAM analysis, the current study incorporated transaction costs to adjust the social prices. Nominal Protection Coefficient (NPC), Domestic Resource Cost (DRC), and Private Cost Ratio (PCR) ratios were calculated to circumvent the problem that

would arise due to dissimilar technologies that are employed by different intermediaries in different marketing channels.

The results indicated that the export channel had the lowest DRC and PCR, while the farm level had the highest DRC and PCR. Inclusion of transaction cost increased the PCR and DRC, hence reducing the efficiency. Sensitivity analysis indicated that group marketing with well-laid contracts with exporters would improve the competitive advantage of farmers.

The study concluded that the export market channel is both privately and socially most profitable. The study therefore recommends that the export channel should be promoted and that the farmers should be vertically integrated with this channel. Farmers should also be availed credit facilities to enable them produce the ICPL pigeon pea variety that meets the export demand specifications. Farmers should be encouraged to form marketing groups and be trained on the managements of these groups. Contract arrangements should also be made between farmers and exporters to facilitate smooth flow of market information and hence reduce transaction costs.

CHAPTER ONE

INTRODUCTION

1.1   Kenya's agricultural sector

The agricultural sector is the mainstay of many economies in Sub-Saharan Africa, where it contributes about 18% of the GDP, 23% of the total value of exports, and employs about 69% of the active labour force (World Bank, 1999). The sector is distinctly divided into small-scale and large-scale sub-sectors, although the balance between the two varies from country to country (Jones *et al*, 2002).

In Kenya, the agricultural sector accounts for about 27% of GDP (Itabari, 1999). The sector is diversified, consisting of varied food and cash crops sub-sectors, is a major source of the country's food security and is a stimulant to growth of the overall economy. Before independence, Kenya's production of the traditional export crops (including coffee, tea, and cotton) from the smallholder sector boomed as a result of high producer share of export prices and access to markets. However, growth in this sector was depressed in the post independence period. This was due to government economic policies that imposed direct and indirect taxes that discriminated against the agricultural sector, thus reducing economic incentives for agricultural producers. The cumulative effect of these policies was a gradual loss of the country's export shares in the world markets (Jones *et al*, 2002). The challenge now is how to improve the farmers' competitive advantage in the international markets in order to regain lost export market shares.

There is ample experience now to show that farmers' willingness to increase food production in many developing countries is closely linked to the existence of efficient markets for their produce. Similarly, the adoption by smallholders of improved management techniques on their farms seems to occur when there is ready access to input supplies and assured markets with fair and predictable prices for their produce (Crosson and Anderson, 1995). However, in many developing countries, progress towards the goal of increased agricultural production continues to be impeded by a lack of well-functioning marketing, processing and distribution systems (FAO, 1995).

An efficient agricultural marketing system is an essential component of a food system, adding transport, storage, and processing services to food products (Owen, 1995). The interests of both producers and consumers may be simultaneously promoted through policies that reduce food-marketing costs and increase market access. Reduction of food marketing costs may do more than reduce food prices for consumers because it may improve production incentives that generate dynamic changes in farm investment, technology adoption, production costs, and cropping patterns that increase real incomes for both rural and urban households.

As the urbanization process unfolds, a larger share of national food consumption takes place at a location other than where the crop is produced (FAO, 1995). This means that the food marketing system must develop to provide necessary services as producers sell their produce in markets distant from where consumers purchase. If the marketing systems function inadequately, an investment in production becomes both more costly and more risky and may end up being wasted. Equally, inadequate handling and transport arrangements, especially for high-value export products, can

negatively affect expensive investments in production facilities (FAO, 1995). Therefore, efficient post-harvest handling and distribution systems are important to avoid unnecessary post-harvest losses. In other words, if the role of agricultural production is to supply the market, then the market determines production needs and preferences such as quality, quantity, and price. The market determines what the farmer should produce and not the other way round and if the market fails, agricultural development collapses (Allen and Shaffer, 1964).

The liberalization of domestic markets and the effects of globalization provide new opportunities and challenges such as better prices that could benefit poor smallholder farmers in developing countries. However, this requires interventions that improve the competitiveness of smallholder farmers to be given priority (IFAD, 2001). This implies the development of well-organized marketing, distribution and post-harvest systems; effective information systems; and technologies that allow smallholder farmers to be price and quantity competitive. Unfortunately, smallholder farmers face high transaction costs and uncertainties arising from inadequate input and product markets, high market access barriers and high costs of information and other market imperfections that restrict market access. As a result, poor smallholder farmers mainly produce only for subsistence and their marketable surplus is very low. The research question then is how smallholder farmers in developing countries can remain price and quantity competitive and be integrated into high value markets. This could be done through interventions that increase productivity, reduce transaction costs and improve market access. The current study will address this problem using smallholder pigeon pea producers in Kenya as an example.

1.2   Production, Marketing and Utilization of Green Pigeon pea

1.2.1   Production

Pigeon pea (*Cajanus cajan*) is produced in most tropical countries. It is one of the major grain legumes of the tropics and sub-tropics, ranking sixth in area and production after such other grain legumes as beans, peas and chickpea. The crop is drought tolerant and thus important in solving agricultural as well as other problems, such as under-nutrition, land degradation and fuel shortages in the rural areas. It is also an important cash crop for smallholder farmers, especially women farmers of the marginal areas (Nene and Sheila, 1990).

India is the worlds leading producer of pigeon pea as well as its major consumer. Pigeon pea is also grown in Eastern and Southern Africa for household consumption and for export, primarily as unprocessed pea. Table 1.1 below shows the average production and area of pigeon peas in Kenya, Malawi, Tanzania, and Uganda. From the table, we learn that pigeon pea production has been growing over the years in all these countries. This has a positive implication towards the promotion of production of this crop in Africa.

Table 1.1: Average Production (Mt) and Area (Ha) of Pigeon Pea in Kenya, Malawi, Tanzania, and Uganda for the Periods 1980-83 and 1995-97 and Annual Growth Rate in Production for the Period 1980-97.

Country	Average production (Mt) 1980-82	Average production (Mt) 1995-97	Average area (Ha) 1980-82	Average area (Ha) 1995-97	Annual growth rate in production (1980-1997)
Kenya	28845	44874	66337	147510	4.7
Malawi	85000	98000	127333	143000	0.8
Tanzania	22667	37333	36667	56667	2.2
Uganda	26333	58333	55000	71000	6.1

Source: Freeman *et al*, (1998)

In Kenya, pigeon pea is the third most important grain legume after field beans and cowpea, being grown mainly in the Arid and Semi Arid Lands (ASALs). Over 90% of the pigeon pea crop in Kenya is grown in the Eastern Province, particularly in Machakos, Makueni and Kitui districts. In recent years, small quantities of the crop are being grown in parts of western Kenya (FAO, 1995).

Pigeon pea is mainly cultivated by peasant farmers for subsistence needs, but they sell any that they may have as surplus. According to Silim *et al* (1994), pigeon peas are well adapted to systems where they are grown and their sensitivity to both day length and temperatures results in restricted production within those systems. However, once the phenology of the crop was understood, it became possible to develop early maturing varieties. These early maturing varieties enabled farmers in Kenya to produce pigeon pea throughout the year, hence increasing marketable surplus including the possibility of exporting green pea to the United Kingdom, especially when the supply from alternative sources is low and market prices are relatively high (Freeman, *et al*, 1999).

1.2.2 Marketing

ICRISAT and its collaborators have shown that there is a vibrant trade for pigeon peas in both regional and international markets. India is the world's largest producer, importer and consumer of all types of dried and processed pigeon pea products. However, the size of the global market excluding India is not well established but ICRISAT's research suggests that there is a potentially huge growing market for green pigeon pea (fresh and processed) in Europe, North America and Middle East

(Freeman *et al*, 1999). However, the study by Freeman does not give specific statistical data to support the availability of these market opportunities.

Nevertheless, these high value market niches in Europe, North America, and the Middle East pay premium prices for enhanced product attributes, such as high quality pods as well as for processed products that add value to the primary products. These markets provide excellent opportunities for smallholder farmers to increase their returns to pigeon pea production, thus leading to improvements in household food security through sustainable increase in income. Smallholder farmers can be enabled to make use of these opportunities through interventions that make them competitive in quality and price.

Through a rapid market appraisal, Freeman *et al* (1999) estimated marketing margins[1] for the major marketing channels of dry pigeon pea grain in Kenya (see Table 1.2). These marketing channels are also illustrated in Figure 1.

Table 1.2: Marketing margins (percent) for various alternative marketing channels for dry grain pigeon pea in Kenya.

Market participant	Channel 1	Channel 2	Channel 3	Channel 4
GMM Rural assembler	6.0	8.4	8.1	3.3
GMM rural wholesaler	3.0	5.2	4.3	1.7
GMM urban transporter	5.3	24.4	7.0	2.9
GMM urban processor/export	31.4	-	41.9	60.3
GMM urban retailer	25.7	20.0	-	15.9
TGMM in the channel	71.4	58.0	61.2	84.1
GMM producer share	28.6	42.0	38.8	15.9

GMM: Gross Marketing Margin.
TGMM: Total Gross Marketing Margins.
Channel 1: urban Retail of whole Grain pigeon pea (Supermarkets).
Channel 2: urban retail of whole grain pigeon pea (open-air market).
Channel 3: urban retail of processed pigeon pea.
Channel 4: export of whole grain pigeon pea.

Source: Freeman *et al*, 1999

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[1] Marketing margin measures the share of the final selling price that is taken by a market intermediary at each level in the marketing channel. It includes cost of transferring the product from one stage to the other and a return to the intermediary.

These marketing margins were gross margins because they included both cash costs and implicit costs, thus making it difficult to estimate marketing costs precisely. Marketing margins provide the initial insight in determining the performance of different marketing channels of pigeon pea. Besides, the margins suggest that there exist differences in the economic efficiency of different marketing channels as evidenced by the large price spreads between the producer and consumer prices. It is, however, difficult to determine whether these high marketing margins reflect high traders' profits, or inefficiencies in the marketing channels without complete knowledge of physical marketing costs (transport, storage and processing) and transaction costs.

Transaction costs are simply the costs of carrying out a transfer of goods between technically separable phases of production or distribution (Hobbs, 1996). They are divided into information costs that occur prior to transaction, negotiation costs that occur during the transaction and enforcement costs that occur after the transaction.

In the past, economic analysts ignored the presence of transaction costs when calculating the marketing margins. As such, high marketing margins may reflect presence of high marketing costs and transaction costs. On the other hand, large price spreads in the marketing channel could suggest the existence of opportunities for transferring a proportion of these margins to the advantage of the producer (Freeman *et al*, 1999).

Figure 1: Marketing channels of dry pigeon peas

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                              FARMGATE
        (1)              (2)              (3)              (4)
   Rural            Rural            Rural            Rural
   assembler 1      assembler 2      assembler 3      assembler 4
        │                │                │                │
   Rural            Rural            Rural            Rural
   wholesalers 1    wholesaler 2     Wholesaler 3     Wholesaler 4
        │                │                │                │
   Urban            Urban            Urban            Urban
   transporters 1   transporter 2    transporter 3    transporter 4
        │                │                                 │
   Urban processor                                    Urban
        │                                              exporter
   Urban retailer   Urban retailers
   (Supermarkets)
                         │
                   Domestic consumer

                   FOREIGN
                   CONSUMER
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Source: Adapted from Freeman *et al* (1999).

Each of the market intermediaries performs different functions in different channels. The Rural Assemblers are involved in crop collection and assembly, and this is the first entry of pigeon pea into commercial marketing. They collect small volumes and assemble them into larger lots for resale to rural retailers, rural wholesalers, and transporters. They transport the produce to the market, but in a few cases, the wholesalers provide transport when large volumes are collected. The Rural

Wholesalers on the other hand are mainly involved in storage of the produce as well as sorting, grading and weighing. A few offer transport of the produce from the village to their premises. Urban Transporters mainly offer transport from the rural centers to urban centers. They own means of transport, and transport large quantities of the produce from the rural wholesalers to processors, exporters and urban retailers. Urban processors are involved in processing dry pigeon pea into dhal[2] and selling to urban retailers and exporters. They also offer storage facilities. The Urban retailers mainly are involved in packaging and selling the produce to consumers. The produce is mainly placed on shelves in supermarkets.

These marketing agents incur transaction costs that affect the efficiency of the channels. In dry grain pigeon peas, the main type of transaction costs encountered are associated with poor grain quality resulting from information asymmetry, adulteration of grains and high opportunity cost of time spent while assembling the produce. These adversely affect the efficiency of the channels.

Three alternative marketing arrangements[3] for green pigeon pea have been identified in Kenya (Freeman *et al*, 1999). In one case, smallholder farmers produce and market their produce through a web of intermediaries (rural assemblers); in another case, smallholder producers market their produce under contracts with exporters. Another alternative marketing arrangement involves group production and marketing with or without formal contracts.

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[2] Dhal is made by removing the seed coat and splitting the cotyledons.
[3] Market arrangement refers to the manner in which farmers market their produce (groups or individuals with contracts or without contracts).

The study by Freeman *et al* (1999) however, does not show which arrangement is the best in terms of the farmers' price and quality competitiveness.

The challenge of the current study is to determine which marketing arrangement is most effective and which marketing channel[4] is most efficient so as to enable farmers to be competitive in price and quality. The current study analyzes the marketing channels to determine the ones that offer the best link for producers to the high-value market niches. The study also examines and demonstrates the importance of transaction costs in hindering smallholder farmers' access to high value markets.

Green pigeon pea marketing according to Freeman *et al* (1999) was being done by horticultural companies who could arrange for pick-up at some agreed informal collection points, such as identified places along the road where the farmers could take their produce. Some companies, however, dealt with middlemen who took the produce to some agreed points. The export market requirement for green pigeon pea is pure green pods without speckles, which is met by the improved short duration pigeon pea variety ICPL 87091. This variety requires intensive husbandry in order to meet the export demand specifications unlike the traditional long-duration variety. However, its early maturing trait has enabled regular supply of pigeon pea in the export market.

1.2.3   Utilization

Pigeon pea is widely grown by smallholder farmers in Eastern and Southern Africa, both for subsistence consumption and as a cash crop. In Kenya, it is an important food crop in the Arid and Semi Arid Lands of Kenya. Pigeon pea contains between 15%

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[4] Marketing channel refers to the path followed by the produce once it leaves the farm (through the assemblers, retailers or exporters).

and 29% protein, and is thus an important source of cheap protein in the diet of people who can ill-afford animal protein, or whose religion discourages eating animal protein (Salunkhe *et al*, 1986). This view is shared by the FAO (1987), which observes that: "pulses play an important role in the diets of a large number of countries and that they are a major source of protein in many developing counties, especially among the poorer section of the population".

According to Freeman *et al* (1999), pigeon pea is consumed in diverse ways, but mostly as a complement in cereal-based dishes in many parts of Kenya, particularly in the Eastern, Central, and Coast provinces. At household level, it is consumed as green pods and as dry grain. Shelled green or dry peas are commonly boiled in combination with maize grain, or mashed with Irish potatoes and green vegetables. In coastal areas, dry grains cooked with coconut flesh form a popular breakfast dish. Dhal is common only with the Indian communities in the country. In Europe, pigeon pea is mainly utilized in vegetable form and as a supplement for animal protein. For export green, nearly mature, clean pods are harvested and packed in small cartons.

Pigeon pea stalk is also used as an alternative source of energy in form of wood fuel, and its by-products, such as leaves and hulls, are used as animal feeds.

1.3   The problem and its justification

The liberalization of domestic markets provides new opportunities such as better prices for enhanced produce attributes, for smallholder farmers growing pigeon pea. However, the long-term marginalization of agriculture in Kenya since independence has left the sector poorly equipped to take advantage of these opportunities (Jones *et al*, 1999). A large number of poor smallholder farmers growing green pigeon pea face high transaction costs, especially due to lack of (i) access to well-organized marketing, distribution and post-harvest handling systems; (ii) effective information; and (iii) technologies that allow them to be price and quality competitive, (Freeman *et al*, 1999).

Case studies based on the application of sub-sector analysis in the pigeon pea sub-sector in Tanzania, Mozambique and Kenya (Freeman *et al*, 1999) provide insights into important aspects of pigeon pea marketing. One, the study estimated marketing margins, which were used as a measure of performance of the marketing channels. The large price spreads (marketing margins) suggest that there is an opportunity of transferring a proportion of these margins to the advantage of the producer. However, a better understanding of this proposition requires a detailed analysis of the farmers' and traders' profits (both private and social) and marketing costs. Second, the study gave evidence of high levels of transaction costs that could not be ignored in determining market performance. These transaction costs are seldom accounted for in the development of interventions to improve market access and enhance commercialization of agriculture. Randolph and Ndungu (2000) define transaction costs as the various costs, both monetary and non-monetary, other that price, incurred

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[5] Marketing costs are costs incurred as the goods change ownership and location along the marketing channel. They include cost of storage, transportation, levies and transaction costs.

to conduct a market transaction. Freeman *et al* (1999) note that there is no standard classification of transaction costs. However the most common transaction costs encountered in the marketing of green pigeon pea are; lack of key information, high opportunity cost of time spent in search of the produce and lack of alternative markets making the producers to continue selling to a particular market intermediary even when they are dissatisfied. These transaction costs affect the efficiency of marketing systems. The current study addressed the first two that were most critical in the pigeon pea sub-sector.

According to Argwings-Kodhek and Kamau (2001), the magnitude of marketing costs is an important determinant of the competitiveness of any produce in domestic as well as in the international markets. In order to remain competitive, traders often choose to cut costs by paying producers low prices, hence leading to a reduction of the farmers' share of consumers' price. The central challenge that the African policy makers often face is to determine the most productive roles of public, private and non-governmental organizations in supporting African farmers so as to build their competitive advantage in the international markets (Eicher, 1999).

The question addressed in this study is how smallholder farmers can be integrated into high-value markets through interventions that make them quality and price competitive. This requires an understanding of the current situation in the pigeon pea sub sector. This kind of study has not been undertaken to date. The current study, therefore, attempts to identify, evaluate and characterize different marketing channels of green pigeon pea and analyse the effects of transaction costs on the efficiency of different marketing channels of green pigeon pea. Efficiency can be broadly defined

as how well and less costly a marketing system performs its marketing function relative to the theoretical model of perfect competition. A marking channel is said to be efficient if, given any set of resources achieves the highest level of output.

The study attempted to answer the following research questions:

1. What are the major marketing channels of green pigeon pea in Kenya?

2. Which of these marketing channels is more efficient?

3. How do transaction costs affect the efficiency of these marketing channels?

The answers to these questions require a detailed analysis of the performance of different marketing channels of green pigeon pea. The current study tackles this challenge so as to contribute further to the understanding of the pigeon pea sub-sector in Kenya and contribute to its development.

1.4 Objectives:

The overall objective of the study is to identify and assess the performance of different marketing channels for green pigeon peas. The specific objectives of the study were:

i). To compare and rank in terms of economic efficiency the alternative marketing channels of green pigeon pea.

ii). To assess how transaction costs affect the efficiency of the marketing channels.

1.6 Study area

The study is based on the pigeon pea marketing situation in Makueni District of Kenya. The district, located in the Eastern Province of Kenya, has sixteen administrative divisions with 92,980 farm families. The district covers an area of 7,440 square kilometers and is between Latitude $1^0 35'$ South and Longitude 37^0 East

and $38^030^/$ East. There are two rain seasons; long rains between March and June, and short rains between October and December. Average rainfall is slightly over 1,000mm per annum. The northern and central parts of the district receive good rains while the southern lowlands are dry and hot. Mean monthly temperatures vary between 18^0C and 25^0C, with the coldest month being July, while October and March are the hottest months. The soils range from red clays, sandy soils and black cotton soils distributed according to the underlying rock (Republic of Kenya, 1997-2001 Makueni District Development Plan).

The major economic activity in the district is agriculture, which is mainly small-scale. Only a few cash crops are grown, and these include cotton, tobacco, and sunflower. In view of this, such crops as green grams, cowpeas, and pigeon pea play a dual role of being food as well as cash crops. Farmers in the district mainly practise mixed farming (MARD, 1999).

Makueni District is the major producer of pigeon pea in Eastern province of Kenya among other districts like Machakos and Kitui. The crop is grown primarily to supply the farm households with food, even though some farmers produce surpluses for sale. Recent developments have shown that the demand for pigeon pea has been rising both in the local and international markets (Freeman *et al*, 1999). This creates an important opportunity for the residents in the district to generate income since the district being in the semi-arid region, has few cash crops.

CHAPTER TWO

LITERATURE REVIEW

2.1. Evolution of agricultural marketing in Kenya

An agricultural marketing system can be defined as a system or institution that co-ordinates the production, transformation and consumption of agricultural produce (Jean, *et al*, 1996). Included in the system are all activities of buying and selling; all the physical activities, designed to give the commodity time, place, and form utility; and all the auxiliary activities such as financing, risk bearing and disseminating information to participants. Markets of most agricultural goods involve physical contacts between buyers and sellers. Most villages have small markets where traders regularly gather. Larger markets exist at regional, national, and international levels. Whether or not we regard individual market locations as part of one large market will depend on whether the locations are linked by trade opportunities (Jean, *et al*, 1996).

Globally, agricultural market performance during the past two decades has been uneven, with a rapid expansion in the 1970s followed by virtual stagnation in the mid 1980s and a slow recovery since then (FAO, 1998). Government economic policies imposing direct taxes that discriminated against agricultural sector in the former colonial territories led to distortions in the economy of Sub-Saharan Africa (Brandao and Martin, 1993). The cumulative effect of government economic policies was gradual loss of export market shares in world markets. For example, the share of sub-Saharan Africa in the total value of agricultural exports from developing countries declined from 28% during 1961-1963 periods, to 12% during 1995-1997 period (FAO, 1998).

In Kenya, the pre-independence period was characterized by private traders doing most of the marketing activities for agricultural produce. However, after independence, marketing boards and cooperatives were formed to handle the marketing of certain agricultural commodities. These public agencies had a statutory monopoly that was backed by the government (Bates, 1993). By mid 1980s, the purchasing, processing and exporting of agricultural commodities in the country was almost entirely in the hands of marketing boards (Shepherd and Farolfi, 2000). Although pigeon pea was not being extensively marketed, the little which entered the official marketing channel was being handled by the National Cereals and Produce Board (NCPB), (Mbatia and Kimani, 1992). The performance of these public agencies was, however, hampered by high overhead costs, few incentives for efficiency and lack of marketing expertise. The most affected was marketing of food crops due to the greater complexity of domestic food marketing system which involved thousands of assembly and distribution points and generally lower level of value- adding in processing, compared to exports (Staatz and Riley, 1993).

Until the 1980s, agricultural markets in the Less Developed Countries (LDCs) were characterized as imperfect, exploitative and rather unhelpful to development of agriculture (Timmer *et al* 1984). Prior to the 1980s studies analyzing the performance of agriculture in Sub-Saharan Africa primarily placed emphasis on the constraints posed by inappropriate fiscal and pricing policies, inadequate extension and marketing channels and mismanagement (World Bank, 1989). The liberalization of agricultural marketing under the Structural Adjustment Programmes (SAPs) since the 1980s was meant to relax the parastatal monopolies and make private enterprises more active (Abbott, 1984). In this regard, the macro-economic and sectoral policy

reforms implemented in Sub-Saharan Africa since the late 1980s put greater emphasis on the private sector to ignite economic growth (Klitgaard, 1991). These reforms reversed the overvaluation of the exchange rates, withdrew export and import licensing, pan territorial pricing of agricultural products, and domestic stabilization policies and reduced the degree of discrimination against the agricultural sector (Crowford, 1997). Wagacha (2000) has presented the objectives and rationale of these reforms in Kenya.

The policies under the reform program were directed towards the commercialization of agriculture, production of a wider range of agricultural products and improvements in spatial integration of agricultural markets (World Bank, 1989). The private sectors in Less Developed Countries were expected to take an active role in agricultural marketing. However, despite the vigorous response by the private sector in some countries to these new commercial opportunities, the implications on commercialization of smallholder farmers are not clear (Tabor, 1995). Carlos (1999) has suggested that it is important to seek ways of linking rural economies to growth markets in a profitable and sustainable way, in this time of economic aperture and globalization.

The New Institutional Economics (NIE) recognizes that the withdrawal of the state from marketing and removal of policy distortions may not necessarily lead to more efficient and competitive marketing channels due to high transaction costs associated with marketing (Kydd, *et al* 1996). Studies have shown that smallholder's access to liberalized markets is hampered by producers' costs and traders' costs. Producers' costs include transport costs, information costs, risk determined by price and demand

instability and risk aversion while traders' costs include transport, cost of finance, information/transaction costs, and risks determined by price and demand instability. These constraints, according to Nyangito (1998), lead to market failures and should be removed through proper intervention in a bid to create incentives for increased smallholder production and access to markets.

Pigeon pea is a major legume crop in the Arid and Semi- Arid Lands (ASALs) of Kenya and is primarily grown to supply the farm households with food, though some farmers produce some surplus for sale. Miller *et al* (1990) note that the world market for pigeon pea is relatively thin because the major producing country, India, is also the major consumer. Mbatia and Kimani, (1992) and Omanga (1992) also note that the bulk of pigeon pea produced in Kenya is consumed in areas where it is grown. Such trends can be attributed to lack of capital by farmers and traders to make investments necessary to exploit commercial opportunities (Sherman, 1981).

However, pulses (such as pigeon pea) require investments that are not significantly larger than other cash crops as noted by Omamo (1995) in his study of smallholder agriculture under market reform in the Southern Siaya District. On the other hand, farmers rarely mention investment costs as a reason why they choose food crops over cash crops (Pagiola *et al*, 1990 and Winter-Nelson *et al*, 1990). The research questions then are why is there a low commercialization of some crops, such as pigeon pea, and how can smallholder farmers take advantage of the emerging market opportunities. Studies by ICRISAT and its collaborators have shown that there is a vibrant trade in pigeon pea in both regional and export markets (Freeman *et al*, 1999). There is need to investigate if there are barriers in the marketing system that may

prohibit the entry of potential market participants. Provision of answers to the questions posed above calls for an assessment of the efficiencies of different marketing channels for the relevant product, which is in this study.

Mbatia and Kimani (1992) found that marketing of pigeon pea in Kenya is poorly structured and recommended that marketing facilities, such as transport and storage, be improved. The study did not indicate how these facilities should be improved, neither did it point out the efficiency or profitability of the various marketing channels that were identified. Freeman *et al* (1999) went further than what Mbatia and Kimani (1992) had done and identified marketing channels of pigeon pea as well as tried to assessing the performance of each of the channels. The study by Freemans *et al* (1999) identified marketing channels and estimated marketing margins, which were used as indices of the performance of these marketing channels. However, it is difficult to determine whether high marketing margins reflect supernormal profits in the marketing channel. Complete knowledge of marketing costs is required for such conclusions to be made. A big marketing margin may result in little or no profit, or even loss, depending on traders' profits, physical marketing costs and transaction costs (Mendoza, 1995). The current study intends to fill this gap by carrying out a detailed analysis of both social and private marketing and transaction costs. Cost reduction and efficiency in marketing of agricultural produce are important to the survival of the agricultural sector. Jones *et al* (1999) note that, for countries in Eastern and Southern Africa to remain competitive in agricultural production, productivity needs to increase, transaction costs reduced and quality standards improved.

2.2 The Concept of Market Efficiency

The concept of market efficiency is concerned with how well and less costly a marketing system performs its marketing functions relative to the theoretical model of perfect competition. An efficiently functioning agricultural marketing system is a necessary factor for sustaining economic growth in countries where agriculture is becoming more commercialized and the population is getting urbanized (Moyer, 1965). Marketing efficiency comprises price (allocative) efficiency and operational (technical) efficiency. Price efficiency is achieved if the marketing system is able to generate competitive prices that would allocate resources to their best alternative use. According to economic theory, a marketing system is price efficient if:

- Price differences between two areas reflect only the cost of spatial transfer.

- Price differences between two time periods for a storable commodity reflect the storage costs.

- The price of a processed product exceeds that of the unprocessed equivalent by the cost of processing.

Operational efficiency on the other hand is concerned with physical or technical functions and the costs of performing them. A marketing system is said to be operationally efficient if it achieves the highest level of output given any set of resources. A marketing system may deviate from efficiency due to government interventions or market failures (Monke and Pearson 1989). Government interventions introduce distortion policies that support inefficient production and marketing systems. Market failures result from monopolies or monopsonies (due to sellers or buyers control over the market), externalities (factor market intervention), or lack of transparency (market information).

The improvement of efficiency in the marketing of agricultural products by smallholder farmers requires knowledge of the marketing arrangements that operate at the present time. This can be achieved by examination and discussion of all aspects of marketing in which the benefits and costs of the existing arrangements are compared with the potential benefits and costs of alternative marketing channels (Tobias and Sibanda, 1994). This calls for a method that determines how efficiently marketing systems and marketing agents are performing their dual role of transforming commodities in time, space, and form, while reflecting relative abundance or scarcity through the price signals communicated to producers and consumers.

French (1977) observed that agricultural marketing efficiency is a relative term, which is difficult to measure. He noted that efficiency of one market might seem satisfactory using a certain measure and unsatisfactory when a different measure is used. Therefore, the measures used to assess efficiency of a marketing system should be based on the underlying assumptions and objectives.

FAO (1990) observes that the performance of a marketing system could be evaluated in terms of how well the agricultural and food marketing system performs and what the society and the market participants expect of it. For example, farmers assess the performance of a marketing system using the capacity of intermediaries to exert undue influence on prices, the extent of competition in input markets and the accessibility to infrastructure at reasonable costs. Therefore, several contrasting measures can be used to assess the performance of a marketing system: the farmers share of the retail price paid by the end user, gross marketing margin/ farm-retail price spread, and the proportion of a consumers' income which must be spent on food. In whatever perspective from which marketing system performance is evaluated, the

term most commonly used is efficiency and conclusions on efficiency depend on underlying assumptions.

As observed, there are numerous ways in which efficiency of marketing channels can be measured but the usefulness of a particular measure depends in large part on the purpose for which the evaluation is being made (World Bank, 1989). One way is to look at the three marketing functions whose combined costs constitute marketing margins (transport, storage, and processing). Cost and returns from the main participants in transportation, processing, and storage are estimated, including all costs of management and capital. Rates of returns are then calculated. To determine if these rates represent normal profits, they must be compared with the prevailing interest rate in the credit market. If the prevailing interest rate is less than the earned rate of return, then the earned level of profits is above normal. Timmer *et al* (1984), however, assert that assessing marketing efficiency through this type of analysis is time consuming and its data requirements very extensive. Hence there is need to explore other approaches.

The Cobb-Douglas production function analysis, as used by Karugia (1990) in studying beef marketing in the metropolitan city of Nairobi, could give reliable results in marketing. However its limitation is the in the in the current study is the assumption of complementarity of inputs, since some marketing agents perform their activities without performing all the marketing functions.

In recent times, Policy Analysis Matrix (PAM) methodology has become increasingly useful in analysing the economic efficiency of production and marketing systems. The

PAM methodology, as developed by Monke and Pearson (1989), provides a systematic framework to identify patterns of incentives for economic agents at each level of the commodity chain, and to analyze the direct impact of policy on these patterns at each level. Besides analysing policy effects on private profitability, PAM also examines the relative social optimality of alternative economic activities, thus incorporating the protection coefficient approach. It also allows the comparison of farm and post-farm welfare changes by evaluating each level of the commodity chain (Monke and Pearson, 1989).

The PAM methodology has been used increasingly in a framework of policy analysis in agricultural marketing. It tells us the extent to which actual prices differ from efficient prices and, therefore, the degree to which these actual price signals are likely to lead resources to be misallocated, resulting in loss of output and utility. A major advantage of the PAM as an analytical tool is the way it simplifies the analysis down to the essentials. The analysis is focused on the difference between the private and social prices. Kydd *et al* (1986), however, suggests that it is not strictly necessary to know precisely which policies or market failures are causing these effects. Given prior knowledge of the macroeconomic and market environment prevailing in the sub-sector, one can attribute these divergences to some of the policies in the economy. PAM can be used to assess efficiency issues and transfers caused by endogenous distortions like market failures and externalities (Harrigan *et al* (1992). However, it is seldom used for this purpose and, instead, is mainly used to analyze effects of government policy interventions, i.e. exogenous market distortions.

Several researchers have used PAM to analyze the efficiency of production and marketing systems. Njoroge (1996) used PAM to analyze the social profitability and comparative advantage of domestic wheat production in Kenya. Using selected PAM indicators of efficiency, the study found that there was a great potential for improving wheat production in the marginal areas than in the high potential areas. Nyangito (1998) used PAM indicators to evaluate the self-sufficiency strategy in maize production in Kenya. The study concluded that maize production is privately and socially profitable. Therefore, it is economically appropriate for Kenya to pursue the policy of increased domestic production of maize as a means of achieving food security, based on the competitiveness of production. Ochere (1999) used the same method to examine policy incentives and competitiveness of maize production in Trans-Nzoia District of Kenya and came up with similar conclusions to those of Nyangito (1998). Staal and Shapiro (1995) applied PAM in the study of Dairy Production and Marketing in Nyeri, Kenya. The results of the analysis showed that the processors were able to extract a large rent or profit that could have accrued to producers. The analysis suggested that although milk prices were not officially controlled, the position of Kenya Co-operative Creameries (KCC) as the dominant raw milk buyer allowed it to pay low producer prices, and subsequently increase its profits.

Although the previous studies that adopted the PAM framework accounted only for physical marketing costs, Kydd *et al* (1996) observes that, even in the context of full market liberalization, private prices might still deviate significantly from social prices due to transaction costs and the persistence of uncompetitive markets. These transaction costs have been overlooked in the traditional PAM frameworks, yet they

are very significant in determining the efficiency of a given marketing system. According to Kydd *et al* (1996), social prices of inputs and outputs obtained from border prices may not take into account the complexity of marketing, its risks, its seasonality and the various associated transaction costs. This may, as a consequence, underestimate the costs of inputs and overstate the price of outputs, especially in regions where transaction costs are high. This makes an enterprise appear more profitable than it actually is. Thus it is important that one considers adjusting the social prices by incorporating these transaction costs. The current study adopted the PAM framework as it allows for the adjustment of social costs using the transaction costs.

The basic PAM permits application of twelve indicators of economic efficiency, six of which are non-ratio and six are ratio indicators (Kydd *et al* 1996). Ratio indicators are more useful for comparison of commodity systems (marketing channels) and are adopted in this study.

2.3: Transaction Costs and their Effects on Marketing Efficiency

Transaction costs refer to various costs (both monetary and non-monetary), other than price, incurred to conduct a market transaction (Randolph and Ndungu 2000). They arise whenever there is any form of economic organization. There is no clear demarcation and direct empirical measurement of many transaction costs (Staal and Shapiro, 1995). A standard classification of transaction costs is yet to be agreed upon. However, New Institutional Economics categorizes transaction costs is (i) those costs that occur prior to transaction (information costs) which are mostly related to searching for and screening potential trading partners and obtaining price information,

(ii) after transaction (negotiation cost), including the cost associated with arranging for the trade, physical transfer of the product, drawing up contract, and (iii) after the transaction relating to monitoring the terms of trade (enforcement cost). Jones and Freeman (2000) outline various types of transaction costs that occur in pigeon pea sub-sector. These include:

- Lack of key information on prices, major market outlets, seasonal market requirement, and market product specification or quality standards. The cost of acquiring such information is high, thus preventing many smallholder farmers and market intermediaries from using such information to make production and investment decisions.

- Rural assemblers face high opportunity cost of time taken while collecting small volumes of produce from a large number of producers scattered across areas.

- Many producers continue to sell to a particular market intermediary even when they are dissatisfied with his/her services because they cannot find alternative market outlets.

The current study addressed the first two types of transaction costs because of the critical role they play in hindering farmers and market participants from accessing high value market niches. In the first category, farmers and marketing agents fail to know about the market hence produce and deliver sub-standard produce. This produce ends up being rejected or sold at a lower price hence making the enterprise being unprofitable. The second category of transaction costs studied herein mainly affects the marketing agents, who spend considerable time collecting produce from the small-scale farmers. The two types of transaction costs end up increasing the cost of production and marketing hence reducing marketing efficiency.

Jones and Freeman (2000) do not directly measure the transaction costs or assess their impact on reducing market access. The difficulties encountered when characterizing many transaction costs explain to a large extent the little progress made with respect to their empirical measurement (Radolph and Ndung'u, 2000). Staal *et al* (1997) point out that not only are many transaction costs inherently difficult to quantify, but in many cases, they are simply not observable; and yet they are sufficiently high to prevent a transaction from taking place.

The current study sought to determine the nature and the extent of transaction costs experienced in green pigeon pea marketing so that interventions to reduce these costs via alternative marketing arrangements can be devised. Information from the current study can show how the farmers and middlemen can access the high value market niches. The transaction costs that the current study attempted to measure are those resulting from information asymmetry, thus leading to sub-standard produce, and the high opportunity cost of time spent by the rural assemblers to collect their produce. In the first case, smallholder farmers are constrained by lack of information about the markets, lack of business and negotiating experience, and lack of a collective organization that can give them the power they require to interact on equal terms with the other generally larger and stronger market intermediaries. Poor road networks and scarcity of the produce lead to the second category of transaction costs considered in this study.

The current study adopted the PAM methodology. However, in addition to the conventional approach, social prices were adjusted by incorporating the elements of transaction costs. As noted earlier in the text, PAM allows the use of twelve indicators

of efficiency, but the current study only adopted three ratio indicators of efficiency. This is because ratio measures are more useful for comparison of marketing systems that use dissimilar technologies. The three ratio indicators adopted in this study are: Nominal Protection Coefficient (NPC), Private Cost Ratio (PCR) and Domestic Resource Cost Ratio (DRC). If alternative-marketing channels exist, these indicators can be used to evaluate not only the relative desirability of each channel, but also the relative impacts of existing and potential interventions. These indicators can also be used to determine the sensitivity of private and social incentives to changes in other parameters. The ratios are discussed in Chapter Three.

Other indicators used by PAM methodology include Effective Protection Coefficient (EPC), Profitability Coefficient (PC) and Subsidy Ratio for Producers (SRP). EPC measures the degree of policy transfer from the product market, but unlike NPC, the EPC ignores the transfer effects of factor market policies. Hence EPC is not a complete indicator of incentives. PC measures the effects of all policies and thus serves as a proxy for the net transfers. However, its usefulness is restricted when private or social profits are negative. Finally, SRP is the proportion of revenue based on world price that would be required to subsidize the producer prices if a single subsidy or tax were substituted for the entire set of commodity and macroeconomic policies. This has limited use when applied in marketing systems.

CHAPTER THREE

METHODOLOGY

3.1 Conceptual Framework

Efficiency as noted by French (1977) is a relative term that is difficult to measure. A marketing system may appear efficient using a certain measure and inefficient when a different measure is used. For example, the perfect competitive market model asserts that a market is efficient if entrepreneurs are earning normal profits (PCR and DRC equal to 1). However, in reality, markets seldom possess all the characteristics of perfect competition. Thus they are usually distorted or imperfect. The presence of distortions in a market makes the actual equilibrium prices to diverge from the efficiency prices (Monke and Pearson, 1989). It is important to know how these policies come about and the intervention that would correct them.

Beside other marketing costs, transaction costs reduce the efficiency of marketing channels and hence the farmers competitiveness in general. For example, due to information asymmetry, farmers tend to produce poor quality products, which is rejected in the market. This leads to low returns on the farmers' side. On the other hand, marketing agents face high transaction costs associated with opportunity cost of time spent in search of the produce as well as lack of information hence increased marketing costs. These transaction costs essentially reduce the efficiency of the whole commodity system as shown in the conceptual model below.

FARMER

- Poor farmers returns

- Low productivity

Transaction costs (Information asymmetry, risks aversion etc)

Commodity system

MARKETING AGENT

Increased marketing costs
Reduced market efficiency

Transaction costs (opportunity cost of time, risk related to demand and supply instability etc)

CONSUMER
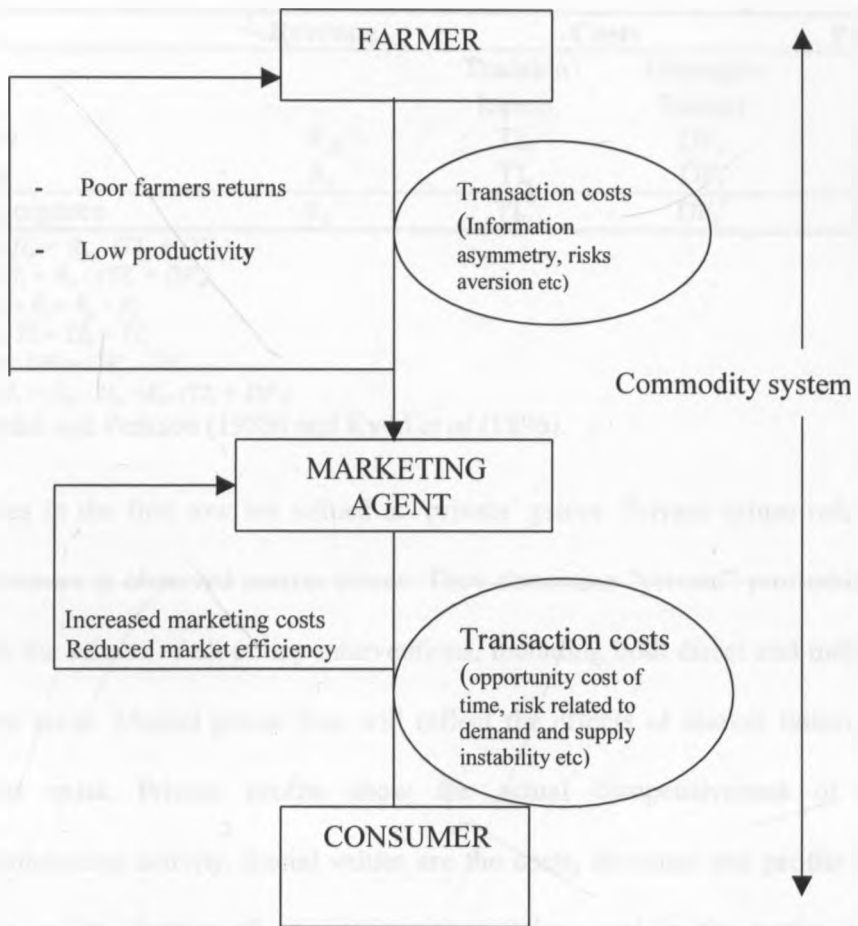
Source: Authors' compilation

3.2: Analytical model

To be able to answer the research questions raised in this study, a detailed analysis of costs and revenue structures of economic activities in each marketing channel is required. The Policy Analysis Matrix (PAM) framework provides an analytical model to carry out such an analysis (Monke and Pearson, 1989). Table 3.1 shows the PAM framework for a commodity system.

Table 3.1: The Policy Analysis Matrix

	Revenue	Costs		Profits
		Tradable Inputs	Domestic Factors	
Private prices	R_p	TI_p	DF_p	Π_p[1]
Social prices	R_s	TI_s	DF_s	Π_s[2]
Effect of Divergence	R_t[3]	TI_t[4]	DF_t[5]	Π_t[6]

[1]Private profits $\Pi_p = R_p - (TI_p + DF_p)$
[2]Social profits $\Pi_s = R_s - (TI_s + DF_s)$
[3]Output transfers $R_t = R_p - R_t$
[4]Input transfers $TI_t = TI_p - TI_s$
[5]Factor transfers $DF_t = DF_p - DF_s$
[6]Net transfers $\Pi_t = \Pi_p - \Pi_s = R_t - (TI_t + DF_t)$
Source: Monke and Pearson (1989) and Kydd *et al* (1996).

All the entries in the first row are valued at 'private' prices. Private values refer to costs and revenues at observed market prices. They determine "private" profitability. They include the effects of all policy interventions, including both direct and indirect subsidies and taxes. Market prices thus will reflect the effects of market failures if such failures exist. Private profits show the actual competitiveness of the agricultural/marketing activity. Social values are the costs, revenues and profits that would occur in the absence of any policy interventions and in the presence of efficiently functioning markets. Economic profit is the difference between social costs and revenues. Social values are the standards by which the policy effects inherent in private values are measured. They cannot be measured from observed domestic market values, which may include distortions due to government interventions or market failures. For tradable goods, the values are estimated using observed world market values, while for domestic factors, the values are estimated using the alternative domestic economic activity with the highest returns.

The rationale for the calculation of the individual revenue and costs elements of the second row borrows heavily from the logical foundation of cost-benefit analysis and international trade theory. According to Monke and Pearson (1989), the efficiency

prices for tradable outputs and tradable commodity inputs are given by world prices in the absence of domestic government policies. Setting domestic prices equal to world prices allows the economy to exhaust potential gains from trade and realize maximum national income. Social profitability is a measure of efficiency of an economic activity. It is a measure of profit that would result if the resources were optimally employed in the absence of distorting policies and market failures. It is calculated using prices that reflect opportunity costs and scarcity values. To be able to capture the effect of transaction costs, social prices were adjusted using transaction costs. The divergence row represents the difference between efficient market results and the observed market results. This divergence represents the effects of policy and market failures. It is given by the difference between the entries in the private row and those in the social row. This concept of divergence is used as a measure of relative efficiency.

In the application of PAM in marketing, the entries in the first row are the marketing costs encountered by market intermediaries at the observed value (private costs), split into tradable and domestic components. These are further expressed in their social values at the second row, while the third row represents the divergence (transfers) between the efficient value and the observed value. Each marketing channel is taken to be equivalent to a commodity system.

Major Limitations of PAM Framework.

The basic PAM (non expand) presented on Table 3.1 shows the aggregated results of divergences but not the cause of the divergences. However, an expanded PAM as shown in Table 3.2 can be drawn to identify each group of divergences separately.

This important contribution of PAM analysis allows desegregating the divergences in order to identify the specific impact on the market of each policy intervention or market failure (Staal *et al*, 1995).

Table 3.2. Expanded Policy Analysis Matrix

	Revenue	Costs		Profits
		Tradable inputs	Domestic factors	
Private prices	R_p	TI_p	DF_p	Π_p
Social prices	R_p	TI_p	DF_p	Π_p
Effects of divergence	R_t	TI_t	DF_t	Π_t
Effects of subsidies	R_{sub}	TI_{sub}	DF_{sub}	Π_{sub}
Effects of taxes and duties	R_{td}	TI_{td}	DF_{td}	Π_{td}
Effects of rent seeking	R_{rs}	TI_{rs}	DF_{rs}	Π_{rs}
Effects of market failures	R_{mf}	TI_{mf}	DF_{mf}	Π_{mf}

Π_p (Private profits) = $R_p - (TI_p + DF_p)$
Π_p (Social profits)= $R_p - (TI_{p+} DF_p)$
Π_t (Net transfers) = $R_t - (TI_t + DF_t) = \Pi_p - \Pi_p$ and $= \Pi_{sub} + \Pi_{td} + \Pi_{rs} + \Pi_{mf}$
R_t (Output transfer)= $R_p - R_p$ and $= R_{sub} + R_{td+} R_{rs} + R_{mf}$
TI_t (input transfers) = $TI_p - TI_p$ and $= TI_{sub} + TI_{td} + TI_{rs} + TI_{mf}$
DF_t (factor transfer) = $DF_p - DF_p$ and $= DF_{sub} + DF_{td} + DF_{rs} + DF_{mf}$
Source: Kydd *et al* (1996), and Monke and Pearson (1989)

The current study used the non expand PAM since the important thing was to get the effect of transaction cost and it did not require the expand version.

Another major limitation of PAM analysis is the use of fixed input-output coefficients ignoring potential economies of scale or costs associated with changes in the scale of the productive activity. Kydd *et al* (1996) however notes that, for given levels of market activity, this assumption may not be a problem but if policy changes that would lead to changes in the levels of activities are expected, the fixed coefficients impair the PAM's reliability.

PAM methodology also fails to consider supply and demand interactions, which can involve changes in prices of input and outputs. However, Kydd *et al* (1996) notes that in context where these factors are unlikely to give significant impacts, PAM

methodology is effective. Finally, PAM methodology is a static model. These limitations of PAM were assumed not to significantly affect the current study since pigeon pea production has not been produced in large scale and that policy influence in this sub-sector is very minimal. However, to overcome the effect of static results, a sensitivity analysis was carried out.

3.3: Calculation of PAM coefficients

To apply the PAM methodology, detailed budgets are obtained for all activities being studied. Costs are broken down to tradable inputs and domestic factors, whose social values are arrived at differently as discussed hereafter.

3.3.1: Estimation of private prices

Private values were derived from the observed market costs, revenues and quantities, as well as inputs at the farm level. The actual market prices incorporate the underlying economic costs and valuations, plus the effects of all policies and market failures which can be derived from the divergence between these observed values and the social (efficient) values (Monke and Pearson, 1989).

3.3.2: Social pricing of inputs and outputs

Social prices are determined differently for tradable commodities and domestic factors. All inputs and outputs are therefore classified into categories of tradable commodities and domestic factors. However, a third category of inputs and outputs that must be considered are the non-tradable inputs and outputs that have a characteristic of containing both tradable and domestic factor components. To estimate the social prices of this category of inputs and outputs, they need to be

decomposed into domestic and tradable inputs. The section below explains how social prices were estimated for the various inputs and outputs.

i) Tradable inputs and outputs

For commodities that are widely traded in the international markets, the efficiency prices used in this analysis are the world prices equivalent of the domestic products. In case of imported goods, domestic transportation and handling costs are added to the Cost, Insurance and Freight (Cif) price to arrive at the social price equivalent or import parity prices. In the case of exported goods, domestic transportation and handling costs are subtracted from the Free on Board (Fob) prices to arrive at social prices equivalent or export parity prices. Long-term Cif and Fob prices should be used in calculating import and export parity prices since decisions based on policy analysis have a long-run perspective (Morris, 1989). Long-term trends reduce the effects of short-term price fluctuations that are observed in marketing of agricultural produce. The current study adopted this method and used the average of Cif and Fob prices for the period 1998-2000.

Since the world market prices are usually quoted in foreign currency, a foreign exchange rate is needed to convert world market prices from foreign to domestic currency. This requires that Shadow Exchange Rate (SER) be estimated. Among the methodologies used to estimate the Shadow Exchange Rate (SER) is to adjust the Official Exchange Rate (OER) by the Inflation Adjustment Factor (IAF). IAF is obtained by dividing a countrys price index in the base year by the weighted average index of the major trading partner countries. For the Real Exchange Rate, the base

year is defined as the year in which the exchange rate reflects the real exchange rate as close as possible. Thus SER=OER*IAF

According to PAM (1990), the official exchange rate in Kenya does not diverge significantly from the opportunity cost of foreign exchange. Following the liberalization of the exchange rate, the estimated long-term equilibrium market exchange rate is now a good approximation of the social exchange rate. Equilibrium exchange rate for 12 months is taken to be equivalent to Social Exchange Rate. This study adopted this procedure to estimate the social exchange rate and used the year 2000 as the base year. Other researchers including Njoroge 1996, PAM (1990) and Ochere (1999), have used the same method.

World reference prices for pesticides, herbicides, and other imported agro-chemicals are not readily available. One way of estimating social prices for these types of tradable commodities is to start with domestic price and remove policy induced distortions, such as tariffs, taxes and exchange rate effects, to arrive at the equivalent of an import parity (Morris, 1989). The limitation of this procedure is its extensive data requirement. The current study assumed the divergences between the actual market prices and social prices of inputs used in pigeon pea production to be minimal since the Kenya government has waived duties on agrochemicals (USAID 1996, Njoroge 1996). However, it is worth noting that this assumption may not be applicable in most agricultural activities, which utilize taxable inputs such as petroleum products.

ii) Non-tradable inputs

According to PAM (1990), several strategies can be used to estimate social prices for non-tradable inputs and outputs. One of the most commonly used approaches is to estimate decomposition coefficients for the costs of production of the non-tradable commodities. The non-tradable commodity is decomposed into inputs needed to produce it: that is, labor, capital and tradable commodity components. The social costs for each are estimated and are then aggregated to find the social prices of the non-tradable commodity. There are various approaches of obtaining decomposition coefficients. For some inputs, lack of data forces reliance on the rule of thumb where private costs of production are arbitrarily decomposed into 1/3 capital, 1/3 labor and 1/3 tradable. These costs are then adjusted to social values by applying the ratio of social prices to private prices for relevant category. Summation across the category gives the social value of the non-tradable commodity.

Another approach is to identify all the direct and indirect inputs used to produce the non-tradable commodity from the annual budgets and reports of the institutions that produce the non-tradable input. The inputs are disaggregated into domestic factor and tradable inputs and their social prices estimated. The final procedure for obtaining decomposition coefficients is using the partial multipliers from the national input output matrix. These are measured at private market prices, and each category of private costs is multiplied by the ratio of social to private prices to obtain the social costs of the non-tradable input. The current study made use of the decomposition coefficients used by other researchers, such as Hassan and Faki (1993), Njoroge (1996), Nyangito (1998), and Ochere (1999). These coefficients are given in Table 3.2.

Table 3.3: Decomposition coefficients for non-tradable inputs in Kenya.

	Percent traded	Percent non-traded
Road transport	65	35
Purchased inputs	90	10
Dairy meal	78	22
Fixed cost of machinery	25	75
Variable cost of machinery	65	35
Building and construction	35	65
Seeds	50	50
Others	33	66

Source: Past PAM studies, extracted from the Input Output Matrix for Kenya

iii) Domestic factors

These are goods that are not normally traded internationally and include land, labour and capital. They are assigned costs equal to their opportunity cost value. That is, returns in their most socially profitable alternative use (Morris, 1989).

Land: The socio-economic value of land should be equal to its highest alternative production use (Gonzales *et al*, 1993). Determination of the highest alternative production use of land requires knowledge of crop patterns, and the costs and returns of various enterprises over time. Alternatively, the opportunity cost of land can be estimated from its rental value. If there is a competitive market for renting or leasing land, the rental value can be considered as indicative of the contribution of land to the alternative output (Tsakok, 1990). However, PAM (1990) suggests that, since land is a fixed input, its value is usually left out as part of social profits. The current study adopted this idea and did not include land values in the analysis.

Capital: Opportunity cost of capital can be estimated by calculating the real interest rate on borrowed capital. Interest rate observed in the real world will usually be nominal rate that reflects not only real returns to capital accumulation but also

expected inflation. Therefore, to estimate real interest rate, nominal interest rate has to be deflated by netting out inflation. The current study used 13.4% for 2000 base year as the real interest as shown in Table 3.3.

Table 3.4: Real interest rates on Commercial Banks Loans and Advances in Kenya

Year	Nominal interest rate	Inflation rate	Real interest rate
1997	30.4	11.2	19.2
1998	27.1	6.6	20.5
1999	25.2	3.5	21.7
2000	19.6	6.2	13.4

Source: Republic of Kenya (2001a)

Labour: This is usually valued using the marginal value product, which is the shadow price or the opportunity cost of labour. In a perfectly competitive market, the wage rate is a good indication of the opportunity cost for labour. Although the Government of Kenya sets a minimum wage rate, the actual wage rate paid in the agricultural sector is negotiated between the employer and workers. The going wage rate, therefore, was used to reflect the social price of labour.

3.4: Indicators of Economic Efficiency

(1) Nominal Protection Coefficient (NPC)

This measure of economic efficiency is used to determine the net incentives or disincentives in the output market. Effective Protection Coefficient (EPC) on the other hand measures the net incentive or disincentive caused by government policies and market failures in both input and output markets. However, most inputs used in pigeon pea production are not affected by tariffs since in Kenya, the government has waived tariffs on the inputs used in the agricultural sector (Njoroge, 1996). Therefore, policy distortions are likely to occur only in the output market. Hence Nominal

Protection Coefficient is an acceptable measure of efficiency in this case. NPC is computed from the PAM matrix as follows (see Table 3.1):

$$NPC = \frac{R_p}{R_s} \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots 1$$

Where: R_p = Revenue valued at private prices.

R_s = Revenue valued at social prices.

The result indicates the degree of output transfer in the output market.

(2) Private Cost Ratio (PCR)

This is the private cost of domestic resources required to produce a unit of value added (the difference between revenue and tradable input costs). It measures the private profitability of a channel. This ratio is computed from the PAM matrix as follows:

$$PCR = \frac{DF_p}{R_p - TI_p} \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots.2$$

Where: DF_p = Domestic factor cost valued at private price.

R_p = Revenue valued at private price

TI_p = Tradable inputs valued at private price

(3) Domestic Resource Cost Ratio (DRC)

A final indicator of efficiency used in the current study was Domestic Resource Cost Ratio (DRC) calculated from the PAM matrix as follows:

$$DRC = \frac{DF_s}{R_s - TI_s} \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots.3$$

Where: DF_s = Domestic factors valued at social prices.

R_s = Revenue at social price.

TI_s = Tradable inputs valued at social price.

This indicator can serve as a measure of the relative efficiency of domestic resource use (Fox *et al*, 1990). The ratio measures social profitability with respect to domestic resource use. The value-added of the channel is its total revenue less the cost of tradable inputs (E-F). According to Asuming-Brempong (1994), a DRC of less than one indicates efficiency of the channel, while a DRC greater than one indicates that more domestic inputs are being used to produce one unit of output.

3.5: Sampling procedures

Ostertag (1999) notes that a market survey focus on marketing channels and the industry but not on consumers *per se*. Therefore, a representative sample would cover a larger proportion of the total population and the conclusions are likely to be precise. A representative sample was selected among people who were likely to provide the needed information, which included representative farmers or farmers' groups, local and regional market intermediaries and exporting companies. The names of these groups were obtained from the Ministry of Agriculture, Kibwezi Division and sampled from each administrative location. A total of fourty questionnaires were administered, ten farmers, ten rural assemblers, five rural retailers, five urban open-air retailers, five supermarkets, and five exporters all of whom were purposefully selected.

Sampling was done with the help of the officers from the Ministry of Agriculture. The survey considered those farmers who grew green pigeon pea for the market. Rural assemblers were identified with the help of the farmers: that is, the farmers were asked whom they sold their produce to. Local retailers were sampled during market days by interviewing those people who were selling green pigeon pea in large

quantities. This also applied to Urban open-air retailers. Exporters were sampled with the help of officials from the Horticultural Crops Development Authority (HCDA). The officers provided a list of registered exporters, and out of these, all those that were dealing with green pigeon pea were selected.

3.6: Data collection

The calculations of private profitability of green pigeon pea production and marketing provided baseline information that enabled the assessment of the efficiency of the economic activity under the present policies. These calculations necessitated the development of activity budgets. To develop activity budgets, price information and technical coefficients for production and marketing are necessary. Private profit refers to the difference between observed revenue and observed costs, and reflects the actual market prices received or paid by the farmer. The private prices of the inputs and outputs incorporate the underlying economic costs and valuations plus the effects of all policies and market failures (Monke and Pearson, 1989).

Data needed to compile private and social budget for each participant and to compute the PAM for each channel were collected from farmers and traders in Kibwezi, Makindu and Mtito Andei divisions of Makueni District. Data were collected from representative farmers and farmers' groups to update the data that had been collected by Freeman *et al* (1999) using structured questionnaires. The questionnaires were pre-tested elsewhere in Wote Division of Makueni District. The targeted respondents were representative farmers or farmers groups, rural assemblers, local retailers, urban open-air retailers, purchasing officers from the supermarket and exporters in Nairobi.

The types of data collected from farmers were levels of inputs and output per area, prices of inputs and outputs, major market outlets and the prices in these alternative markets, credit facilities and indicators of transaction costs encountered during marketing. From the rural assemblers data collected were on the prices of the produce at the farm gate and at the market, marketing costs (sorting, grading and packaging), cost of packaging materials and indicators of transaction costs. For rural retailers, urban open-air retailers and urban supermarkets, data collected were on price of the produce at entry and exit level, marketing costs (sorting, grading and packaging), cost of packaging materials and indicators of transaction costs. For exporters, export parity price was included on top of what was collected from other marketing agents.

Informal interviews were also held with various Non Governmental Organizations (NGOs) and parastatals who deal with farmers directly or indirectly. These included Care-Kenya, Horticultural Crops Development Authority (HCDA), and Action Aid. Secondary data from past studies were also employed to fill in some gaps. Such secondary data were obtained from the FAO library, Tegemeo Institute of Policy Analysis, Central Bureau of Statistics, the University of Nairobi Library, ICRISAT, Ministry of Agriculture and Kenya Agricultural Research Institute (KARI).

CHAPTER FOUR

RESULTS AND DISCUSSION

4.1: Estimates of Private Profitability

4.1.1 Farm level activity budgets

The objective of this section is to assess the competitiveness of the farmers growing green pigeon pea. Hence, a farm budget was computed using the survey data as a means of measuring competitiveness at farm level (Table 4.1). The study considered individual non-contracted farmers, as they were the dominant category in the area. The results from Table 4.1 indicate that the farmers are earning an average gross margin of 50,111 Ksh per hectare per season. It is also clear from Table 4.1 that farmers in Makueni area mainly use oxen for ploughing and furrowing. However, the study established that very few farmers owned these implements and, were instead hiring them from those who had. As a result the values for hiring were used to prepare the farm budgets.

Table 4.1: Farm level activity budget (Ksh per ha) per season

Item	Cost (Ksh per ha)
Input costs:	
Land preparation:	
Ploughing (Oxen)	3,663.50
Furrowing	1,562.50
Planting:	
Seeds	460.38
Labour	1,426.10
Fertilizer application:	
DAP	287.50
Manure	700.00
Topdressing	1,106.30
Labour	600.00
Weeding:	
Weeding labour	6,883.50
Pest control:	
Chemicals	12,489.00
Spraying labour	1,830.00
Harvesting:	
Harvesting labour	7,350.00
Grading, sorting and cleaning	2,357.00
Gunny bags/cartons	356.25
TOTAL COSTS	**41,071.00**
TOTAL REVENUE[6] (Ksh/ha)	**91,182.00**
GROSS MARGIN (Ksh/ha)	**50,111.00**

Source: Authors' calculation

4.1.2: Post-farm private budgets

4.1.2.1: Marketing channels

The current study identified four major marketing channels for green pigeon pea.

Figure 2 below illustrates the different marketing channels of green pigeon peas.

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[6] Total Revenue was calculated as the product of output (production) from one hectare and average selling price per unit of produce at the farm gate.

Figure 2. Marketing channels of green pigeon pea.
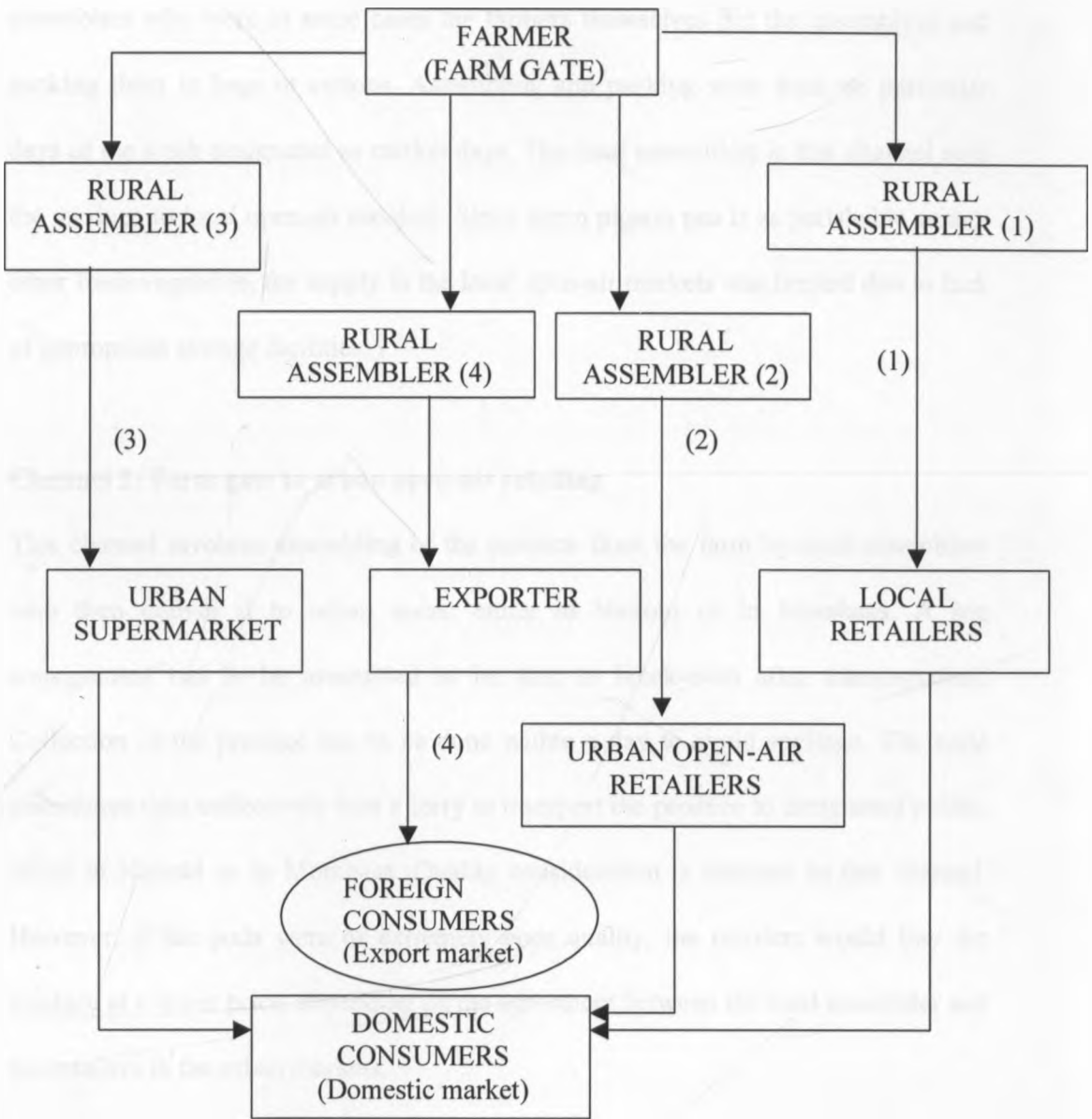
Source: Author's survey.

Figure 2 shows the major marketing channels for green pigeon pea that were identified during the survey. Unlike the channels in figure 1 the channels in figure 2 are shorter probably due to the perishability of green pigeon pea. Also in figure 2, different rural assemblers were categorized depending on where they were supplying the produce. These channels are discussed hereafter.

Channel 1: Farm-gate to local retailing

This channel entails assembling of green pigeon pea for sale in the local market. Rural assemblers who were in some cases the farmers themselves did the assembling and packing them in bags or cartons. Assembling and packing were done on particular days of the week designated as market days. The rural assemblers in this channel sold the produce to local open-air retailers. Since green pigeon pea is as perishable as any other fresh vegetable, the supply in the local open-air markets was limited due to lack of appropriate storage facilities.

Channel 2: Farm gate to urban open-air retailing

This channel involves assembling of the produce from the farm by rural assemblers who then deliver it to urban areas, either in Nairobi or in Mombasa. A big consignment has to be assembled to be able to break-even after transportation. Collection of the produce has to be done within a day to avoid spoilage. The rural assemblers then collectively hire a lorry to transport the produce to designated points, either in Nairobi or in Mombasa. Quality consideration is minimal in this channel. However, if the pods were of extremely poor quality, the retailers would buy the produce at a lower price, depending on the agreement between the rural assembler and the retailers in the urban markets.

Channel 3: Farm gate to urban supermarkets

The main supermarkets that were found selling green pigeon pea were those in high-income areas, and as such quality aspects were important considerations. These included, Uchumi Hyper Ngong Road, Sarit Centre, Kenyatta Avenue, Nakumatt check point and down town. Orders were made from specific suppliers who would supply quality products.

Channel 4: Export of green pigeon peas

This channel entails collection, sorting, grading and packing of green pigeon peas pods in carbonated cartons awaiting export. Grading is done twice, first at farm level and second at the exporter premises. According to the HCDA (2000), the major destination of Kenyan green pigeon peas is West London Market. Shipment is done through Jomo Kenyatta International Airport (JKIA) in Nairobi.

Table 4.2 below shows the private profitability of the different marketing channels of green pigeon pea. The entries in the item column are the major marketing costs encountered by different intermediaries in different channels. Since the commodity in marketing process (green pigeon pea) was an output in one level and an input in the subsequent level, care was taken to avoid double counting. That is, the cost of green pigeon pea was taken as an input only at the entry point and as an output at the final level of the channel. The rest of the costs considered in budget preparation were the value added costs, e.g. sorting, grading and packaging at different levels.

From Table 4.2, it is clear that the most profitable channel is channel 4 (Export channel), which is earning the highest level of private profit (185.50 Ksh per carton); followed by channel 3 (179.00 Ksh per carton), channel 2 (166.00 Ksh per carton) and channel 1 (93.00 Ksh per carton). Therefore, one can interpret that the Export channel is the most efficient since it is earning highest profits. This result has an important implication in policy. If farmers can access the export market directly then they can get better prices for their produce.

Table 4.2: Private budget for different marketing channels (Ksh per carton[6])

Item	Channel 1	Channel 2	Channel 3	Channel 4
Input				
Commodity in process	100.00	100.00	100.00	100.00
Handling[7] cost	20.00	22.00	25.00	10.00
Transport to selling point	10.00	10.00	10.00	-
Cost of cartons	10.00	10.00	10.00	80.00
Polythene bags	2.00	2.00	6.00	-
Market charges	15.00	5.00	-	-
Transport to pack house	-	-	-	5.00
Transport to airport	-	-	-	5.00
Airport parking fee	-	-	-	0.55
Agency fee	-	-	-	11.00
Bond fee	-	-	-	1.10
Kenya Airport Authority charges	-	-	-	1.18
Custom charges	-	-	-	0.80
Air handling fee	-	-	-	3.50
Euro fee	-	-	-	1.40
Total Cost	**157.00**	**149.00**	**151.00**	**199.50**
Total Revenue	**250.00**	**315.00**	**330.00**	**385.00**
Gross Margin[8]	**93.00**	**166.00**	**179.00**	**185.50**
Market share	**1.50**	**2.15**	**1.30**	**2.85**

Source: Author's calculation

4.1.2.2: Marketing agents

The major marketing intermediaries involved in these marketing channels were: Rural Assemblers, Local Retailers, Urban Open-air Retailers, Urban Supermarkets and Exporters. These are discussed briefly hereafter.

1) Rural Assemblers

These are the market intermediaries who collect the produce from the farmers and deliver it to the market. The study differentiated four categories of rural assemblers, depending on their cost structure and the activities they perform, and prepared a

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[6] Carton refers to a container that was being used to measure green pigeon pea. The standard carton was weighing 6 kg

[7] Handling involves sorting and grading of the produce.

depending on their cost structure and the activities they perform, and prepared a separate budget for each. The first and the second category of rural assemblers consisted of women living in the village or in the neighbouring villages or farmers themselves who wanted to earn extra income. In this category, the assemblers moved around from farm to farm in search of the produce. In most cases, these assemblers harvested the produce themselves, packed it in cartons or gunny bags and transported it to the market using hired lorries. These assemblers sold their green pigeon pea to the local retailers and to the urban open-air retailers in Mombasa and Nairobi markets. Transport costs varied between the two categories of rural assemblers depending on the distance to the market. Therefore, two separate budgets were prepared for those selling to the local market and those selling to the urban open-air market.

The third category of rural assemblers consisted of youth living in the villages, usually hired by the exporters to collect the produce. The main activities done by this category of rural assemblers is sorting, cleaning, grading and packing the produce in cartons provided by the exporters. This is done in designated collection centers where farmers deliver their produce at particular days of the week. The exporter then collects the produce from these centers. The exporter usually advances these rural assemblers money to purchase the produce from the farmers. The final category of rural assemblers consisted of those selling to urban supermarkets. These were also required to supply quality produce to the supermarkets hence incurred extra costs of sorting and grading. Due to differences in costs and benefits for different categories of rural assemblers, separate budgets were prepared for each type as shown in Table 4.3 below. The rural assemblers selling to the urban open-air retailers are earning the highest profits (Ksh 150 per carton). This is probably due to the fact that quality

consideration was minimal hence less wastage. Also due to the fact that this category of rural assemblers was able to transport a large consignment hence minimize transportation cost. This is followed by rural assemblers selling to supermarkets, then to local retailers and finally to exporters. Rural assemblers selling to urban supermarkets are however incurring the highest costs (Ksh 145 per carton). This is probably because pigeon pea gets spoilt on the shelves faster and the assembler has to replace.

Table 4.3: Private activity budget for different categories of rural assemblers (Ksh per carton).

Rural assembler selling to;	Total revenue	Total cost	Profits
Local retailers	200	130	70
Urban open air retailers	280	130	150
Urban supermarkets	240	145	95
Exporters	160	105	55

Source: Author's calculation

2) Rural Retailers

Women who sold green pigeon peas along with other green vegetables dominated this group of market intermediaries. They obtained the produce from farmers who delivered the crop to the market place during designated days of the week or as agreed between the two parties. Rural retailers mainly did their selling in the local open-air markets, by the roadside and in the residential estates. However, due to lack of proper storage facilities, the retailers purchased only the quantity they could sell within a day or two.

3) Urban Open-air Retailer

This category of market intermediaries is also dominated by women who sell green pigeon pea along with other vegetables in urban estates, urban municipal markets and along the streets in major urban centers. The produce is supplied by rural assemblers who transport the produce to the urban areas.

4) Urban Supermarkets

This category of market intermediaries obtains the produce from appointed suppliers through tender services. The study established that, unlike the other fresh produce being sold in these supermarkets, pigeon pea is obtained from the farmers and supplied directly to the supermarkets. This was because pigeon pea has a short shelf life. The study also established that the supermarkets handling green pigeon peas were those mainly in high-income areas. This has an important implication towards the commercialization of green pigeon peas. According to the supermarket purchasing officers, the demand in this market outlet has continued to rise. This is probably due to the fact that, as urbanization unfolds, people living in the urban areas prefer fast cooking food, and this demand is compounded by the fact that consumers in the high-value market niches prefer plant-based protein foods to animal based protein foods (FAO, 1998).

5) Urban Exporters

This group of market intermediaries consists mainly of companies that export pigeon peas along with other vegetables. Such companies are mainly located in Nairobi. They hire rural assemblers in the villages to assemble the produce into one consignment and they send their own vehicles to collect the produce.

From the above discussion, it is clear that each of the market intermediaries was performing different marketing functions (collection, storage, and transport), and unique costs and benefits structures experienced by each type of market participants. Private budgets for each type of market participant were estimated. A summary of these budgets is presented in Table 4.4 below.

Table 4.4: Private activity budget for different market participants (Ksh per carton)

Market participant	Channel 1			Channel 2			Channel 3			Channel 4		
	T.R	T.C	Profit	T.R	T.C	Profit	T.R	T.C	Profit	T.R	T.C	Profit
Rural assembler	200	130	70	280	130	150	240	145	95	160	105	55
Local retailer	250	227	23	-	-	-	-	-	-	-	-	-
Urban open-air	-	-	-	315	299	16	-	-	-	-	-	-
Urban supermarket	-	-	-	-	-	-	330	246	84	-	-	-
Exporter	-	-	-	-	-	-	-	-	-	385	255	131
Total profit for the channel			93			166			179			186

Where: T.R is Total Revenue and T.C is Total Cost
Source: Author's calculation

The results from the above table indicate that channel 4 is earning the highest profits (Ksh 186 per carton) followed by channel 3 (Ksh 179 per carton), channel 2 (Ksh 166 per carton) and finally channel 1 (Ksh 93 per carton).

4.2: Estimates of Social Profitability

In order to move from private profitability to social profitability and assess the underlying effects of market failures on economic efficiency of pigeon pea production and marketing, social prices of inputs and outputs must be estimated. As noted earlier, social prices are estimated differently for domestic factors, tradables and non-tradables. For ease of entry in the PAM framework, inputs were classified into different categories of tradable inputs and domestic factors. However, some inputs,

such as ploughs, have the characteristic of containing both tradable and domestic components. For this category of inputs, it was necessary to decompose them into a tradable component and a domestic factor component (land and capital). This was done through the use of decomposition coefficients that have been used by previous researchers for common agricultural inputs and services in Kenya (see Table 3.2).

For land preparation and furrowing which were done using hired oxen, the observed costs were decomposed into one-third labor, one-third capital and one-third tradable due to lack of data (Monke and Pearson, 1989). For seeds, the observed costs were decomposed into 50% tradable and 50% domestic, while chemicals were decomposed into 90% tradable and 10% domestic and harvesting (cartons) was decomposed into 33% tradable and 66% domestic. However, it was difficult to further decompose the domestic factor components in seeds, chemicals and harvesting (cartons) into labour and capital. Therefore, the current study assumed that the major component of the domestic factor is capital and that the labour component was minimal. Majority of agricultural work is accomplished by family labour, with a few cases of casuals being employed. Road transport was decomposed into 65% tradable and 35% domestic, while other miscellaneous services were decomposed into 6% tradable and 94% domestic.

Social valuation of tradable inputs and outputs was done using the world market price equivalents. However, since world market prices are usually quoted in foreign currency, a foreign exchange rate is needed to convert world market prices to domestic currency. This requires the use of a shadow exchange rate. In Kenya, since late 1993 the government has continued to maintain a competitive and market-

determined exchange rate. Hence the social exchange rate is equal to the market

exchange rate following the liberalization of the foreign exchange market. This study

used the year 2000 as a base year so that the social exchange rate was equivalent to

the market exchange rate during the year 2000. The monthly exchange rates for the

year 2000 are shown in the Table 4.5.

Table 4.5: Monthly exchange rates (Ksh to a US dollar), 2000

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
70.7	73.2	74.4	74.4	76.0	77.5	70.0	70.0	78.2	79.3	78.9	78.7

Source: CBK (2000 a,2000b, 2000c, 2000d, 2000e) and CBK (2001a, 2001b).

The social prices of pigeon pea were estimated as follows:

$$P_p = (P_{fob} * ER) - IC$$

Where P_p=the social price of pigeon pea

P_{fob}=the fob price of pigeon pea in Mombasa

ER =foreign exchange rate

IC= internal handling costs

The export parity price of pigeon peas was used as the efficient price because Kenya

has been exporting green pigeon peas. Estimation of export parity price is shown in

Table 4.6.

Table 4.6: Estimation of export parity prices of unshelled green pigeon pea, (2000)

C.I.F, West London market US$/ton	2,875.00
Freight charges-Nairobi to London, US$/ton	1,875.00
F.O.B at Nairobi, US$/ton	1,000.00
Exchange rate, Ksh to a US $	75.00
FOB at Nairobi Ksh per ton	**75,000.00**
Kenya Airport Authority charges (Ksh/ton)	225.00
Airport parking fee (Ksh/ton)	110.00
Agency fee (Ksh/ton)	2,115.00
Air bond fee (Ksh/ton)	207.00
Customs charges (Ksh/ton)	150.00
Air handling fee (Ksh/ton)	952.50
Euro fee	255.00
Packaging	16,000.00
Handling at pack house Ksh/ton	1,000.00
Transport from pack house to air port	1,000.00
Export parity price at Nairobi	52,986.00
Transport farm gate to airport (Ksh/ton)	3,000.00
Packaging	1,000.00
Handling charges per ton	2,600.00
Export parity at farm gate, Ksh/ton	**46,386.00**
Export parity farm gate Ksh/carton (6kgs)	**278.31**
Export parity at farm gate Ksh per kg	**46.39**

Source: Author's calculation

For such inputs as chemicals and fertilizers used in pigeon pea production, the study took the social prices to be equivalent to the market prices following the waive of duty on these agricultural inputs by the Kenyan Government. However, it is worth noting that there are still some commodities such as diesel, which are used, in agricultural activities and they still attract taxes. These commodities are rarely used in growing pigeon peas hence not considered in the adjustment of social prices. For domestic factors, the social prices were assigned to be equal to their opportunity cost. The opportunity cost of capital was estimated by calculating the real interest rate on borrowed capital. This was done by deflating the nominal interest rate on borrowed loans from commercial banks. The real interest rate was estimated to be 13.4 % for year 2000.

The opportunity cost of labour is equal to the marginal value product of labour, i.e. the output of labour forgone elsewhere because of its use in the production activity. In a perfectly competitive economy, the shadow prices of labour would be equal to the wage rate (PAM 1990b). In Kenya, it has been shown that the agricultural labour markets are highly competitive (Njoroge, 1996 and Ochere, 1999). Therefore, the current study used the market price for labour as its social price equivalent. Based on the estimates of the social prices, social budgets for farm and post-farm levels were calculated and the summary is shown in Tables 4.7 and 4.8.

Table 4.7: Farm level social activity budget (Ksh per hectare per season)

| | Tradable | | Domestic factors | | | | Total | |
| | | | Labour | | Capital | | | |
	Private	Social	Private	Social	Private	Social	Private	Social
Input cost:								
Land preparation:								
Ploughing (oxen)	1,221.00	671.50	1,220.80	1,221.00	1,221.00	1,384.00	3,662.50	3,276.70
Furrowing (oxen)	520.80	286.50	520.83	520.80	520.80	590.60	1,562.50	1,397.90
Planting:								
Seeds	230.20	230.20			230.20	261.00	460.38	491.23
Planting labour			1,426.10	1,426.00			1,426.10	1,426.10
Fertilizer:								
DAP	258.80	258.80			28.75	32.60	287.50	291.35
Manure					700.00	793.80	700.00	793.80
Topdressing	995.70	995.70			110.60	125.50	1,106.30	1,121.10
Application labour			600.00	600.00			600.00	600.00
Weeding:								
Weeding labour			6,883.50	6,884.00			6,883.50	6,883.50
Spraying:								
Chemical	11,240.00	11,240.00			1,249.00	1,416.00	12,489.00	12,656.00
Spraying labour			1,830.00	1,830.00			1,830.00	1,830.00
Harvesting:								
Harvesting labour			7,350.00	7,350.00			7,350.00	7,350.00
Grading, sorting, cleaning			2,357.00	2,357.00			2,357.00	2,357.00
Gunny bags/cartons	118.60	77.11			237.60	269.50	356.25	346.57
TVC	14,585.00	13,760.00	22,188.00	22,188.00	4,298.00	4,874.00	41,071.00	40,822.00
T R							91,182.00	167,776.00
Gross Margin Ksh/ha							50,111.00	126,954.00

TVC is Total Variable Cost
TR is Total Revenue
Source: Author's calculations

Table 4.8: Social budgets for different marketing channels (Ksh per carton)

	Channel 1	Channel 2	Channel 3	Channel 4
Item:				
Commodity in process	113.40	113.40	113.40	113.40
Handling cost	20.00	22.00	25.00	10.00
Transport to selling point	8.70	9.70	9.70	-
Cost of cartons	9.70	10.80	10.80	16.7
Polythene bags	2.20	2.20	6.50	-
Market charges	18.00	5.70	-	-
Transport to pack house	-	-	-	4.80
Transport to airport	-	-	-	4.80
Air parking fee	-	-	-	0.60
Agency fee	-	-	-	10.90
Bond fee	-	-	-	1.20
KAA charges	-	-	-	1.20
Custom charges	-	-	-	0.79
Air handling fee	-	-	-	1.60
Euro fee	-	-	-	1.60
Total Cost	**172.00**	**163.64**	**165.32**	**170.00**
Total Revenue	**340.00**	**325.00**	**329.00**	**377.00**
Gross Margin (Social)	**168.00**	**161.36**	**163.68**	**207.00**

Source: Author's calculation

Using the figures from private and social budgets, Policy Analysis Matrixes were constructed for the farm level and for each marketing channel and the results are summarized in Table 4.9.

Table 4.9: PAM at farm and post-farm level without transaction costs (Ksh. per carton)

	Revenue	Tradable	Domestic	Profit
Farm level				
Private prices	9,1182.00	14,585.00	26,486.00	50,111.00
Social prices	167,776.00	13,790.00	27,062.00	126,954.00
Divergence	-7,594.00	825.27	-576.00	-768.43.00
Channel 1				
Private prices	250.00	10.49	146.5	93
Social prices	340.00	8.70	163.3	168
Divergence	-90.00	1.77	-16.8	-75
Channel 2				
Private prices	315.00	10.46	138.50	166.00
Social prices	325.00	9.80	153.88	161.4
Divergence	10.00	0.70	-15.4	4.6
Channel 3				
Private prices	330.00	11.83	139.17	179.00
Social prices	329.00	11.08	154.23	163.7
Divergence	1.00	0.75	-15.06	15.32
Channel 4				
Private prices	385.00	27.5	135.32	222.1
Social prices	377.00	19.9	149.8	207.3
Divergence	8.00	7.65	-14.48	14.83

Source: Author's calculation

Following the liberalization of the agricultural sector the study assumed that the divergences between the private and social prices as indicated by the results in table 4.9 above, were due to market failures. Market failures are likely to arise from market imperfections, due to imperfect information and underdeveloped institutional structures (Monke and Pearson, 1987). It is worth noting that liberalization of domestic markets creates new opportunities for the smallholder farmers, but it offers special competitive advantages to those areas endowed with better access to markets and good information flow. Poor or non-existent communication infrastructure for disseminating information on markets, products and prices increases the divergence between the private and social prices.

Due to differences in technologies used by different marketing intermediaries, direct comparison of the data in Table 4.9 may not be sufficient to make conclusions about the efficiency (Monke and Pearson, 1987). To overcome the problem of dissimilar technologies, PCR, DRC and NPC ratios were computed. Table 4.10 summarizes the results of the calculation of these ratios at farm level and at different marketing channels of green pigeon pea.

Table 4.10: DRC, PCR and NPC at farm and post farm levels

	DRC	PCR	NPC
Farm level	0.180	0.350	0.540
Channel 1	0.493	0.612	0.735
Channel 2	0.488	0.455	0.969
Channel 3	0.485	0.437	1.003
Channel 4	0.419	0.379	1.021

Source: Author's calculation

The results in table 4.10 indicate that channel 4 is earning the lowest DRC (0.419) followed by channel 3 (0.485), channel 2 (0.488) and channel 1(0.493) respectively. The PCR result indicates that channel 4 is earning the lowest (PCR= 0.379) followed by channel 3(PCR= 0.437), channel 2 (PCR=0.455) and channel 1 (PCR=0.612) respectively. The NPC ratio indicates that channel 4 is earning the highest (1.021) followed by channel 3 (1.003), channel 20.969) and channel 1(0.735) respectively.

4.3. Interpretation of PAM ratios with respect to the research questions

(i) Private Cost Ratio (PCR)

This ratio was computed to address the issue of private efficiency of the marketing channels. PCR shows how much a channel can afford to pay domestic factors (including a normal return to capital) and still remain competitive. Intermediaries in the channel try to minimize PCR in order to maximize profit. This means a lower

PCR is most preferred since it implies more profits. The levels of costs and revenues at private market prices will reveal the presence or the absence of excess profits and the actual competitiveness of the channel (Monke and Pearson, 1989). Thus PCR<1, indicates that entrepreneurs are earning excess profits while, PCR>1 implies entrepreneurs are making losses. PCR = 1 indicates the breakeven point. From Table 4.10, it is evident that the four marketing channels of green pigeon pea are earning excess profits. The export channel however is earning the highest profits since it had the lowest PCR, (PCR=0.379). This is followed by channel 3 (PCR =0.437), channel 2 (PCR=0.455) and finally channel 1(PCR= 0.612). Thus, it follows that the export channel is the most profitable and offers the best link for farmers to the high value markets. The excess profit could be used to the advantage of farmers if the farmers were vertically integrated to the exporters.

(ii) Domestic Resource Cost Ratio (DRC)

This ratio was computed to address the issue of social profitability of the pigeon pea marketing channels. DRC is PCR expressed in social prices and is therefore a measure of social efficiency or comparative advantage of the marketing channel. Thus minimizing the DRC is equivalent to maximizing social profits. Any channel with DRC<1 is efficient or socially profitable. However, a negative DRC indicates negative value added at world prices hence inefficient. Therefore, the relevant competitive DRC range is 0 <DRC < 1. From the results in Table 4.10 it is evident that the export channel has the lowest DRC (DRC = 0.419), followed by channel 3 (DRC=0.485), channel 2 (DRC=0.488), and channel 1 (DRC = 0.493). Thus it follows that the export channel is the most efficient.

(iii) Nominal Protection Coefficient (NPC)

A final ratio, NPC, which addresses the issue of policy-induced transfers, was calculated. This ratio measures the incentives or disincentives caused by government policies or market failures in the output market. It contrasts the observed (private) commodity price with a comparable world (social) price. Two of the channels are earning prices below world prices; that is 25.5%, 3.1%, for channel 1 and 2, while channel 3 and 4 are earning 0.3% and 2% above the world market respectively. The NPC figures were as follows: 0.735, 0.969, 1.003, and 1.021 for channels 1, 2, 3, and 4 respectively. Thus it follows that the export market is the most efficient.

The farm level on the other hand is earning PCR=0.35 and DRC = 0.18. This means that farmers are competitive both privately and socially. However, the NPC ratio at farm level indicates that output prices have been depressed by 46 percent in comparison with the efficient (world) prices (NPC=0.54).

4.4: Effects of Transaction Costs on Efficiency of Marketing Channels.

Producers and marketing intermediaries often face transaction costs, which potentially hinder their access to the market and hence limit the efforts towards the commercialization of the pigeon pea sub-sector. As discussed earlier in Chapter Two, transaction costs are costs that cannot be observed directly and market participants do not attach a price to them directly (Kydd *et al*, 1996). This leads to an increased divergence between the private and social prices, thus making the channels seem more socially profitable than they would be in the absence of these transaction costs. Many researchers generally accept that transaction costs are difficult to measure. However, Kydd *et al* (1996) address this issue by incorporating these transaction costs

in PAM framework, arguing that activity budgets of traders do not explicitly include transaction costs.

The current study considered two types of transaction costs that are often encountered by the marketing intermediaries. These were the high assembling costs encountered by rural assemblers and the cost of the rejected peas due to poor quality, resulting mainly from lack of information on market product specification and quality standards. In the current study, assembling cost was estimated by using the opportunity cost of time spent by the market intermediary in collecting the small volumes of the produce from the farms, while the information asymmetry that leads to rejection of produce was estimated by using the difference in the market value of the produce. For example rural assemblers chose to pay another person to assist in collecting the produce and therefore spend less time in the field. This was considered to be the value of that transaction cost. The difference between in the market value of the rejected produce from the actual value of the acceptable produce was taken to be the second transaction cost. The two types of transaction costs were used to adjust social prices and the results are presented in Table 4.11 and 4.12. Policy Analysis Matrices (PAMs) were then constructed and the ratios of economic incentive calculated. The results are summarised in Tables 4.13 and 4.14.

Table 4.11: Farm activity budget with transaction costs (Ksh per hectare)

	Tradable		Domestic factors				Total	
			Labour		Capital			
	Private	Social	Private	Social	Private	Social	Private	Social
Input cost:								
Land preparation:								
Ploughing (oxen)	1,220.80	1,220.80	1,220.80	1,220.80	1,220.80	1,384.40	3,662.50	3,826.10
Furrowing	520.83	520.83	520.83	520.83	520.83	590.63	1,562.50	1,632.30
Planting:								
Seeds	230.19	230.19			230.19	261.04	460.38	491.23
Planting labour			1,426.10	1,426.10			1,426.10	1,426.10
Fertilizer								
DAP	258.75	258.75			28.75	32.603	287.50	291.35
Manure					700.00	793.80	700.00	793.80
Topdressing	995.67	995.67			110.63	125.45	1,106.30	1,121.10
Application labour			600.00	600.00			600.00	600.00
Weeding labour			6,883.50	6,883.50			6,883.50	6,883.50
Spraying:								
Chemical	11,240.00	11,240.00			1,248.90	1,416.30	12,489.00	12,656.00
Spraying labour			1,830.00	1,830.00			1,830.00	1,830.00
Harvesting:								
Harvesting labour			7,350.00	7,350.00			7,350.00	7,350.00
Handling			2,357.00	2,357.00			2,357.00	2,357.00
Gunny bags/cartons		77.11			237.62	269.46	356.25	346.57
TRANSACTION COST						15,157.00		15,157.00
TVC	**14,585.00**	**14,544.00**	**22,188.00**	**22,188.00**	**4,297.80**	**20,031.00**	**41,071.00**	**56,762.00**
T.R (Ksh/ha)							**91,182.00**	**167,776.00**
TOTAL PROFIT Ksh/ha							**50,111.00**	**111,014.00**

Source: Authors' calculations

The transaction costs were used to adjust the social prices as noted by Kydd *et al* (1996). Inclusion of transaction cost reduces the social profit, thus the profits are not overstated.

Table 4.12: Social budgets for different marketing channels (Ksh per carton) adjusted with transaction cost.

	Channel 1	Channel 2	Channel 3	Channel 4
Item:				
Commodity in process	100.00	100.00	100.00	100.00
Handling cost	20.00	22.00	25.00	10.00
Transport to selling point	8.70	9.70	9.70	-
Cost of cartons	9.70	10.80	10.80	16.80
Polythene bags	2.20	2.20	6.50	-
Market charges	18.00	5.70	-	-
Transport to pack house	-	-	-	4.80
Transport to airport	-	-	-	4.80
Air parking fee	-	-	-	0.60
Agency fee	-	-	-	10.90
Bond fee	-	-	-	1.20
KAA charges	-	-	-	1.20
Custom charges	-	-	-	0.79
Air handling fee	-	-	-	1.60
Euro fee	-	-	-	1.60
Transaction cost	25.00	45.00	58.00	40.00
Total Cost	**196.96**	208.64	223.32	251.30
Total Revenue	**340.00**	325.00	329.00	377.00
Gross Margin	**143.04**	116.36	105.68	125.70

Source: Author's calculation

Table 4.13: PAM at farm and post-farm levels with transaction costs. (Ksh. per carton)

	Revenue	Tradable	Domestic	Profit
Farm level				
Private prices	91,182.00	14,585.00	26,486.00	50,111.00
Social prices	167,776.00	14,544.00	42,219.00	111,014.00
Divergence	-76,594.00	42.00	-15,733.00	-60,903.00
Channel 1				
Private prices	250.00	10.46	146.5	93.04
Social prices	340.00	8.70	198.26	133.04
Divergence	-90.00	1.76	-51.76	-40.00
Channel 2				
Private prices	315.00	10.46	138.50	166.04
Social prices	325.00	9.76	182.88	132.36
Divergence	-10.00	0.70	-44.38	33.67
Channel 3				
Private prices	350.00	11.83	139.17	199.00
Social prices	329.00	11.08	179.24	138.70
Divergence	21.00	0.74	-40.01	60.32
Channel 4				
Private prices	385.00	27.53	135.32	222.12
Social prices	377.00	19.87	172.80	184.31
Divergence	8.00	7.65	-37.48	37.83

Source: Author's calculation

Table 4.14: DRC, PCR, and NPC with social prices adjusted with transaction costs.

	DRC	PCR	NPC
Farm level	0.28	0.35	0.54
Channel 1	0.568	0.612	0.735
Channel 2	0.631	0.455	0.969
Channel 3	0.668	0.437	1.003
Channel 4	0.640	0.379	1.021

Source: Author's calculation.

Tables 4.13 and 4.14 show that the inclusion of transaction costs in the current study increases the DRC figures both at farm and at post-farm levels. The level of DRCs after inclusion of transaction costs are: Farm level DRC=0.28 (0.18*[11]), channel 1

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[11] * Indicates the DRC figures in Table 4.10 before the transaction costs were included.

DRC = 0.568 (0.493*), channel 2 DRC=0.631(0.488*), channel 3 DRC= 0.668 (0.485*) and channel 4 DRC=0.640 (0.419*). The increase in DRC means that it now costs more to produce one unit of a produce domestically hence a reduction in efficiency. The PCR and the NPC ratios were however not affected by the inclusion of transaction costs since only social costs were adjusted; yet PCR and NPC are computed using private prices. The increase in DRC clearly indicates that, if transaction costs are not accounted for, farmers and marketing agents tend to understate their costs and overstate the efficiency (profits). In that case one can say that transaction costs reduce the efficiency of marketing channels.

Apparently the transaction costs were higher in the Urban Supermarkets (channel 3) and in the Export market (channel 4). This was considered to be due to information asymmetry, which led to more produce being rejected in the channels. Quality considerations are of great importance in these two market outlets. However these outlets offered premium prices for enhanced product attributes, thus products of low quality were rejected. In local retail and urban open-air markets however, quality considerations did not matter as much. The implication of this observation is that there is need for free flow of information (market transparency) in channels 3 and 4 in order to reduce transaction costs.

The market intermediaries face transaction costs while accessing the villages to purchase the produce from farmers, either due to poor roads or due to scarcity of the produce. The current study attributed scarcity of produce for the export market to farmers' failure to adopt the crop variety such as ICPL variety, which meets the export requirement. Failure to adopt the new ICPL variety may be due to its intensive

husbandry requirement, coupled with farmers' lack of credit. On the other hand, farmers face high transaction costs due to lack of information about the market requirement.

4.5: Sensitivity analysis.

One major limitation of the PAM framework is that it gives results that are static. However, PAM also allows for a sensitivity analysis of the results that helps to overcome this problem. Sensitivity analysis can be used to test the efficiency of alternative marketing arrangements, and the effect of changing certain critical parameters of the existing market arrangement. The current study carried out a sensitivity analysis to assess how alternative marketing arrangements affect farmers' social and private competitiveness. As noted earlier in the text, the main challenge of the study was to assess how the competitive advantage of the farmers growing green pigeon peas could be improved. The results presented in previous sections indicate that the export channel is the most efficient and hence the best marketing link for the farmers. Therefore, an outstanding question is how the farmers can take advantage of this channel.

Sensitivity analysis provides a way of assessing the impact of changed assumptions on profitability (Monke and Pearson, 1989). Essentially, all parameters in PAM can be subjected to sensitivity analysis, but the most sensitive ones are the world market prices of outputs, and the cost of labour and capital. One approach to sensitivity analysis involves the calculation of break-even values for social profitability. These are values necessary to achieve zero social profits, when all the revenues and costs are held at their initial values (Monke and Pearson, 1989). A second indicator is the

elasticity of social profitability with respect to a particular parameter, expressed as the percentage change in social profit with respect to percentage change in that particular parameter. The current study used the latter approach to carry out sensitivity analysis at the farm level. The study considered the farm level alone since the idea is to improve the competitive advantage of the farmers. The assumption made here is that if the farmers can access the export channel, they will have attractive prices, even though they will incur additional costs of transport and handling that were previously borne by the middlemen.

During the survey, the author visited two NGOs, i.e CARE Kenya and ACTION-AID, who are actively involved in organizing farmers into production and marketing groups and lobbying for contracts between the farmers and the exporters of Asian vegetables. An informal interview with the officials of these two organizations revealed that marketing groups with well-laid contract arrangements might improve the farmers' price by up to 40%. This is because the farmers will have a higher bargaining power when in a group than when working as individuals. Also, with well-laid contract arrangements, the flow of information on expected prices, product quality specifications and seasonal market requirements are guaranteed. This reduces the rate of produce rejection by the exporters, and hence reduces the transaction costs at the farm level. This is also evident from the results of the current study whereby the rural assemblers were offering Ksh 100 per carton of green pigeon pea to farmers and selling to the exporters at Ksh 160 per carton. Many companies preferred having contract arrangements with groups of farmers rather than individual farmers. Hence, it was difficult for an individual farmer to access the exporters, unless through an assembler.

Based on these arguments, the current study considered "group-marketing with contracts with exporters", as well as the "improvement of collection centers", as the alternative marketing arrangement to the "individual non-contracted farmers marketing arrangement" that is currently being practiced by farmers. A sensitivity analysis was carried out as shown in Tables 4.15 whereby the price of green pigeon peas was to improve by 40% should the farmers market their produce in a group to exporters. The farmers will, however, encounter extra costs of transporting the produce to the collection centers (estimated at 5 Ksh per carton) and extra handling cost (estimated at 5 Ksh per carton), which were being encountered by the rural assemblers in the former case. By varying these parameters, the ratios changed as indicated in Table 4.16.

The survey also established that the Horticultural Crops Development Authority is improving the collection centers of horticultural crops by building cold stores where the produce is kept awaiting collection. These stores will also benefit farmers growing green pigeon peas.

Table 4.15: Farm Budget sensitivity analysis. (Ksh per ha)

| | Tradable | | Domestic factors | | | | Total | |
| | | | Labour | | Capital | | | |
	Private	Social	Private	Social	Private	Social	Private	Social
Input cost:								
Land preparation:								
Ploughing (Oxen)	1,221.00	1,220.80	1,221.00	1,220.80	1,220.80	1,384.00	3,662.50	3,826.10
Furrowing hired	520.80	520.83	520.80	520.83	520.83	590.60	1,562.50	1,632.30
Planting:								
Seeds	230.20	230.19			230.19	261.00	460.38	491.23
Planting labour			1,426.00	1426.1			1,426.10	1,426.10
Fertilizer costs:								
DAP	258.80	258.75			28.75	32.60	287.50	291.35
Manure					700	793.80	700.00	793.80
Topdressing	995.70	995.67			110.63	125.50	1,106.30	1,121.10
Application Labour			600.00	600.00			600.00	600.00
Weeding:								
Weeding labour			6,884.00	6,883.50			6,883.50	6,883.50
Spraying:								
Chemical	11,240.00	11,240.00			1,248.90	1,416.00	12,489.00	12,656.00
Spraying labour			1,830.00	1,830.00			1,830.00	1,830.00
Harvesting:								
Harvesting labour			7,350.00	7,350.00			7,350.00	7,350.00
Grading, sorting cleaning			2,357.00	2,357.00			2,357.00	2,357.00
Gunny bags/cartons	118.60	77.11			237.62	269.50	356.25	346.57
Transport to market	1,976.00	1,797.80	531.90	531.90	531.90	712.70	3,039.40	3,042.40
Handling			3,039.00	3,039.40			3,039.40	3,039.40
TRANSACTION COST						15,157.00		15,157.00
T. V. COSTS	**16,561.00**	**16,341.00**	**25,760.00**	**25,760.00**	**4,829.70**	**20,743.00**	**47,150.00**	**62,844.00**
T. R Ksh/ha)							**127,655.00**	**169,234.00**
PROFIT Ksh/ha							**80,505.00**	**106,390.00**

Source:Authors'calculations.

Table 4.16: DRC, PCR, and NPC after the sensitivity analysis

	DRC		PCR		NPC	
Without Transaction cost	0.18*	0.20**	0.35*	0.28**	0.54*	0.75**
With Transaction cost	0.28*	0.30**	0.35*	0.28**	0.54*	0.75**
% Change		11		20		35

* Current market arrangement
** Alternative marketing arrangement

From Table 4.16 above, it is shown that the PCR under the alternative marketing

arrangement has decreased from 0.35 to 0.28. Decline in PCR under the alternative

marketing arrangement implies an increase in the farmers' price competitiveness. This

is supported by the increase in the NPC ratio from 0.54 to 0.75. This result implies that farmers would now get 24.6 % less than the export parity price, compared to 46% less in the initial case. However, the DRC increase from 0.18 to 0.20 (without transaction costs) and from 0.28 to 0.30 (with transaction costs).

The increase in DRC could be due to the fact that farmers are spending more on transport, an activity that was previously being done by market intermediaries, hence an increase in use of domestic resources. However, the decline in PCR implies that farmers' competitiveness has improved. This is to say that, in the implementation of the new marketing arrangement, there are trade-offs whereby farmers have to spend more domestic resources to earn extra foreign exchange. It is worth noting that the percentage increase in DRC (11% without transaction cost) is lower than the percentage decrease in PCR (20%). Therefore, the alternative marketing arrangement is worthwhile implementing despite the increase in DRC.

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMEDATIONS

5.1 Summary and conclusions

The liberalization of domestic agricultural markets and the effects of globalization provide new opportunities such as better prices and good flow of information that could benefit smallholder farmers in developing countries. However, due to lack of well-organized marketing, distribution and post-harvest systems, the smallholder farmers who grow pigeon peas have not been able to enjoy the benefit of these opportunities. Consequently, these smallholder farmers who grow pigeon peas in Kenya focus on producing for subsistence due to poor market access. The objective of this study was to identify, compare and rank alternative marketing channels of green pigeon peas on the basis of their efficiency and analyse the effects of transaction costs on the efficiency of these marketing channels.

To determine the efficiency of the different marketing channels, private and social budgets were constructed for each marketing channel and Policy Analysis Matrix (PAM) constructed for each channel and for the farm level. PAM ratios (PCR, DRC, and NPC) were calculated to enable comparison of the channels and to circumvent the problems arising from dissimilar technologies that are used by different market intermediaries. Four marketing channels through which green pigeon pea is marketed in Makueni district were identified as follows: farm gate to local retail market, farm gate to urban open-air market, farm gate to urban supermarkets and farm gate to export market. In each channel, there were different market intermediaries carrying out different functions, such as assembling of the produce, sorting, grading, packaging and transporting. These intermediaries were identified as rural assemblers, rural

retailers, urban open-air retailers, urban supermarkets and exporters. Channel 4 (export channel) ranked first both in private and social profits with a DRC = 0.419, and a PCR = 0.379 as shown in Table 4.10 hence it was considered the most profitable. This was followed by channel 3 (urban supermarket), channel 2 (urban open-air retailing) and channel 1 (local retail market) in that order. The NPC figures also indicated that channel 4 (export channel) was earning 2.1% higher than the world market prices (NPC=1.021) hence ranked first.

Besides identifying and ranking the marketing channels of green pigeon pea on the basis of their efficiency, the current study also determined the competitiveness of smallholder farmers in the district by preparing a farm budget as well as calculating the DRC, PCR and NPC ratios. The results of the farm level analysis indicated that, farmers were competitive (both private and social). The DRC and PCR ratios were 0.18 and 0.35 respectively. However, the NPC indicated that farmers were earning 46% less than the world market price. This indicates an implicit taxation at the farm level.

The current study identified and estimated two types of transaction costs encountered in marketing of green pigeon pea. These transaction costs were: opportunity cost of time spent during the assembly of produce and information asymmetry leading to rejection of produce by buyers. The incorporation of transaction costs in the PAM framework increased the DRC figures from 0.180, 0.493, 0.488, 0.485, and 0.419 in Table 4.10, to 0.280, 0.568, 0.631, 0.668, and 0.640 in Table 4.14, for farm level, and channels 1, 2, 3, and 4 respectively. The implication for this result is that transaction costs reduce the efficiency of the marketing channels. The transaction costs were

found to be high in the urban supermarkets and in the export market outlets. The study concluded that this was due to the fact that in these market outlets, the quality of the produce was critical. If the produce did not meet the required specifications, it was rejected. However, in local retail and urban open-air markets, the quality of the produce was not considered important. This calls for free flow of information about product specifications as well as seasonality so that farmers may produce only what is required in the market and when it is needed. This will reduce wastage hence reduce the transaction costs.

The current study concludes that the export channel is the most efficient and hence offers the best link for the farmers. This, however, requires that the farmers form groups and enter into contracts with exporters. This will allow the farmers to access the market information and hence produce what is required. Availability of the produce will help to reduce the opportunity cost of time spent collecting the produce.

Sensitivity analysis results indicated that group marketing, as an alternative marketing arrangement would improve the farmers' competitiveness since the PCR decreased from 0.35 to 0.28. However, this was not without trade-offs since the DRC increased from 0.18 to 0.20. Thus, the current study concludes that group marketing with well-laid contract arrangements with the exporters could improve the competitive advantage of the farmers because the farmers are likely to have more bargaining power over their produce. Further, the improvement of collection centers, as is being attempted by the HCDA, will reduce post-harvest losses.

5.2: Recommendations

From the results and the discussion above, it is clear that the export channel was the most profitable marketing channel. Thus, the study therefore makes the following recommendations to increase marketing efficiency and competitiveness of pigeon pea production

- That institutions that govern production, exchange and distribution of produce be put in place in order to reduce transaction costs. Such institutions would include organizations such as marketing firms (exporters), producer groups, information systems (news letters) and regulatory agencies such as KEPHIS. These institutions, and with set of rules and market practices, farmers and marketing agents are able to reduce transaction costs hence improve marketing efficiency.

- To reduce transaction costs associated with enforcement, contractual arrangements between producers and marketers should be made, whereby farmers are supplied with inputs in exchange of the produce.

- Many researchers view group marketing as a solution to marketing problems in small-scale farmers. However, on their own, farmers are unable to sustain these groups. Therefore, different stakeholders such as CARE-Kenya and ACTION-AID, should assist pigeon pea farmers in forming marketing groups and also lobby for contract arrangements between the farmers and the exporters. This will improve the bargaining power, enhance information flow and hence reduce the transaction costs. This has worked well with other horticultural farmers in the same area (Makueni).

- The Government via the Ministry of Agriculture should organize to train farmers through open field days, workshops and seminars on how to sustain these groups through proper management practices.

- Collection centres should be improved and more introduce closer to the farmers in order to help farmers reduce the post-harvest losses. Officials of the Horticultural Crops Development Authority (HCDA) confirmed that with the farmers delivering their produce to these improved centers, they could save up to 50% on post-harvest losses.

- Credit institutions such as K-rep and Faulu Kenya could come in and offer this will enable farmers produce the ICPL variety that meets the export demand specification.

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APPENDICES

APPENDIX I: Green Pigeon Pea Farmer's Questionnaire

Date_____

Questionnaire Serial No._____

Farmer's Name_____

Division_____

Village_____

A) Production:

1. What is the size of your farm? _____Acres
2. How many acres/hectares of your farm do you cultivate?
3. How many acres/hectares of the farm is under green pigeon pea? _____
4. Which varieties of green pigeon pea do you grow? _____
5. Which is the major variety of pigeon pea that you grow? _____
6. Why do you prefer this particular variety to the other varieties? _____.
7. Which variety is commonly grown by your neighbours and why? _____
8. How long have you been growing green pigeon pea? _____
9. What is the cost of ploughing, planting, weeding, spraying and harvesting per acre/hectare of green pigeon pea (Labour/Oxen/ specify _____)?

Item	Cost per area planted	Cost per acre
Ploughing		
Furrowing		
Seeds		
Fertilizers		
Planting		
Top dressing		
Planting labour		
Weeding labour		
Spraying		
Chemical		
Labour		
Harvesting labour		
Shelling		

10. What is the output per variety per acre/hectare?_____(units)

B) Marketing Information

1. To whom do you sell your green pigeon pea (main buyer)? _____
   (1. Rural assemblers 2. rural wholesalers 3. exporting companies 4. others (specify)_____)
2. What is the selling price per unit of the output? _____
3. Why do you prefer to sell to the buyer you have named above? (1. Better prices 2. proximity 3.no alternative market 4. others (specify)_____)
4. How much did you consume at home from your total harvest last season? Or how much did you sell from the last season? (Whichever that can be remembered)_____
5. Do you think your green pigeon pea sales have been increasing? 1.Yes 2. No
6. If yes, then why have the sales been increasing?_____
7. If no, then why have the sales not been increasing?_____.
8. Do you sell your green pigeon pea through a co-operative or individually? _____
9. Give the advantages and disadvantages of the marketing arrangement you use.

	Advantages		Disadvantages
1.	_____	1.	_____
2.	_____	2.	_____

10. Are you contracted or not contracted?_____

11. Give the advantages and disadvantages of selling as contracted and non-contracted

	Advantages		**Disadvantages**
1.	_____	1.	_____
2.	_____	2.	_____

12. Do you sort, grade and clean your green pigeon pea before selling? **1** Yes **2.** No
13. If yes, why?(1. fetch better prices 2.required to do so 3. others (specify)_____)
14. How much does it cost you to sort, grade and clean one unit of your green pigeon pea?

Activity	**cost**
Sorting	_____
Grading	_____
Cleaning	_____

15. If not, then why? _____
16. Do you transport your green pigeon pea to the point of sell? 1. Yes 2.No
17. If yes, how far (km) is the selling point from your farm? _____ Km.
18. How much does it cost you to transport a unit (kg/bag) of this pigeon pea to the market?_____.
19. If you don't transport your pigeon pea to the market, then what makes you not transport your grain to the market? _____.
20. Do you think you could get a better price if you did so? 1.Yes 2. No
21. Do you store the green pigeon pea in order to sell it later? 1. Yes 2.No
22. If yes, how much does it cost you to store one unit of the output? ____Ksh/carton.
23. How much do you loose per unit of the output in storage? _____Cartons.
24. If you don't store, then what makes not store the pigeon pea? _____.
25. Do buyers of your green pigeon pea give you any other services? 1. Yes 2. No
26. If yes, name them.(1. credit 2. transport 3. others (specify)_____)
27. How reliable are these services? _____
28. Name any other fixed costs you incur in running the green pigeon pea business with their respective per unit costs _____._
29. What is your opinion about the infrastructure in the area and how it affects your farming activities?

C) Transaction costs.
i) Prices, alternative market outlets and seasonal market requirements
1. Do you get prior knowledge of prices for your green pigeon pea? 1.Yes 2.No
2. If yes, then how do you get the information on those prices? _____
3. Are you aware of any alternative market for your green pigeon pea?1.Yes 2.No
4. If yes, name them_____
5. How far are these alternative markets from your farm? _____ Km.
6. Are you aware of the prices in those alternative market outlets? 1. Yes 2.No
7. If yes, are those prices in alternative markets better than those in the market outlet you are utilizing? 1.Yes 2.No.
8. Do you access these alternative market outlets you have mentioned?1.Yes 2.No

9. If not, then what makes you not able to access them? _____.
10. Are you aware of the seasonal market requirements? **1.**Yes **2.**No.
11. If yes, then where do you get such information on seasonal market requirements?
12. Do you have a problem of over-production at any one given point in the year? **1.**Yes **2.**No
13. If yes, then which months? _____
14. How much do you over-produce in that given season? _____
15. What do you do with such over-produced output? _____
16. Do prices vary widely from place to place? **1.**Yes **2.**No
17. If yes, what do you think causes such variability in prices? _____.
18. Do prices vary widely from place to place? **1.**Yes **2.**No
19. If yes, what do you think causes such variability in prices? _____.

ii) Quality Standards
1. Do buying traders of your green pigeon pea consider the quality? **1.**Yes **2.**No
2. If yes, what are the quality parameters considered (1. poor pod colour, 2. foreign matter composition, 3. MRLs 4. Others specify_____)?
3. Which proportion of your pea (per kg/bag) is rejected as of unacceptable quality?
4. What do you think should be done to reduce this problem of getting your pigeon pea rejected by the buying traders? _____.
5. Do you find alternative market for your rejected green pea? **1.**Yes **2.**No
6. If yes, then where? _____.
7. What is the per unit price of the rejected green pea? _____ksh per carton.

iii) Cost of time
1. Do you take your green pigeon pea to the selling point? **1.**Yes **2.**No.
2. If yes, then how long does it take you to transport one unit of your green pigeon pea to the market and sell it (kg/bag/ton/specify_____)?
3. How many hours do you spend at the market per day? _____
4. How much do you sell in a day?_____cartons.
5. When you hire somebody to take the grain to the market for you, then how much do you pay for those services (per unit output or per day)_____
6. What other activities do you engage in when you have hired somebody to take the green pea to the selling point for you from your farm? _____

iv) Credit and Risk Factors
7. Do you access any form of credit facilities? **1.**Yes **2.**No
8. If yes, from whom? _____
9. What are the minimum requirements for one to access those credit facilities?
10. Which type of credit facility do you get (cash/kind/others_____)?
11. What are the terms of payment?_____
12. If no, what makes you unable to access such credit facilities? _____
13. Do you sell on credit to the buying traders of your green pigeon pea? **1.**Yes **2.**No
14. If yes, then what are the conditions for such credit sales? _____
15. What are the terms of payment? _____
16. If no, then what makes you not to sell on credit? _____

APPENDIX II: Green Pigeon Pea Urban Exporter's questionnaire

Date_____

Questionnaire Serial No._____

Respondent's Name_____

Town_____

Estate_____

A) Marketing:

i) Purchasing

1. From whom do you buy your green pigeon pea? (1.rural assemblers, 2.rural wholesalers, 3. Urban wholesalers, 4. Urban Exporters, 5. others-specify_____)
2. How much do you buy per day/week/month from each source (local variety and improved variety respectively)?

Source	frequency	amount	price per unit
1_____	_____	_____	_____
2_____	_____	_____	_____
3_____	_____	_____	_____

3. Do you store the green pigeon pea? 1.Yes 2. No
4. Why do you store or don't store the green pigeon pea?_____
5. If you own the storage facility, what is its value?_____
6. What is the useful life (years) of this storage facility?_____
7. For how long do you store the pigeon pea before selling?_____
8. What is the average cost of storing a unit of the green pigeon pea? (Give the breakdown of storage costs per unit e.g. Labour, chemicals e.t.c)

Item	cost per unit
Labour	_____
Chemical	_____
Storage hire	_____

9. Do you experience any losses in storage (both quality and quantity losses)? 1.Yes 2. No
10. If yes, what causes such respective losses?_____
11. How much do you loose per unit (kg/carton/ton) in storage?_____
12. Do you transport the green pigeon pea from the buying point to your premises? 1.Yes 2. No
13. If yes, what is the transportation cost per unit or per distance? _____
14. Do you own the means of transport? 1.Yes 2. No
15. If yes, name the means of transport you own? _____
16. What is its value?_____
17. What is the useful life (years) of this transportation means?_____

iii) Selling

1. Which are the major exports markets for your green pigeon pea?

Export market	sales per week	price per unit
_____	_____	_____
_____	_____	_____

2. Has your sales been increasing? 1.Yes 2. No
3. If yes, in which market has the sales been increasing?_____
4. What factors have contributed to the increased sales?_____
5. If no, what factors have hindered the increase in sales?_____

B) Transaction Costs:

i) Prices, Alternative Market Outlets and Seasonal Requirements

1. Do you ever get prior knowledge of prices for your green pigeon pea product in the export market? **1.**Yes **2.** No
2. If yes, then how do you get the information on those prices?_____
3. Are you aware of any alternative export market outlet for your green pigeon pea? **1.**Yes **2.** No
4. If yes, name them_____
5. Are you aware of the green pigeon pea prices in those alternative export market outlets? **1.**Yes **2.** No
6. If yes, are those prices in alternative export markets better than those in the market outlet you utilize? **1.**Yes **2.** No
7. Why do you prefer the market outlet that you utilize to the alternative ones? _____
8. Do you access these alternative market outlets you have mentioned? **1.**Yes **2.** No
9. If not, then what makes you not able to access them?_____
10. Are you aware of the seasonal export market requirements for green pigeon pea? **1.**Yes **2.** No
11. If yes, then where do you get such information on seasonal market requirements?_
12. Do you have a problem of disposing off the stocks you have purchased at any one given point in the year due to glutting of the targeted export market? **1.**Yes **2.** No
13. If yes, then which months of the year?_____
14. Do you have an alternative market for such stocks? **1.**Yes **2.** No
15. If yes, which ones?_____
16. What is the per unit selling price of your product in these alternative market outlets?

Market outlet	**selling price per unit**
_____	_____
_____	_____

17. If no, then how much do you loose in that given season?_____
18. What factors do you consider when negotiating for the buying price? _____
19. How long does it take to negotiate for the prices? _____
20. Do prices in these markets vary from season to season? **1.**Yes **2.** No
21. If yes, what do you think causes such variability in prices?_____

ii) Green quality, grades and standards
1. Do you buy the green pigeon pea in different grades/qualities? **1.**Yes **2.** No
2. If yes, what are the quality parameters considered (1. MRLs, 2.pod colour, 3. Texture 4. others (specify)_____
3. What are the per unit prices for the different green pea grades?

Grades	**price perm unit**
_____	_____
_____	_____

4. Do you clean, sort and grade the green pigeon pea before selling it? **1.**Yes **2.** No
5. If yes, then how much does it cost you to clean one unit (kg/carton/ton)?

Activity	**cost per unit**
Cleaning	_____
Sorting	_____
Grading	_____

6. Does the your targeted export market consider the green pigeon pea quality? **1.**Yes **2.** No
7. If yes, what are the quality parameters considered (1. poor pod colour, 2. foreign matter composition 3. others (specify)_____)?

8. Which proportion of your green pigeon pea (per kg/carton) is rejected as of unacceptable quality?_____

9. What do you think should be done to reduce this problem of getting your pigeon pea rejected by your buying customers? _____

10. Are you always aware of the green pigeon pea quality that is needed in your targeted exporting market? **1**.Yes **2**. No

11. If yes, where and how do you get such information on quality   ?_____

12. If no, how would you like to get such information?_____

13. Do you find alternative market for your rejected green pigeon pea? **1**.Yes **2**. No

14. If yes, then where?_____

15. What is the per unit price of the rejected pea?_____

16. If no, then what do you do with such rejected pea?_____

iii) Cost of time

1. Do you go to get your green pigeon pea from the source yourself? **1**.Yes **2**. No

2. If yes, then how long does it take you to collect one unit (kg/carton/ton/specify)?

3. From how many sources are you able to get the amount mentioned above?_____

4. When you send somebody to collect the green pigeon pea for you, then how much do you pay for those services (per unit output or per day)_____

5. What other activities do you engage in when you have hired somebody to assemble the green pigeon pea for you from the various sources? _____

iv) Credit and Risk Factors

1. Do you access any form of credit facilities? **1**.Yes **2**. No

2. If yes, from whom?_____

3. What are the minimum requirements for one to access those credit facilities? ____

4. Which type of credit facility do you get (cash/kind/others_____)?

5. What are the terms of payment?_____

6. If no, what makes you unable to access such credit facilities? _____

7. Do you give any credit facility to farmers/rural assemblers, urban wholesalers, etc.? **1**.Yes **2**. No

8. If yes, then what are the minimum requirements for one to access such credit facilities?

9. Which type of credit facility do you give (cash/kind/others_____)?

10. What are the terms of payment? _____

11. If no, then what makes you not give them credit?_____

APPENDIX III: Green Pigeon Pea Urban Supermarket Retailer's questionnaire

Date_____

Questionnaire Serial No._____

Respondent's Name_____

Town_____

Estate_____

i) Purchasing

1. From whom do you buy your green pigeon pea? (1.rural wholesalers, 2.Urban wholesalers, 3. Urban Exporters, 4. Others-specify_____)

2. How much do you buy per week/month from each source (local variety and improved variety respectively)?

	source	amount	price per unit
1.	_____	_____	_____
2.	_____	_____	_____
3.	_____	_____	_____

3. Do you store the green pigeon pea? 1. Yes 2. No.

4. Why do you store (don't store) the green pigeon pea? _____

5. If you own the storage facility, what is its value?_____

6. What is the useful life (years) of this storage facility?_____

7. For how long do you store the green pigeon pea before selling? _____

8. What is the average cost of storing a unit of the green pigeon pea? (Give the breakdown of storage costs per unit e.g. Labour, chemicals e.t.c)

Item	cost per unit
Labour	_____
Storage hire	_____
Other (specify)	_____

9. Do you experience any losses in storage (both quality and quantity losses)? 1. Yes 2. No.

10. If yes, what causes such respective losses? _____

11. How much do you loose per unit (kg/carton/ton) in storage?_____

12. Do you transport the green pigeon pea from the buying point to your premises? 1. Yes 2. No.

13. If yes, what is the transportation cost per unit or per distance? _____

14. Do you own the means of transport? 1. Yes 2. No.

15. If yes, name the means of transport you own? _____

16. What is its value? _____

17. What is the useful life (years) of this transportation means? _____

iii) Selling

1. To whom do you sell your green pigeon pea? _____

2. What is the per unit selling price of your pigeon pea? _____

3. Has your sales been increasing? 1. Yes 2. No.

4. If yes, what factors have contributed in your increased sales? _____

5. If no, what factors have hindered your increase in sales? _____

C) Transaction Costs:

i) Prices, Alternative Market Outlets and Seasonal Requirements

1. Do you ever get prior knowledge of prices for your green pigeon pea product? 1. Yes 2. No.

2. If yes, then how do you get the information on those prices?_____

3. Are you aware of any alternative market outlet for your green pigeon pea? **1.** Yes **2.** No. If yes, name them

Outlet	Distance from farm	Price per unit of green pea sold
1.		
2.		
3.		

4. If yes, are those prices in alternative markets better than those in the market outlet you utilize? **1.** Yes **2.** No

5. Why do you prefer the market outlet that you utilize to the alternative ones?_____

6. Do you access these alternative market outlets you have mentioned? **1.** Yes **2.** No

7. If not, then what makes you not able to access them? _____

8. Are you aware of the seasonal market requirements? **1.** Yes **2.** No

9. If yes, then where do you get such information on seasonal market requirements?_____

10. Do you have a problem of disposing off the stocks you have purchased at any one given point in the year due to glutting of the targeted market? **1.** Yes **2.** No

11. If yes, then which months of the year?_____

12. Do you have an alternative market for such stocks? **1.** Yes **2.** No

13. If yes, which ones?

Alternative market	Price per unit.
1.	
2.	
3.	

14. If no, then how much do you loose in that given season? _____

15. What factors do you consider when negotiating for the buying price? _____

16. How long does it take to negotiate for the prices?_____

17. Do prices vary from season to season? **1.** Yes **2.** No

18. If yes, what do you think causes such variability in prices? _____

ii) Green quality, grades and standards

1. Do you buy the green pigeon pea in different grades/qualities? **1.** Yes **2.** No

2. If yes, what are the quality parameters considered (1. MRLs, 2. Pod colour, 3. Size

3. Others (specify)_____?

4. What are the per unit prices for the different green pigeon pea grades?

Grade	price per unit
1. _____	_____
2. _____	_____
3. _____	_____

5. Do you clean, sort and grade the green pigeon pea before selling it? **1.** Yes **2.** No

6. If yes, then how much does it cost you to clean one unit (kg/carton/ton)?

Activity	time taken per unit	cost
Cleaning	_____	_____
Sorting	_____	_____
Grading	_____	_____

7. Do the buying traders of your grain consider the green pigeon pea quality? **1**. Yes **2**. No
8. If yes, what are the quality parameters considered 1. Poor pod colour, 2. Foreign matter composition 3. Sizes 4. Others (specify)_____?
9. Which proportion of your green pigeon pea (per kg/carton) is rejected as of unacceptable quality?_____
10. What do you think should be done to reduce this problem of getting your pigeon pea rejected by the buying consumers? _____
11. Are you always aware of the pigeon pea quality that is needed in your targeted market? **1**. Yes **2**. No
12. If yes, where and how do you get such information on green pigeon pea quality? _
13. If no, how would you like to get such information?_____
14. Do you find alternative market for your rejected green pigeon pea? **1**. Yes **2**. No
15. If yes, then where?_____
16. What is the per unit price of the rejected pigeon pea?_____
17. If no, then what do you do with such rejected pigeon pea?_____

iii) Cost of time
1. Do you go to get your green pigeon pea from the source yourself? **1**. Yes **2**. No
2. If yes, then how long does it take you to collect one unit (kg/carton/ton/specify) _
3. From how many sources are you able to get the amount mentioned above?_____.
4. When you send somebody to collect the green pigeon pea for you, then how much do you pay for those services (per unit output or per day)_____
5. What other activities do you engage in when you have hired somebody to assemble the green pigeon pea for you from the various sources? _____

 iv) Credit and Risk Factors
6. Do you access any form of credit facilities? **1**. Yes **2**. No
7. If yes, from whom?_____
8. What are the minimum requirements for one to access those credit facilities?____
9. Which type of credit facility do you give (cash/kind/others_____)?
10. What are the terms of payment?_____
11. If no, what makes you unable to access such credit facilities?_____

APPENDIX IV:Green pigeon pea rural assembler's questionnaire

Date_____

Questionnaire Serial No._____

Respondent's Name_____

Division_____

Village/Market_____

Marketing:
i) Purchasing

1. From whom do you buy your green pigeon pea? (1. Individual farmers, 2. farmers' groups, 3. others-specify_____)

2. How much did you buy last season from each source (local variety and improved variety respectively)?

Source	quantity	price per unit
1. _____	_____	_____
2. _____	_____	_____
3. _____	_____	_____

3. What is the average buying price of the green pea in the respective seasons?

4. Do you store the grain? **1.** Yes **2.** No

5. Why do you store or don't store the green pigeon pea? _____

6. If you own the storage facility, what is its value? _____

7. What is the useful life (years) of this storage facility? _____

8. For how long do you store the green pigeon pea before selling? _____

9. What is the average cost of storing a unit of the grain? (Give the breakdown of storage costs per unit e.g. Labour, chemicals e.t.c).

Item	cost per unit
Labour	_____
Chemical	_____
Storage hire	_____

10. Do you experience any losses in storage (both quality and quantity losses)? **1.** Yes **2.** No

11. If yes, what causes such respective losses?_____

12. How much do you loose per unit (kg/bag/ton) in storage?_____

13. Do you transport the green pea from the buying point to your premises? **1.** Yes **2.** No

14. If yes, what is the transportation cost per unit or per distance? _____

15. Do you own the means of transport? **1.** Yes **2.** No

16. If yes, name the means of transport you own?_____

17. What is its value?_____

18. What is the useful life (years) of this transportation means?_____

iii) Selling information

1. To whom do you sell your green pigeon pea (1.Rural wholesaler, 2. Urban wholesaler, 3. Others (specify)_____)?

2. Do you transport your green pigeon pea to the point of sell? **1.** Yes **2.** No

3. If yes, how far (km) is the selling point from your store/warehouse? _____

4. How much does it cost you to transport a unit (kg/bag) of pigeon pea to the market?_____.

5. If you don't transport your green pigeon pea to the market, then what makes you not transport your grain to the market?_____.

6. What is the per unit selling price of your green pigeon pea when you sell it from your premises?_____

7. What is the per unit selling price of your pigeon pea when you transport it to the market? _____

8. Has your sales been increasing? **1.** Yes **2.** No

9. If yes, what factors have contributed in your increased sales? _____

10. If no, what factors have hindered your increase in sales? _____

D) Transaction Costs:

i) Prices, Alternative Market Outlets and Seasonal Requirements

1. Do you ever get prior knowledge of prices for your green pigeon pea? **1.** Yes **2.** No

2. If yes, then how do you get the information on those prices? _____

3. Are you aware of any alternative market outlet for your green pigeon pea? **1.** Yes **2.** No

4. If yes, name them_____

5. Are you aware of the prices in those alternative market outlets? **1.** Yes **2.** No

6. If yes, are those prices in alternative markets better than those in the market outlet you utilize? **1.** Yes **2.** No

7. Why do you prefer the market outlet that you utilize to the alternative ones? _____

8. Do you access these alternative market outlets you have mentioned? **1.** Yes **2.** No

9. If not, then what makes you not able to access them?_____

10. Are you aware of the seasonal market requirements? **1.** Yes **2.** No

11. If yes, then where do you get such information on seasonal market requirements?_

12. Do you have a problem of disposing off the stocks you have purchased at any one given point in the year due to glutting of the targeted market? **1.** Yes **2.** No

13. If yes, then which months?_____

14. Do you have an alternative market for such stocks? **1.** Yes **2.** No

15. If yes, which ones and what is the per unit selling price of your green pigeon pea in these alternative market outlets

Alternative outlet	Price per unit
1.	
2.	
3.	

16. If no, then how much do you loose in that given season? _____

17. What factors do you consider when negotiating for the buying price? _____

18. How long does it take to negotiate for the prices? _____

19. Do prices vary from season to season? **1.**Yes **2.** No

20. If yes, what do you think causes such variability in prices?_____

21. Do prices vary widely from place to place? **1.**Yes **2.** No

22. If yes, what do you think causes such variability in prices?_____

ii) Green quality, grades and standards

1. Do you buy the green pigeon pea in different grades/qualities? **1.**Yes **2.** No

2. If yes, what are the quality parameters considered (1. MRLs, 2. Pod colour, 3. Texture 4. others (specify)_____

3. What are the per unit prices for the different grades?

     Grade   **price per unit**

     1. _____   _____

     2. _____   _____

4. Do you clean, sort and grade the pigeon pea before selling it? 1.Yes 2. No
5. If yes, then how much does it cost you to clean one unit (kg/bag/ton)?

Activity	Time taken	Price per unit
Cleaning	_____	_____
Sorting	_____	_____
Grading	_____	_____

6. Do the buying traders of your grain consider the pigeon pea quality? 1.Yes 2. No
7. If yes, what are the quality parameters considered (1. poor pod colour, 2. MRLs 3. Others (specify_____)?
8. Which proportion of your pea (per kg/bag) is rejected as of unacceptable quality? What do you think should be done to reduce this problem of getting your pigeon pea rejected by the buying traders? _____.
9. Are you always aware of the green pigeon pea quality requirements that are needed in your targeted market? 1.Yes 2. No
10. If yes, where and how do you get such information on green pigeon pea quality? _
11. If no, how would you like to get such information? _____
12. Do you find alternative market for your rejected green pigeon pea? 1.Yes 2. No
13. If yes, then where? _____
14. What is the per unit price of the rejected pea? _____
15. If no, then what do you do with such rejected pea? _____

iii) Cost of time
1. Do you go to get your green pigeon pea from the farm yourself? 1.Yes 2. No
2. If yes, then how long does it take you to collect one unit (kg/carton/ton/specify_)?
3. From how many individual farmers/farmers' groups are you able to get the amount mentioned above?_____
4. When you send somebody to collect the pigeon pea for you, then how much do you pay for those services (per unit output or per day)_____
5. What other activities do you engage in when you have hired somebody to assemble the green pigeon pea for you from the various sources? _____

iv) Credit and Risk Factors
1. Do you access any form of credit facilities? 1.Yes 2. No
2. If yes, from whom?_____
3. What are the minimum requirements for one to access those credit facilities? __
6. Do you give any credit facility do farmers? 1.Yes 2. No
7. If yes, then what are the minimum requirements for one to access such credit facilities?_____
8. Which type of credit facility do you give (cash/kind/others_____)?
9. What are the terms of payment?_____
10. If no, then what makes you not give them credit?_____

APPENDEX V: Green pigeon pea rural retailer's/urban open-air retailers questionnaire.

Date_____

Questionnaire Serial No._____

Respondent's Name_____

Division_____

Village/Market_____

Marketing:

i) Purchasing

1. From whom do you buy your green pigeon pea? (1.Individual farmers, 2. farmers' groups, 3. rural assemblers, 4. others-specify_____)
2. How much did you buy last season from each source (local variety and improved variety respectively)?

<u>Source</u>	<u>quantity purchased</u>	<u>price per unit</u>
_____	_____	_____
_____	_____	_____

3. Do you store the green pigeon pea? **1**. Yes **2**.No
4. Why do you store (don't store) the green pigeon pea? _____
5. If you own the storage facility, what is its value?_____
6. What is the useful life (years) of this storage facility?_____
7. For how long do you store the green pigeon pea before selling?_____
8. What is the average cost of storing a unit of the green pea? Fill the table below.

Item	Per Unit Cost
Gunny bags or cartons (empties)	
Storage chemicals	
Storage labour	
Others_____	

9. Do you experience any losses in storage (both quality and quantity losses)? **1**. Yes **2**.No
10. If yes, what causes such respective losses?_____
11. How much do you loose per unit (kg/carton/ton) in storage?_____
12. Do you transport the green from the buying point to your premises? **1**. Yes **2**.No
13. If yes, what is the transportation cost per unit or per distance? _____
14. Do you own the means of transport? **1**. Yes **2**.No
15. If yes, name the means of transport you own?_____
16. What is its value?_____
17. What is the useful life (years) of this transportation means?_____

iii) Selling

1. To whom do you sell your green pigeon pea (1.Urban wholesaler, 2.Urban Exporters, 3.Urban Retailers, 4.Others_____)?
2. Do you transport your green pigeon pea to the point of sell? **1**. Yes **2**.No
3. If yes, how far (km) is the selling point from your store/warehouse? _____
4. How much does it cost you to transport a unit (kg/carton) of green pigeon pea to the market?_____
5. If you don't transport your green pigeon pea to the market, then what makes you not transport your green pigeon pea to the market?_____
6. What is the per unit selling price of your green pigeon pea when you sell it from your premises?_____

7. What is the per unit selling price of your green pigeon pea when you transport it to the market? _____

8. Has your sales been increasing? **1**. Yes **2**.No

9. If yes, what factors have contributed in your increased sales?_____

10. If no, what factors have hindered your increase in sales?_____

E) Transaction Costs:
i) Prices, Alternative Market Outlets and Seasonal Requirements

1. Do you ever get prior knowledge of prices for your green pigeon pea product? **1**. Yes **2**.No

2. If yes, then how do you get the information on those prices?_____

3. Are you aware of any alternative market outlet for your green pigeon pea? **1**. Yes **2**.No

4. If yes, name them_____.

5. Are you aware of the prices in those alternative market outlets? **1**. Yes **2**.No

6. If yes, are those prices in alternative markets better than those in the market outlet you utilize?_____

7. Why do you prefer the market outlet that you utilize to the alternative ones?_____

8. Do you access these alternative market outlets you have mentioned? **1**. Yes **2**.No

9. If not, then what makes you not able to access them?_____

10. Are you aware of the seasonal market requirements? **1**. Yes **2**.No

11. If yes, then where do you get such information on seasonal market requirements?_____

12. Do you have a problem of disposing off the stocks you have purchased at any one given point in the year due to glutting of the targeted market? **1**. Yes **2**.No

13. If yes, then which months?_____

14. Do you have an alternative market for such stocks? **1**. Yes **2**.No

15. If yes, which ones and what is the per unit selling price of your green pigeon pea in these alternative market outlets

Alternative outlet	Price per unit
1.	
2.	
3.	

16. If no, then how much do you loose in that given season?_____

17. What factors do you consider when negotiating for the buying price?_____

18. How long does it take to negotiate for the prices?_____

19. Do prices vary widely from place to place? **1**. Yes **2**.No

20. If yes, what do you think causes such variability in prices?_____

21. Do prices vary from season to season? **1**. Yes **2**.No

22. If yes, what do you think causes such variability in prices?_____

ii) Green quality, grades and standards

1. Do you buy the green pigeon pea in different grades/qualities? **1**. Yes **2**.No

2. If yes, what are the quality parameters (1. poor pod colour, 2. foreign matter composition, 3. MRLs 4. Others specify_____)?

3. What are the per unit prices for the different green pigeon pea grades?_____

4. Do you clean, sort and grade the green pigeon pea before selling it? **1**. Yes **2**.No

5. If yes, then how much does it cost you to clean one unit (kg/carton/ton) of the green pigeon pea? Fill then table below.

Item	Cost
Sort	
Grade	
Clean	
Others	

6. Do the buying traders of your green pigeon pea consider the quality? **1.** Yes **2.** No
7. If yes, what are the quality parameters considered (1. poor pod colour, 2. foreign matter compositions, 3. MRLs 4. Others specify_____)?
8. Which proportion of your green pigeon pea (per kg/carton) is rejected as of unacceptable quality?_____
9. What do you think should be done to reduce this problem of getting your green pigeon pea rejected by the buying traders? _____
10. Are you always aware of the green pigeon pea quality that is needed in your targeted market? **1.** Yes **2.** No
11. If yes, where and how do you get such information on green pigeon pea quality?_____
12. If no, how would you like to get such information?_____
13. Do you find alternative market for your rejected pigeon pea? **1.** Yes **2.** No
14. If yes, then where? _____
15. What is the per unit price of the rejected green pigeon pea?_____
16. If no, then what do you do with such rejected green pigeon pea?_____

iii) Cost of time
1. Do you go to get your green pigeon pea from the source yourself? **1.** Yes **2.** No
2. If yes, then how long does it take you to collect one unit (kg/carton/ton/specify_)?
3. From how many individual farmers/farmers' groups/rural assemblers are you able to get the amount mentioned above?_____
4. When you send somebody to collect the green pigeon pea for you, then how much do you pay for those services (per unit output or per day)_____
5. What other activities do you engage in when you have hired somebody to assemble the green pigeon pea for you from the various sources? _____

iv) Credit and Risk Factors
1. Do you access any form of credit facilities? **1.** Yes **2.** No
2. If yes, from whom?_____
3. What are the minimum requirements for one to access those credit facilities?____
4. Which type of credit facility do you get (cash/kind/others_____)?
5. What are the terms of payment?_____
6. If no, what makes you unable to access such credit facilities?_____
7. Do you give any credit facility do farmers/rural assemblers? **1.** Yes **2.** No
8. If yes, then what are the minimum requirements for one to access such credit facilities?
9. Which type of credit facility do you give (cash/kind/others_____)?
10. What are the terms of payment?_____
If no, then what makes you not give them credit?_____

APPENDIX VI: Taxes and Duties on Agricultural Product

Agricultural machinery	Free
Fresh peas chilled and unshelled	35%
Polythene paper bags	3%
Corrugated cartons and boxes	35%
Bags and sacks	35%
Bicycles and tricycles	Free
Petroleum products	3%
Motor vehicle spare parts	3%
Agricultural inputs	Free

Source: Republic of Kenya (2001a) Kenya gazette amendments bill June 2001