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AN ECONOMIC ANALYSIS OF THE PERFORMANCE OF THE FERTILIZER SUBSECTOR IN THE MAIZE BELT OF WESTERN KENYA

Volume I

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ABSTRACT

AN ECONOMIC ANALYSIS OF THE PERFORMANCE OF THE FERTILIZER SUBSECTOR IN THE MAIZE BELT OF WESTERN KENYA

By

Maria Namakhoye Wanzala

Following its withdrawal from the importation and distribution of fertilizer 1993, the government of Kenya was concerned about the performance of the privatized fertilizer subsector for two reasons: (i) claims that the price of fertilizer in Kenya was too high because traders were making above normal rates of return; (ii) the neglect of smallholders in the Western Lowlands, an area characterized by soil nutrient deficiency and poor financial and physical access to mineral fertilizers. The objective of the study was to analyze trader margins and assess whether they could be explained by structural factors, and to investigate whether an initiative by a nongovernmental (NGO) organization to supply agricultural inputs to farmers the Western Lowlands is an effective way to induce eventual private sector expansion into this area. The study used an extended industrial organization framework to analyze the performance of the private marketing system.

To address the first problem, profit and loss accounts were used to assess the profitability of each market; cost build-ups of the main fertilizer supply chains were constructed; regression analysis was used to test the hypothesis of market power and to examine whether the relationship between transport costs per bag and distance varied by

road quality; sensitivity analysis was carried out in the supply chains to simulate the impact on the farm-gate prices of fertilizer of policy-induced cost reductions; and the impact of reduced fertilizer and maize prices on the profitability of fertilizer use on maize was simulated by inserting these adjusted prices into farm budgets. To address the second problem the financial sustainability of the NGO was evaluated using a subsidy dependence index and steps the NGO could take to facilitate greater private sector involvement in the distribution of agricultural inputs were identified.

Some of the main findings were: (1) There was market concentration in the importer, wholesale and retail markets. Low barriers to entry to the wholesale market and zero barriers to entry to the retail market made these markets contestable; (2) Fertilizer traders made returns that were not substantially higher than their opportunity cost of capital. However, due to the oligopolistic structure in the importer and wholesaler markets some traders were able to exert market power to make economic rents; (3) Purchasing costs were the main source of scale economies in fertilizer marketing in 1999; (4) On average, the cost of transporting a 50 kg bag of fertilizer an additional 10 km on a bad quality road was four times more expensive than on a good quality road; (5) There are benefits to be gained at the farm-level, from policy changes aimed at reducing or eliminating the cost bottlenecks; (6) In 1999, the NGO was still dependent on subsidies for the equivalent of 35% of its sales revenues; (7) SCODP was an important catalyst for private traders to move into previously under-served areas; (8) Poor quality control, asymmetric information, and weak extension services were the main problems in the institutional and regulatory framework in 1999.

Dedication

To the Wanzala Family

ACKNOWLEDGMENTS

While numerous people have contributed to my education, I would like to recognize a few special contributions. I owe my greatest intellectual debt to my parents, Joseph Wanyakala-Wanzala and Catherine Wanzala who not only aroused in me a desire to learn and work hard, but unstintingly provided the means by which I could do so. I also thank all of my teachers in primary and secondary school and in college who believed in me and encouraged me. Particular thanks go to Dr. Michael Scott and Dr. Mutombo Mpanya who guided me through my undergraduate degree in international development, and Dr. Rudolph M. Nayga who served as my major professor for my Masters degree and initiated what I believe will be a lifelong interest in the field of food and agricultural marketing. Dr. John M. Staatz has served as my major professor throughout my program at MSU and as my dissertation director. His guidance and unwavering support throughout my program has been a truly gratifying experience. Special thanks are also due to the members of my guidance committee (Dr. Eric Crawford, Dr. Thomas Jayne, Dr. Valerie Kelly, Dr. Allan Schmid, and Dr. John Strauss) for their careful review and constructive feedback of this dissertation.

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LIST OF ABBREVIATIONS AND ACRONYMS

C.I.F	Cost, Insurance and Freight
CAN	Calcium Ammonimum Phosphate
COMESA	Common Market for East and Southern Africa
DAP	Diammonium Phosphate
EAC	East African Community
F.O.B	Free on Board
GOK	Government of Kenya
GTZ	German Agency for Technical Cooperation
IFDC	International Fertilizer Development Center
KARI	Kenya Agricultural Research Institute
KBS	Kenya Bureau of Standards
KFA	Kenya Farmer's Association
KGGCU	Kenya Grain Grower's Cooperative Union
KNFC	Kenya National Federation of Cooperatives
KPA	Kenya Port Authority
KRII	Kenya Round Two
Ksh	Kenya Shilling (national currency of Kenya)
MAP	Monoammonimum Phosphate
MSU	Michigan State University
NGO	Non-Governmental Organization
NPK	Nitrogen, Phosphorus, Potassium
SSP	Single Super Phosphate
TSP	Triple Super Phosphate
USAID	United States Agency for International Development

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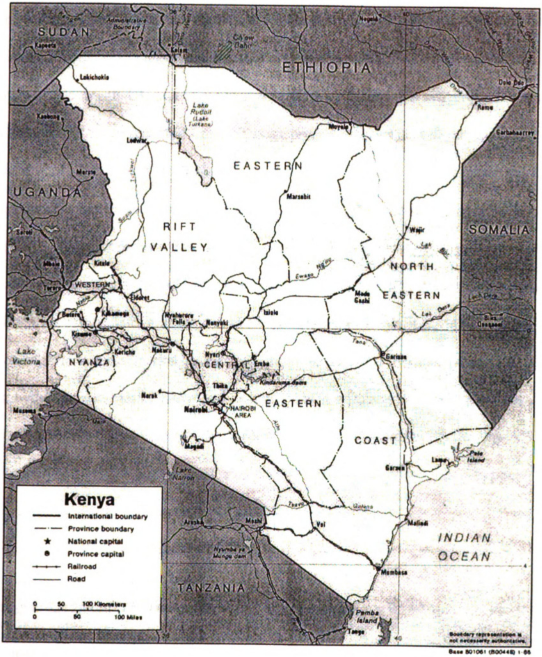
CHAPTER ONE
INTRODUCTION

1.1. Background to the Study

Kenya is located on the east coast of Africa, bordering Ethiopia and Sudan to the north, Uganda to the west, Tanzania to the South, and Somalia to the east. In addition, the south-eastern part of Kenya borders the Indian Ocean (Figure 1). Kenya has a predominantly agrarian economy; agriculture provides 28 percent of the total Gross Domestic Product (GDP) and an additional 27 percent through linkages with manufacturing, distribution and other service-related economic activities. The sector contributes 85 percent to national employment (through farm production and employment) and provides 60 percent of export earnings. The major food crops are maize, millet and sorghum, and the main agricultural exports are tea, sugarcane, and horticulture (MOA, 1999). Given the dominance of the agricultural sector in Kenya, the rapid increase in population growth (3 percent per annum) and the fixed arable land mass, increasing agricultural production via the increased use of productivity-enhancing inputs such as fertilizer must be a critical component of a strategy for overall economic development. Today, Kenya has the highest level of fertilizer consumption in east Africa. In 1999, fertilizer imports were approximately 285,000 metric tons. In comparison, annual imports in metric tons for neighboring countries were as follows: Uganda - 3,400; Tanzania - 38,000; the Sudan - 97,000; and Ethiopia 215,000 (FAO, 1996). Kenya also has the highest rate of fertilizer consumption on arable land in east Africa (with the exception of Mauritius), with an average consumption level of 22 kg/ha (Naseem and Kelly, 1998).

Figure 1: Map of Kenya



Source: Courtesy of The General Libraries, The University of Texas at Austin.

The main types of fertilizers consumed in Kenya are compound fertilizers that provide both nitrogen and phosphate. Before 1990, the government directly controlled the fertilizer subsector.[1] Most of the fertilizer in Kenya was donor-sourced, the Ministry of Finance set prices, and import licences and exchange rate controls were the norm. Under a sole-agency agreement between the government and a parastatal, the Kenya Grain Growers Cooperative Union (now the Kenya Farmers Association or KFA) was the sole distributor of government fertilizer. Although private trade was not illegal, the monopoly position of KFA, coupled with the government restrictions and controls, placed the KFA in a dominant position. As a result, several private importers and distributors ceased to operate, fell under receivership, or closed branches countrywide (Arwings-Kodhek, 1997). A second characteristic of the state-controlled subsector was that the fertilizer supply chains were geared towards large-scale, export-oriented farmers located in the high-potential (in terms of market access and agronomic endowment) highlands, producing high-yielding varieties of maize, and cash crops such as horticulture, coffee and tea (Omamo, 1996; Jayne et al., 1997). Access to fertilizer for smallholder farming communities, particularly those situated outside the high-potential areas, was poor.

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[1]In general, a fertilizer sub-sector is divided into upstream and downstream functions. The upstream functions include procurement of raw materials and manufacture. The downstream functions consist of demand estimation and ordering; procurement or importation; and distribution and sales activities, including handling and assembly, storage, transportation, and market development. Because of the relatively small size of the fertilizer market, and an absence of indigenous capacity for fertilizer production, Kenya relies on imports to meet all of its fertilizer needs. Therefore, the fertilizer sub-sector in Kenya is a downstream marketing system.

1.1.1. Reform of the Fertilizer Subsector

As was the case in many African countries, in the late 1980's the Government of Kenya embarked upon a process to reform its agricultural sector, including the fertilizer subsector. Between 1990 and 1993, the Kenyan government removed price controls on fertilizer, abolished import quotas and import licences, eliminated foreign exchange controls, and closed down KFA outlets. By 1993 the Government of Kenya had completely withdrawn from fertilizer importation and distribution. Today, the private sector dominates the sub-sector, importing and distributing approximately 97 percent of the fertilizer consumed in Kenya, and fertilizer prices reflect world market prices and domestic market conditions.[2]

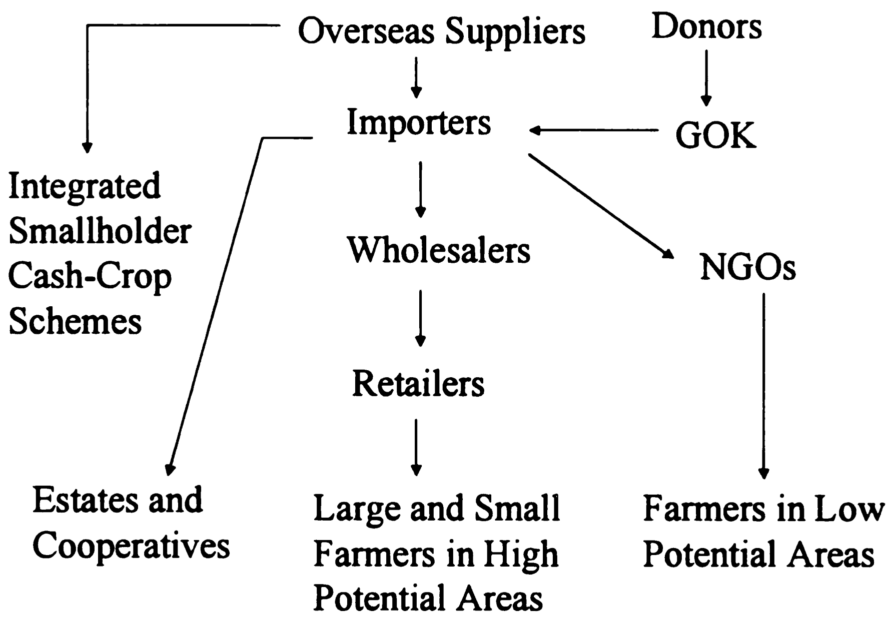
The sole exception is approximately three percent of the imported fertilizer that is donor-sourced via bilateral aid from the Japanese government under the Ministry of Agriculture KRII program (MOA-KRII). Instead of the government receiving aid monies, it receives the goods (fertilizers, pesticides, and agricultural and industrial machinery from Japanese companies), which it sells internally to the private sector and uses the proceeds to finance donor-approved development projects in any economic sector. With regards to fertilizer, the program imports fertilizers that the private sector does not import, and sells it to private traders via an open tendering system administered by the Ministry of

[2] In contrast, in other African countries, concerns about the ability of the private sector to meet the needs of smallholder farmers, especially with regard to credit and service provision to farmers in remote areas, have motivated governments to continue distributing fertilizer during the period of market reform, often at subsidized prices. Some studies have concluded that these government distribution programs have often hampered commercial trading incentives in these countries and hence impeded the private sectors' response to market reform (IFDC 2000; Govereh et al. 2001; Stepanek et al. 2001).

Agriculture (MOA). The donor fertilizer is tendered at the port of Mombasa, with qualifying buyers offering prices and quantity bids for available stocks. The highest bidder typically receives its full allocation, and the lower bidders get whatever remains after the requirements of those offering more have been met. Minimum quantities that can be bid for are fairly small (as low as 1,000 kg or 20 50 kg bags) allowing smaller wholesalers, retailers, and even business people totally unrelated to the fertilizer trade to bid. The allocation system has drawn some criticism over the years due to claims that Ministers have received fertilizer at abnormally low prices and resold it to bidders at exorbitant prices. However, the tendering process appears to have become more transparent with time (Arwings-Kodhek, 1997).

Figure 2 shows the current organization of the fertilizer subsector. There are two types of private-sector groups involved in the subsector. The first group consists of importers, wholesalers and retailers who sell to farmers, estates, cooperatives and to non-governmental organizations. These traders represent a heterogenous group ranging from large, well-capitalized merchants with immense spatial reach, specializing in farm inputs and trading huge volumes of fertilizer year-round, to small diversified traders with small stocks and short trading seasons. The second group consists of estates, parastatals and cooperatives and smallholder cash-crop schemes that import their own fertilizer directly and/or purchase fertilizer from private importers and wholesalers. These include the largest private sugar, horticulture, and coffee producers, government parastatals and cooperatives.[3] This study focuses on the segment of the private sector that is comprised of importers, wholesalers and retailers that supplies fertilizer to farmers. It is hereafter referred to as the private-sector led marketing system.

Figure 2. The Fertilizer Subsector in Kenya



Source: Compiled by author based on secondary data collection and informal interviews with stakeholders, 1999

1.2. Problem Statement

Government and donors anticipated that the reform of the subsector would encourage competition and hence increase the efficiency of marketing and distribution of fertilizer.

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[3]For example, Mumias Sugar Company, a sugar parastatal that provides fertilizer and other agricultural inputs to smallholder sugar outgrowers using interlocking input-output credit arrangements, imported 9,600 tons of fertilizer in 1998. Similarly, the Kenya Tea Development Authority, a government parastatal that supplies management services, imports approximately 50,000 tons or 20 percent of total imports each year and sells it on credit to the country's smallholder tea growers.

The expected outcome was a reduced farm-gate price and an increase in physical accessibility which would catalyze farmer uptake, particularly by smallholder farmers who had been neglected under the state-controlled system. Moreover, advocates of output market reforms, which were launched in the late 1980s, argued that these reforms would raise farm prices and production, which would in turn stimulate demand for purchased inputs like fertilizer (Nyoro et al., 1999).

However, in 1999 there were indications that the reformed fertilizer subsector had fallen short of expectations. On the one hand, since the reforms commenced in 1990, private-sector participation in fertilizer marketing and distribution had increased: 78 percent of the retailers and 73 percent of the wholesalers surveyed in 1999 had entered the fertilizer subsector after 1990.[4] Nevertheless, the expected large increase in fertilizer use had not taken place and even more important, fertilizer use on the staple crop, maize, had decreased.[5]

A comparison of average annual fertilizer consumption between the five-year period before the market reforms (1988/89 -1992/93) and the five-year after the reforms

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[4]Allgood and Kilungu (1996) estimated that after market reform was completed in 1993, there were already 10-12 importers, 500 wholesalers, and 5000 retailers of fertilizer countrywide in 1996.

[5]In 1985 the World Bank estimated potential fertilizer consumption in Kenya at one million tons. This figure is an estimate of potential use if all farmers followed the fertilizer recommendations of the Ministry of Agriculture. The recommendations were the outcome of the GTZ funded initiative, the Fertilizer Use Recommendation Project (FURP), which carried out on-station trials, and were based on agronomic and economic analysis. At the time, consumption was between 250,000 - 300,000 tons of fertilizer material per annum. In 1999, consumption was 285,000 tons. Hence, between 1985 and 1999 fertilizer consumption in Kenya stagnated. Secondly, of that one million tons, the Bank estimated that about 40 percent (437,000 tons) was to be used on maize, which is more than current total consumption on all crops. Clearly, for fertilizer use in Kenya to realize any significant movement towards potential levels, fertilizer use on maize needs to increase.

(1993/94-1997/98) shows that consumption increased by 13 percent from an average of 244,618 metric tons to 277,084 metric tons. However, an analysis of fertilizer use by crop shows that this increase can be attributed to certain types of fertilizers. Table 1 provides an indication of changes in the share of fertilizer being consumed by crop and fertilizer type. Analysis of this variation in consumption by crops reveals consumption of maize fertilizer (DAP) declined from 76,268 tons between 1988/89 and 1992/93 to 67,636 tons between 1993/94 and 1997/98. Hence, the overall share of DAP in total fertilizer consumption declined from 31 percent to 25 percent. In contrast, the share of wheat fertilizer (MAP) rose from three percent to seven percent during this period. Moreover, while the increase in the share of non-cereal crops (tea, coffee, and horticulture) was not substantial, the absolute increase in fertilizer use on these crops exceeded the increase in use on wheat. Therefore, the overall increase in fertilizer use in the post-reform era can be attributed primarily to an increase in fertilizer use on wheat, specifically MAP fertilizer, and non-cereal crops, while the declining use of maize fertilizer (DAP) slowed down the increase in national fertilizer consumption.[6]

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[6]One explanation for the increase in fertilizer use on wheat may be post-reform government trade policy that protects domestic wheat producers from competition from imports. As was the case for fertilizer, the wheat subsector underwent a series of market reforms in 1992. However, trade liberalization opened the Kenyan wheat industry to competition from imports. In response to complaints from farmers, the government imposed an import duty of 25 percent plus a suspended duty which together increased the price of imported wheat to more than double the average cost of production. The imposition of the import and suspended duty created conditions for the domestic producers to ask for wheat prices as high as Kshs 2,000 per bag which is almost double to average cost of production. The continued depreciation of the shilling against major international currencies has also contributed to the increase in the price of imported wheat compared to that produced domestically. Between 1993 and 1999 the exchange rate (US$/Ksh) increased by 35 percent. Under these price conditions wheat producers had the economic incentive to increase their use of purchased inputs like fertilizer to increase output per acre, which would explain the increase in consumption of wheat fertilizer (Nyoro, 1999).

Policy makers in Kenya regard agricultural productivity growth and rural food security as important objectives of policy. So far, increases in food production have come from soil nutrient depletion and extensification. However, the arable land mass is fixed and therefore future increases in food production will have to rely on the increased use of land-saving, labor-using inputs such as mineral fertilizer. Consequently, the overall stagnation in fertilizer consumption and dwindling use of DAP fertilizer on maize, the foremost staple crop in the country, was of particular concern in 1999.

Table 1. Annual Fertilizer Consumption by Selected Crops (Source: Computed by author from MOA data files, 1999)

	Means for 1988/89 to 1992/93		Means for 1993/94 to 1997/98	
Crop/Fertilizer type	Metric tons	% Share	Metric tons	% Share
Maize (DAP)	76,268	31	67,636	25
Tea (NPK 25:5:5)	51,676	21	58,733	21
Coffee (NPK 17:17:17 & MOP)	21,132	8	23,220	8
Wheat (MAP)	6,293	3	18,788	7
Horticulture (Specialty fertilizer)	6,218	3	11,632	4
Others (TSP, Urea, CAN, etc)	83,031	34	97,073	35
Total	244,618	100	277,084	100

Key:

DAP = Diammonimum phosphate
MAP = Monoammonium phosphate
MOP = Muriate of Potash
NPK = Nitrogen, Phosphorus, Potassium fertilizers
CAN = Calcium Ammonium Nitrate
TSP = Triple Super Phosphate
Specialty fertilizers = Mainly horticultural fertilizers

The main problem that had to be addressed from a policy perspective was that ability of the reformed fertilizer subsector to be responsive to farmer needs and thus promote the achievement of the policy objectives. Farmer use of fertilizer is a function of the profitability of fertilizer use on maize and that profitability is determined by input price, output price and crop response to fertilizer use. Therefore, in order to increase farmer uptake of fertilizer significantly requires improvements in the all three determinants. In the case of output markets, such improvements include improvements in the maize subsector, and in the case of crop response to fertilizer use, improvements in farmer husbandry techniques, availability of improved cultivars, and improved extension are important. This study focuses on the issue of reducing the farm-gate price of fertilizer by increasing the efficiency of the marketing system, and hence boosting farmer uptake by increasing the profitability of fertilizer use.

Empirical evidence suggests that a confluence of institutional, infrastructural and organizational factors influence the ability of a private-sector led fertilizer marketing system to meet the needs of farmers. For example, poor roads can constrain the delivery of fertilizer in a timely manner and raise the cost of transportation. Inadequate market information can restrict the availability of the input in the marketplace and result in higher prices than would otherwise be the case. The absence of grades and standards can reduce market transparency and increase transaction costs. Therefore, the main policy question that must be addressed is: How is the reformed private-sector led marketing system in Kenya performing in terms of efficiency and effectiveness in capturing unexploited opportunities to improve coordination? With respect to efficiency, do margins reflect competitive conditions or are farmers paying price a price greater than long-run marginal cost because traders are making economic rents? Second, is there scope to reduce marketing costs and appreciably reduce the farm-gate price of fertilizer? Third, what will be the impact on the profitability of maize production of a reduction in the farm-gate price of fertilizer and what are the implications for fertilizer uptake? In terms of effectiveness, what are the unexploited opportunities for institutional arrangements and organizational changes that could improve time, place, and form utility?

Improvements in the efficiency and effectiveness of the private-sector led fertilizer marketing system have the potential to reduce the farm-gate price of fertilizer, increase the profitability of fertilizer use, and thus enhance farmer uptake of fertilizer. Therefore, information about the structure and performance of the private-sector-led marketing system and the existence of unexploited opportunities to reduce marketing costs and improve the flow of fertilizer to the farm-gate will help the Kenyan government design a more effective fertilizer policy. This study contributes to this understanding.

1.3. General Approach: Objectives of the Study and Hypotheses

1.3.1. Objectives of the Study

Accordingly, the general objective of this study is to evaluate how the private-sector-led fertilizer marketing system in Kenya is performing within the physical and institutional constraints of the market environment and to identify areas for improved coordination and efficiency. The specific objectives are to:

(1) Provide an overview of the private-sector-led marketing system and the policy environment which governs the marketing and distribution of fertilizer;

(2) Identify public and private incentives and innovations that are needed to relax the existing constraints and thereby increase efficiency and coordination

To achieve these objectives, the study will carry out the following activities:

(i) Describe the structural characteristics of the private-sector-led marketing system in terms of marketing chains, location of traders, size of operations and bottlenecks;

(ii) Describe fertilizer traders in terms of quantities purchased, buying and selling prices, procurement practices, and marketing functions and activities;

(iii) Develop and analyze profit and loss accounts to assess the gross margins and net (financial) returns to fertilizer traders at each stage of the private-sector-led marketing system;

(iv) Build regression models to assess whether there is a relationship between the gross margins at the wholesale and retail level and structural features of the respective markets;

(v) Develop cost build-ups of marketing chains and identify potential sources of cost reductions and improved coordination in these supply chains;

(vi) Estimate the impact of simulated policy changes that reduce fertilizer marketing costs and hence reduce the farm-gate price of fertilizer, on the profitability of maize production;

(vii) Derive recommendations for policy makers.

1.3.2. Hypotheses

The reasons for the weak response by farmers to the reformed fertilizer subsector are not clear. One possible explanation for weak uptake of fertilizer is that the farm-gate price of fertilizer under the reformed fertilizer marketing system is too high vis-a-vis the price of maize and this had dampened the economic incentives to use this input. Therefore, a reduction in the farm-gate price of fertilizer could enhance farm-level profitability and hence farmer uptake of fertilizer. However, although extant studies show that maize production using fertilizer is profitable, to date there are no studies that provide conclusive empirical evidence regarding the profitability (or lack thereof) of fertilizer use on maize by smallholder farmers.[7]

Since smallholder farmers in Kenya use fertilizer (albeit at extremely low levels compared to their counterparts in the rest of the world), an important premise of this study is that on average, fertilizer use by smallholder farmers in Kenya is profitable. Nevertheless, the low levels of consumption imply that farmers still face financial, physical and/or institutional constraints to increased uptake. It could be the case that at current price levels, farm income constrains farmers to low levels of consumption. This implies that farmers would benefit from any reduction in the price of fertilizer. The price of fertilizer could be at current levels due to high marketing costs or as a result of fertilizer is being priced above its marginal cost because the marketing system is not competitive.

The empirical data show that the domestic price of fertilizer is a function of world market prices and exchange rates, as well as internal market conditions (See Appendix

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[7]The design of studies on the profitability of fertiizer use for maize production by smallholder farmers do not allow for a conclusive answer to this question. Mose (1998) concluded that the reformed fertilizer market delivers fertilizer to smallholder regions at prices that make its use unprofitable. Karanja and Jayne (1998), using econometric analysis of household survey data, showed that fertilizer use on maize was clearly profitable in most agricultural areas of Kenya, and especially in conjunction with the use of hybrid seeds. However, the study did not disaggregate between large and small farmers. Awuor (2001) used data from the 2000 season to construct partial budgets and found that the gross margins for maize were reasonably high when fertilizer is applied. Similarly, Nyambane (2001), using survey data from a number of maize-producing districts in Kenya, found that the returns to land and labor are typically higher for maize when fertilizer is applied, yet this analysis was not able to net out the effect of hybrid seed use independently from fertilizer use. However, none of the studies used marginal analysis to show that fertilizer use by small-scale farmers is profitable. Therefore, it is not possible to reach a conclusion regarding the profitability of fertilizer use for maize production by smallholder farmers.

1.1). For example, the proportion of the wholesale Nakuru price that could be accounted for by the C.I.F. price in Kenya shillings increased from 33 percent in 1980 to 50 percent in 1999.[8] Fertilizer price trends are also explained by the variation in domestic marketing costs, which accounted for the remaining 50 percent of the wholesale price of DAP in 1999. The policy issue is whether margins reflect competitive conditions or whether farmers are paying a price in excess of marketing costs because traders are making economic rents. Previous studies of the post-reform fertilizer marketing system (Allgood and Kilungu, 1996; Arwings-Kodhek, 1996; Allgood, 1999) concluded that private-sector-led marketing system is competitive. These conclusions were based on the influx of the number of market participants, the "small" size of trader gross margins, and evidence of fiercely competitive business practices. However, these studies did not collect data on trader marketing costs so they were unable to calculate and analyze trader net margins and trader percentage mark-ups (Arwings-Kodhek, et al. 1991; Arwings-Kodhek, 1996; Arwings-Kodhek, 1997; Mose, 1999; Omamo, 196). Therefore, one reason for the poor uptake of fertilizer by Kenyan farmers could be that the price of fertilizer is too high vis-a-vis the price of maize to make fertilizer use by smallholder farmers profitable. Price could be above normal because traders are taking excessive margins or due to a high cost marketing system. Alternatively, it could be that the price of fertilizer is not constraining use on maize, but rather that farmers are facing other constraints in terms of physical and

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[8]Why Nakuru? Nakuru is a city in Western Kenya, approximately 400 km from the capital Nairobi, and 1000 km from the port of Mombasa. The MOA has found over the years that fertilizer prices in Nakuru are the most consistently representative of fertilizer prices prevailing in Kenya. It is also a central point that the majority of imported fertilizer passes through on its way upcountry.

financial access which have resulted in poor uptake. Accordingly, the study develops the following hypotheses to be developed and tested in the remaining chapters:

Hypothesis I: Fertilizer traders face constraints in their procurement and distribution of fertilizer which reduce the effectiveness of the marketing system vis-a-vis farmers;

Hypothesis II: There are unexploited opportunities to reduce fertilizer marketing costs and hence reduce the farm-gate price of fertilizer;

Hypothesis III: Farmers in Kenya are paying in excess of marginal cost because the marketing system is not competitive and hence, traders are making above normal returns.

1.4 Organization of the dissertation

This dissertation is organized into 10 chapters. Chapter Two discusses the conceptual framework of the study. Chapter Three presents the study site and describes the research methodology and survey design. Chapter Four describes the physical and institutional setting of the fertilizer trade. Chapter Five describes the organization of the private-sector-led marketing system. Chapter Six describes and evaluates the structure, conduct and performance of the import market. Chapter Seven describes and evaluates the structure, conduct and performance of the wholesale market. Chapter Eight describes and evaluates the structure, conduct and performance of the retail market. Chapter Nine analyzes the implications of improved efficiency in the private-sector-led marketing system for the profitability of fertilizer use on maize. Chapter Ten summarizes the main findings of the study, makes policy recommendations, and lays out the implications of the findings for future research.

CHAPTER TWO
CONCEPTUAL FRAMEWORK

2.1. Introduction

As described in the previous chapter, the fertilizer subsector underwent a dramatic shift in organization and coordination in the 1990's, changing from government control of the subsector to reliance on the private sector to carry out the marketing and distribution of this commodity. The general objective of this research is to evaluate performance of the fertilizer subsector. Accordingly, this chapter builds a conceptual framework to distinguish the relevant factors and institutions that may affect performance of the fertilizer subsector.[9] Conceptually this research is guided by the subsector approach to market analysis. This chapter describes this approach and highlights how it guided the study's design and subsequent analysis.

2.2. The Commodity Subsector Approach to Market Analysis

Commodity sub-sector studies offer an operational approach to analyzing market performance. The sub-sector approach was originally conceptualized by Shaffer and further developed by Holtzman (1986). A simple but useful way for visualizing and analyzing the industrial organization paradigm and a sub-sector is through the food system matrix.

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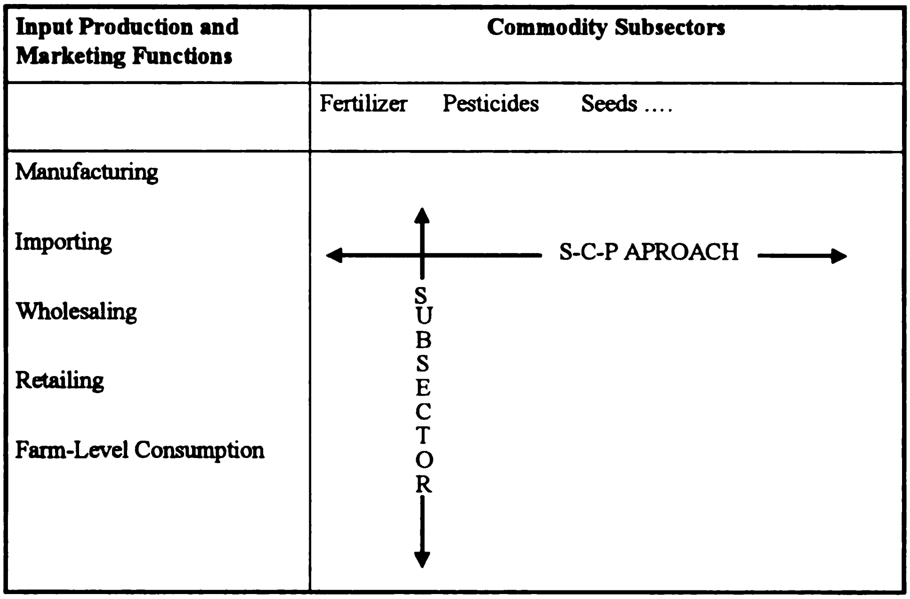
[9]Many of the ideas in this chapter were drawn liberally from and/or informed by Steffen (1995), pp.248 - 309.

Figure 3. A Simplified Representation of the Food System Matrix



Source: Adapted from Steffen (1995)

The food system matrix graphically represents the food system as "the entire set of actors and institutions involved in input supply, farming, processing, and distribution of agricultural production," (Staatz and Bernsten, 1992). Each column in the matrix represents a commodity sub-sector, while each row represents an individual stage or function in the production and transformation of commodities in the food system such as wholesaling or retailing. These stages are linked by institutional arrangements such as type of market exchange mechanisms (spot market, contracts, vertical integration), grades and standards, property rights, and market regulations. The sub-sector approach also argues that the government must play a vital regulatory and facilitating role in system development (Holtzman, 1986).

Hence, the sub-sector approach focuses on the dynamic aspects of the marketing process in that it: a) seeks to identify opportunities for improving the efficiency of marketing systems; b) seeks to diagnose barriers to improved system efficiency and coordination; c) assumes that there are alternative ways of organizing the system to improve consumer satisfaction; d) prescribes roles for both public and private sector participants. The ultimate purpose of subsector analysis is to prescribe the set of measures that achieves government policy objectives at the lowest cost and which is most likely to improve productivity and consumer satisfaction.

The distinguishing feature of a subsector study is its focus on the total marketing system. It captures the interdependencies between stages of the subsector and recognizes they have to be coordinated in order for the system to perform efficiently. Since alternative programs and policies, institutional arrangements and technologies vary from setting to setting, alternative outcomes will also vary.

2.3. Key Characteristics of the Subsector Approach

A *sector* cuts across several industries, such as the food sector, which includes the complex of related firms involved in the production and distribution of food. A *sub-sector* can be defined as the entire range of business activities and services in the production and distribution of a specific commodity or a group of related commodities related vertically and horizontally by market relationships (Shaffer, 1980). The horizontal dimension refers to firms within a particular industry (or a particular stage of the commodity sub-sector where a similar set of functions are performed such as wholesaling). The vertical dimension refers to vertical coordination of product transformation and value-added by firm(s) at each stage from farmer to consumer - such as input distribution, production, assembly, storage, transport, processing and product distribution and retailing - within sub-sectors of single commodities or relatively homogeneous groups of commodities.

There are key structural components that facilitate the vertical progression of a commodity such as fertilizer, from the producer to the final consumer. The key components of a sub-sector are: the supply chains; the marketing functions, institutional environment and marketing participants. Supply chains can be described as sets of interdependent organizations involved in the process of making a product or service available for use or consumption. Various types of supply chains can exist in a sub-sector, each resulting in a different cost structure and final price. The supply chains consist of various stages. Supply chains can also be vertically integrated, whereby successive stages are absorbed under single ownership (for example, a fertilizer wholesaler can integrate forward into retailing, or an importer can forward integrate into wholesaling and retailing). Supply chains can also be of varying breadths (number of competing firms at each stage of a supply chain). There may be one firm at one or all stages operating as a private monopoly, or numerous firms at each stage each obtaining their own supplies independently of each other, with no coordination of their activities.

To move the commodity along the supply chain to the final consumer (the farmer in the case of the fertilizer subsector), firms carry out numerous marketing functions. Marketing functions transform and add value to the commodity as it makes its progression through the sub-sector to the final consumer. These functions are the *exchange functions* of buying and selling; the *physical distribution functions* of transportation, storage and handling; and the *facilitating functions* of standardization, financing, risk-bearing, and market information and research (Beierlein and Woolverton, 1991). The types of marketing functions that have to be performed are determined by the physical characteristics of the commodity.

Marketing costs are generated by the various marketing functions carried out to move the commodity to the final consumer, and in doing so they add value as well as cost to commodities. These marketing functions and institutional arrangements are performed within each supply chain or channel of product transformation, within a specific market environment. The aggregation of these supply chains defines the sub-sector, and the market environment is the context within which the marketing functions, institutional arrangements and market participants operate.

The market environment is comprised of the institutional, social and demographic and physical environmental factors. The institutional environment is comprised of the formal and informal rules; information flows, particularly regarding prices, supplies, levels, and patterns of distribution; and enforcement institutions. As such, it determines the type of relations existing in the system (Dimithe, 1997). Examples of social and demographic factors that can influence performance are the seasonality of demand and the low purchasing power of smallholders, which is typically characterized by small and frequent purchases which may increase transportation, storage and transaction costs. The physical environment can also have a considerable effect on the movement of a commodity through a supply chain. In the case of Kenya, the state of roads limits distances traders and public transporters are willing to travel to deliver a commodity like fertilizer to the farm-gate. Poorly maintained roads increase the amount of time involved in marketing a commodity because trucks have to travel slower and therefore take longer. With respect to the technological environment, fertilizer handling technology is hypothesized to be an important determinant of marketing costs at various stages of the supply chain. First, virtually all of the fertilizer consumed in Kenya is imported in bulk and bagged by private bagging companies at the port for a flat cost per bag, although some importers own their own bagging machines. Second, transit losses can result at each stage of the distribution process due to poor handling techniques: palletization is not used in Kenya, instead bags are carried manually and/or dragged along the floor which can result in torn bags and spillage; storage in damp conditions can result in caking of fertilizer; and inadequate security can lead to losses due to theft. Third, previous studies report that retailers rebag fertilizer manually into plastic bags in one kg and two kg quantities to meet customer needs and incur the associated labor costs and cost of materials.[10]

Marketing participants are marketing and facilitating intermediaries who perform one or more marketing functions in the sub-sector and use various institutional arrangements (spot market, vertical integration, contracts) to coordinate their activities. Marketing intermediaries in the fertilizer marketing system are importers, wholesalers and

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[10]The largest importer did not rebag fertilizer for the following reasons: a) it is more difficult to control inventory of small packs than of larger bags because the counting process requires more time and detail; b) it is labor intensive; c) it requires more space for the rebagging exercise to take place; d) it increases the incidence of transit losses due to theft because small packs are easier to conceal and carry. For these reasons it preferred to leave rebagging to smaller traders.

retailers; and facilitating intermediaries are transporters, warehousing companies, agents and banks. The main purpose of the marketing intermediaries is to market and distribute fertilizer in the least-cost manner and sell the commodity at a price that will maximize their profit.[11]

2.4. Operationalizing the Approach

The subsector approach is based on the adaptation of the industrial organization theory (Bain, 1959; Scherer, 1980). This theory posits that the structure (S) of an industry strongly influences the competitive conduct (C) of firms within that industry, which in turn strongly influences market performance (P) (Bain, 1968; Scherer, 1980). Hence, the conceptual framework for subsector analysis includes components of structure, conduct and performance.

2.4.1. Basic Conditions

A typical sub-sector study starts by describing the nature of the commodity, or its basic conditions, (such as geographic distribution and consumption patterns, population growth and changing population distribution, purchasing power of consumers, and consumer preferences; the physical environment; type and degree of uncertainties such as government policies, weather and climate patterns, and access and/or importance of external markets; laws and government policies and regulations; and macroeconomic variables acting as incentives or disincentives such as exchange rate polices, taxes and tariffs, and interest rates (Steffen, 1995).

[11] These two objectives, minimizing marketing costs and maximizing the profits of marketing firms are not necessarily mutually consistent. Part of the function of public policy is to make them so.

2.4.2. Structure

Industry structure refers to "characteristics of the organization of a market which seem to influence strategically the nature of competition and pricing within the market" (Bain, 1959). Key indicators of market structure are: concentration (the number and size of buyers and sellers and the impact of mergers and acquisitions); product characteristics such as perishability, quality requirements and differentiation (the extent to which a seller has some degree of independence in pricing and other marketing decisions); degrees of mobility (entry and exit conditions); technological characteristics (capital intensity, minimum efficient size of firms; degree of conglomerateness; capacity and capacity utilization; specialization and diversification; and vertical integration. Subsector organization refers to location, timing and clustering of marketing functions, number of stages, number of parallel supply chains, information systems (grades, prices, market conditions, costs, availability), types of exchange such as spot markets and contracts, risk sharing institutions and arrangements, and inter-stage differences such as nature of assembly, sorting and synchronizing tasks, and location, size of enterprises, seasonality and production and consumption characteristics (Steffen, 1995).

2.4.3. Conduct

In general, market conduct refers to a firm's policies towards its product market and in response to moves made by its rivals in that market, in order to enhance its market share. There are three major areas firms focus on in this regard: i) setting prices; ii) setting non-price policies (promotion, product and distribution strategies; and iii) seeking strategic advantage and deterring entry.

According to the theory of industrial organization, the organizational characteristics of a market largely determine the price and other marketing strategies adopted by firms, and therefore, where firms in the industry fall in the competitive spectrum between perfect competition and monopolistic competition.

2.4.3.1. Price-Setting Strategies

There is a generalized price-setting behavior that characterizes a perfectly competitive market and a monopoly. Perfect competition describes a market in which there is complete absence of direct rivalry among economic agents. The price-setting mechanism is similar to that of an auction whereby consumers do not interact directly with producers except by the auctioneer who sets market clearing prices. At the other end of the spectrum is the monopolist who sets its equilibrium price above the competitive price, thus capturing additional consumer surplus. The oligopolistic market falls in between these two polar extremes of perfect and monopolistic competition. Oligopolistic market conduct is characterized by the tendency to influence prices and an awareness that profits depend upon the actions rival firms. (See Appendix 2.1 for a description of price determination in these three types of markets).

2.4.3.2. Non-Price Setting Strategies

In addition, firms can undercut competitors' prices and gain competitive advantage using strategies that reduce the costs allocated to the particular product or business activity of interest. One such strategy is cross-subsidization. Cross-subsidization occurs when a firm uses the profits from one product to subsidize aggressive price competition in another to gain a competitive advantage or to establish a market niche. This may occur across products, across different business activities, or across geographic regions (Staatz, 1996). In order to have the resources to cross-subsidize, a firm must have the ability to earn non-competitive returns on some other good or business activity.

Firms can also compete on the basis of economies of scope. These are derived when it is cheaper to produce or sell two products together rather than separately. In the case of the fertilizer industry, a fertilizer wholesaler could diversify to also sell other less bulky, higher margin products (seed, pesticides, agrochemicals) and allocate more of the joint operating costs to these other items than to fertilizer. The scope to do this is limited by competitive conditions in the markets for these other items. Alternatively, a retailer may decide to deal with one supplier who can meet all of its purchasing demand rather than with several different suppliers. Other aspects of industry conduct are financing and credit characteristics; business objectives, attitudes and capabilities; and frequency of purchases and sales.

Sub-sector conduct considers efforts to shift risk and gain market share, and coordination activities such as the type of exchange arrangements used, information communicated, quality specifications, scheduling and timing synchronization; the process of determining terms of exchange (private treaty, administered, etc.), and efforts to influence interstage cooperation and/or conflict (Steffen, 1995).

2.4.4. Performance

Both the industrial organization approach and the subsector approach focus on the performance consequences of alternative forms of industrial organization. Three steps are involved in evaluating performance: a) defining the performance dimensions -

what types of outcomes from the industry are most important for society; b) defining the performance norms - what are the standards of performance against which we can measure actual industry performance; and c) defining performance measures - what metric or criteria will be used to measure actual performance against the norms (Bain,1959).

Industry performance refers to the outcome or economic results of the structure of the industry and from the group of firms pursuing their respective lines of conduct. The most popular performance dimension is economic efficiency, which has two aspects: price or allocative efficiency and operational or technical efficiency. Allocative efficiency refers to the capability of prices to allocate resources efficiently in accordance with consumer preferences. It refers to the best choice of input combination, that is, whether the increased value from the use of an input (the marginal value product or MVP) is equal to or greater than the additional cost associated with the use of that input (the marginal factor cost or MFC). Accordingly, the rule for allocative efficiency of the marketing process is that additional functions and services should be performed until the additional cost associated with the performance of the marketing functions equals the increased value from performing the marketing functions and services. That is, allocative efficiency of the marketing process is concerned with evaluating the returns to the industry vis-a-vis its investments. Hence, one way of evaluating the allocative efficiency of a sub-sector is to analyze trader profit margins, that is, what remains once the trader deducts the marketing costs generated by the marketing process, plus a competitive return on investment and entrepreneurship.[12] With respect to the second dimension of economic efficiency, a firm is technically efficient if the production function yields the greatest output for any set of inputs. This performance dimension is concerned with the degree to which any output is produced in the least costly way (operational efficiency).

To increase the efficiency of the marketing process, it is possible to reduce the costs of performing a marketing function which may involve eliminating marketing intermediaries, but marketing functions cannot be eliminated from the marketing process. Eliminating marketing intermediaries involves the transfer of marketing functions and costs to someone else. Therefore, two key issues concerning marketing functions is whether the necessary number of functions is being performed and whether these functions are being performed in the most efficient (least-cost) manner. In addition to the efficiency performance dimension, subsector performance dimensions are the dynamic performance dimensions of the marketing system. That is, how effective is the system with respect to product suitability (quality, variety); system progressiveness (adoption of innovative handling and distribution methods such as rebagging and various forms of vertical coordination); and equity of returns to system participants given distribution of investments, risk and responsibilities.

The industrial organization view of performance has its roots in the perfect competition model which has a number of limitations for empirical analysis. As originally conceptualized by Bain (1959) it is linear - structure determines conduct, which

[12]In an efficient market each firm sets price equal to marginal cost and operates at minimum average cost so that each firm is making zero economic profits or a competitive return on its investments.

determines performance but there is no feedback between these market characteristics - whereas in the real world there is constant feedback between these aspects of a market. Secondly, the I-O approach is only useful to analyze the choices and behavior of groups of firms in the same industry and their impact on performance. However, firms are also linked vertically, as they choose different supply chains by which to obtain their inputs and distribute their output respectively, according to their individual desire to maximize their profits. Therefore, what happens at one stage of a supply chain will influence what happens at other stages. For example, if prices in an upstream firm increase, this will have repercussions for the downstream industry, but these repercussions are not captured by the I-O paradigm. However, by focusing analysis at one stage at a time the paradigm does not capture these vertical linkages between firms and their implications for performance.

Third, the original industrial organization framework assumes costless transactions, whereas in reality marketing generates transaction and transformation costs. Moreover, in order for markets to function efficiently they need market facilitating institutions and services. Due to these limitations, economists have devised some alternatives and extensions to the neoclassical model of perfect competition to enrichen the analysis of market performance. Before delineating the performance dimensions, norms and criteria that will be used in this study, this chapter will define two alternatives to perfect competition and summarize the transaction cost economics paradigm and its relevance for the evaluation of the fertilizer subsector, and the role of institutions and the government for markets. The rest of the chapter is organized as follows. Section 2.5.1.1 summarizes the perfect competition model and its performance dimensions. Section

2.5.1.2. defines the first alternative, "workable competition", and Section 2.5.1.3. defines the second alternative, "contestable markets.", Section 2.5.2. defines transaction cost economics and its relevance to the fertilizer subsector. Section 2.5.3. discusses the role of institutions and governments for well-functioning markets.

2.5. Further Considerations for Performance Evaluation of the Fertilizer Subsector

2.5.1. Perfect Competition and Two Alternatives

2.5.1.1. Perfect Competition

According to neoclassical economics, perfectly competitive markets are characterized by a large number of small firms (this is a necessary but not sufficient condition for perfect competition), whereas a market comprised of one big firm gives rise to monopoly power with no competition. Alternatively, markets are characterized by a structure in between these two extremes, that is, oligopolistic or monopolistic competition, giving rise to imperfect competition.

The following elements characterize a perfectly competitive market system: (1) "self-seeking" or "rational" economic behavior whereby producers maximize profits and consumers maximize their utility; (2) Firms are small and numerous enough that no market participant is sufficiently large enough to influence prices alone. Every firm is a price taker, not a price setter; (3) entry into and exit from the market are free, that is, there are no unfair, prohibitive or excessive barriers to entry or exit. All participants have access to the market on the same terms; (4) Items of the traded commodity are interchangeable and divisible. They can be traded in small or large lots; (5) Every market participant has perfect knowledge of market conditions likely to influence supply and demand which permits her/him to modify her/his economic strategies. If these five conditions are met, the market will perform efficiently with no scope for excess profits in the short run and zero profits in the long run (where marginal cost equals marginal revenue and each factor of production receives a competitive return).

Market research using perfect competition norms has contributed to: (1) providing a good empirical description of how the marketing system really works; (2) challenging prevailing stereotypes regarding inefficient farmer and exploitative trader behavior and indigenous marketing systems; (3) showing that since market participants act in an economically rational manner, standard economic policies can be used to influence market behavior.

Although perfect competition norms provide a good first approximation, there are also serious limitations to marketing research using this approach. First, in addition to the static efficiency performance measure, dynamic performance measures of the marketing system such as product suitability, progressiveness and equity also need to be considered. Second, perfect competition norms do not address other aspects of market development, namely institutional arrangements such as market information systems and credit programs for farmers and traders that could improve the flow of goods and reduce marketing costs. This is because the model assumes the market is perfectly competitive therefore these issues are not necessary to consider as they are already addressed. The following two sections discuss two alternatives to the perfect competition model.

2.5.1.2. Workable Competition[13]

Another reason economists have raised doubts about the validity of perfect competition for prescribing economic policy is that industry structures falling in between the extremes of perfect competition and monopoly might even produce desirable performance outcomes. Some economists have argued that departures from perfect competition are not as harmful in a long-run context as otherwise supposed. Instead, they argue, excessive competition is not conducive to technological innovation, whereas a blend of monopoly power and competition is (Schumpeter, Scherer, Bain as cited in Steffen, 1995). These qualifications of the ideal of perfect competition prompted a search for more operational norms of competition or "workable competition". Scherer's elements of workable competition, based on Sosnick's lengthy general criteria, are cited directly in Figure 4.

However, as Scherer acknowledges, the most difficult part in evaluating performance is securing agreement on good and bad attributes of performance, and invariably value judgements must be made. That is, a main drawback of subsector studies is that performance norms that are partly based on concepts of workable competition, are less clearly defined (Riley and Staatz, as cited in Steffen, 1995).

[13]The term "workable competition" was coined by Clark in 1940. Clark observed that perfect competition "does not and cannot exist and has presumably never existed" and that perfect competition affords no reliable standard for judging real work conditions (Steffen, 1995 pp.42 - 43).

Figure 4. Norms of Workable Competition

Structure

- The number of traders should be at least as large as scale economies permit.
- There should be no artificial inhibitions on mobility and entry.
- There should be moderate and price-sensitive quality differentials in the products offered.

Conduct

- Some uncertainty should exist in the minds of rivals as to whether price initiatives should be followed.
- Firms should strive to achieve their goals independently, without collusion.
- There should be no unfair, exclusionary, predatory or coercive tactics.
- Inefficient suppliers and customers should not be shielded permanently.
- Sales promotion should be informative, or at least not misleading.
- Persistent, harmful price discrimination should be absent.

Performance

- Firms' production and distribution operations should be efficient and not wasteful of resources.
- Output levels and output quality (i.e., variety, durability, safety, reliability etc.) should be responsive to consumer demands.
- Profits should be at levels just sufficient to reward investment, efficiency, and innovation.
- Prices should encourage rational choice, guide markets toward equilibrium, and not intensify cyclical instability.
- Opportunities for introducing technically new superior products and processes should be exploited.
- Promotional expenses should not be excessive.
- Success should accrue to sellers who best serve consumer wants.

Steffen, p. 264, 1995

2.5.1.3. Contestable Markets

The contestable market hypothesis suggests that imperfectly competitive markets may generate a competitive equilibrium provided that a credible threat of entry by other firms exist. In perfectly contestable markets, entry is absolutely free. New entrants encounter none of the commonly recognized barriers to entry.[14] In short, contestability requires there be no cost discrimination against entrants. Moreover, in perfectly contestable markets, exit is also absolutely costless in that firms can recoup all their entry costs. Another feature of contestable markets is that potential entrants are able to evaluate profitability of entry from pre-entry prices of the incumbent firms. This supposes that incumbents adjust their prices too late to prevent entry, profit-making, and exit. Thus, perfectly contestable markets are vulnerable to "hit and run" by new firms which can exploit temporary profit-making opportunities and exit before established firms reduce their costs. To ward off would-be entrants, established firms must produce efficiently and earn zero economic profits.

Hence, there are three main features of contestable markets. First, a contestable market never offers more than normal profits (economic profits must be zero or negative), even if it is oligopolistic or monopolistic. Second, there are no sources of inefficiency in production because any unnecessary cost, like any abnormal profit, constitutes an invitation to entry. Third, no product can be sold at a price less than its marginal cost.

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[14]These include: a) absolute cost advantage (where established firms or incumbents have lower unit costs; b) scale barriers (where suboptimal-sized firms are subject to significantly higher costs; c) capital costs (where the absolute size of initial investment limits newcomers); d) product differentiation (where incumbents enjoy advantages, such as consumer brand loyalty); and e) strategic behavior by incumbent firms to purposely deter newcomers (such as cross-subsidies or predatory pricing).

Some economists remain skeptical of the contestable markets theory. The theory rests on extreme assumptions with limited real-world relevance (Steffen 1995). However, the theory may be relevant for the fertilizer market in Kenya at the retail level that is characterized by a large number of "speculative" retailers who enter the industry during the peak trading season each year when high prices increase the likelihood they can make a quick profit, and exit as soon as price changes make the venture less profitable vis-a-vis their next best alternative.

2.5.2. The Transaction Cost Economics Paradigm

Market structure in the subsector and original industrial organization approach is exogenously determined by considerations such as whether the industry or some aspect of its operations is characterized by economies of scale and the nature of the regulatory framework. Within this given structure, firms seek to maximize profits, and any attempt to modify structure is taken as an attempt to gain market power. In contrast, the transactions-cost economics approach (Coase, 1937; Williamson, 1985) postulates that structure is endogenous to the model of economic optimization. The approach recognizes that the optimal organization of economic activities depends on both production costs and information costs, that is, the costs and risks associated with obtaining the information needed to carry out transactions. If information costs are too high, they can prevent certain transactions from taking place. Therefore, firms choose to assign transactions to the institutional arrangements (spot markets, various contractual arrangements, or vertical integration) that will minimize transaction costs.[15]

In the case of a structural characteristic such as economies of scale, the transactions-cost economics paradigm recognizes that whether an industry is characterized by economies of scale is determined not only by the physical dimension of this attribute, but also by whether the institutional environment is conducive. For example, it may be possible to capture economies in transporting fertilizer from the port of Mombasa to a wholesaler in Nairobi if wholesalers pool their orders and use one truck, instead of each wholesaler using individual trucking services. However, this is just the physical dimension to gaining economies of scale. Each transaction also involves a potential source of conflict in that each party will wish to arrange the terms of trade in her favor to appropriate as large a share of the gains from trade as possible. Invariably, efforts to influence the distribution will dissipate some of the potential gain (Masten as cited by Steffen, 1995, p.273). In the case of the wholesalers, whether or not these traders can actually reach an agreement to use one truck is an institutional matter which is determined by such considerations as the level of trust and obligation among the wholesalers as well as the enforceability of their agreements either via social pressure or by using the legal system. For example, the largest wholesaler may demand to pay lower unit costs than the others on the grounds that without his or her cargo, none of the cooperating traders would be

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[15]Transaction costs occur before (ex ante) and after (ex post) the transaction for both parties to the transaction. The ex ante costs are: a) the cost of gathering information; b) the cost of processing that information; c) the cost of coming to a decision. The ex post costs are: a) the cost of monitoring performance; and b) the cost of resolving disputes (Williamson, 1985).

able to reap economies of scale. If these firms cannot reach an enforceable agreement, a potentially advantageous institutional arrangement will not take place.

2.5.2.1. Elements of Transaction Costs Economics

2.5.2.1.1. Behavioral Assumptions

Transaction costs are influenced by two behavioral assumptions. The first is "bounded rationality" - the notion that people have limited information and limited cognitive ability to process it. The second is "opportunism" - acting in self-interest if one can get away with it because it is too costly for others to find out. Opportunism compels people to disclose information in a selective and distorted manner by strategic lying, cheating, confusing or obfuscating. Opportunism is thus related to moral hazard and the agency problem.[16] Transaction cost economics takes into account these behavioral assumptions by placing emphasis on the behavioral dimensions of firms and individuals who develop multiple goals and many techniques to satisfy these goals, such as satisficing, organizational slack (Hirshman), X-inefficiencies (Leibstein) or opportunistic behavior - as distinct from simple profit maximization (Steffen, 1995, page 268 - 269).

2.5.2.1.2. Attributes of Transactions

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[16]Like opportunism, moral hazard and agency depend on imperfect information and information asymmetries. Moral hazard refers to risk-increasing actions (or failure to take risk-reducing actions) that a first party can take to affect output which are generally not observable to the second party, thus altering the expected liability or payment of the second party. The agency problem stems from the relation between a principal and her agent hired to enforce terms of an agreement or contract. Self-interests of the agent are likely to diverge from those of the principal, imposing costs on the principal in terms of shirking by the agent (possibly unobservable to the principal) and monitoring, policing and disciplining the agent by the principal, and may influence the outcome of the contract in ways not necessarily anticipated by the principal.

There are three main attributes of transactions which increase transaction costs. The first attribute is the uncertainty to which the transaction is subjected. The greater the uncertainty the higher the transaction costs and the greater the incentive to contracting or vertical integration. Uncertainties in fertilizer marketing can arise from things such as whether bribes will be required and how much they cost; the absence of reliable grading and standardization; and uncertainty of access to or availability of supply chains for reliable supply of fertilizer as well as timely distribution.

The second attribute is asset specificity. Asset specificity refers to the extent to which "fixed" assets, that is, assets that have limited alternative uses or whose value in alternative uses is lower than in the intended use, are committed by parties to a transaction. The more the transaction involves the use of costly specialized assets which are fixed, the less likely the transaction gets handled on the spot market. [17] Fixed assets are especially vulnerable to the actions of relatively autonomous transactors in spot market transactions. One party to the transaction may act opportunistically to appropriate quasi-rents[18] generated by that specialized asset. This concept is known as "hold-up" or "hostage-taking".[19] For hold-up to be a problem, the market has to be less than

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[17]Asset specificity can refer to site-specific physical capital, human capital trained in specialized fields, and access to benefits (quasi-rents) from specific institutions (where beneficiaries will resist institutional reforms which cut their quasi-rents). A fourth type of asset specificity refers to temporal specificity, where a producer's value is inherently time-dependent, such as perishable agricultural crops.

[18]Quasi-rents refers to the difference between the value of the specialized asset in its current use and its value in any alternative use, including salvage value.

[19]For example, growers of a tree crop could decide at the last minute to divert their produce away from the usual processor in an attempt to negotiate a higher price. The processor, with her stationary fixed assets, must either capitulate, risk sub-optimal processing capacity utilization, or quickly look for alternative sources of supply. However, the direction of hold-up can be reversed if the processor announces her intention to buy less than the usual supply of the temporal (perishable) fixed asset tree crop. This time,

competitive (or contestable) in that the aggrieved party doesn't have equivalent options to those originally offered by the other party.

The extent to which hold-up is a source of transaction costs on fertilizer marketing will depend on whether traders have access to alternative supply chains so that they are less vulnerable to hold up by suppliers (or vice-versa, suppliers are less vulnerable to hold-up by buyers), since the transaction cost of finding alternative sources of supply are not prohibitive. With respect to asset specificity, given the nature of the commodity, this attribute is not hypothesized to be a source of transaction costs in fertilizer marketing. Firstly, the fertilizer commodity itself is not a specific asset since an asset has a longer life than a current input like fertilizer, typically at least a year (as is the case for perennial crops like trees). Therefore, a commodity like fertilizer that is held in inventory for a week or two does not qualify as an asset. Moreover, a specific asset is 'specific' to a transaction between two parties, not to a use. Secondly, site-specific, non-trivial fixed investments are few in the fertilizer trade. No special facilities are required. None of the fertilizer handled by the private-sector-led marketing and distribution system is processed since it is imported from overseas manufacturers. Fertilizer warehouses can store other goods. Trucks can carry other goods, and the polythene bags are properly classified as variable costs, rather than fixed investments. This negligible need for specific assets removes one type of obstacle to entry. However, specific human capital in terms of knowledge of the fertilizer trade and commercial practices represents another form of

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the growers must either capitulate, risk low volume sales (and partial loss of revenues and/or crop) or quickly look for alternative buyers.

asset specificity. To the extent that poor knowledge of the fertilizer market (availability of supplies, prices, reliable contacts with suppliers and buyers) hampers performance, ignorance of the market may pose a barrier to entry.

The third attribute of transactions, frequency, refers to similarity of transactions or repetitive fertilizer transactions. Coase (1937) argues that internal organizational costs increase with the spatial distribution and dissimilarity of transactions. Conversely, similarity of transactions lowers the costs of internal organization and tends to increase the likelihood of vertical integration.

North (1990) disputes this assertion from a game theoretic perspective. In a one-time game (or transaction), players (traders) have strong incentives to cheat opportunistically. But in an iterated game (similar and repetitive fertilizer transactions), the cooperative outcome is more likely to occur because the gains from successive iterations exceed the benefits that could derive from a single defection. The propensity for hold-up between transactors is also weakened because alternative suppliers (or buyers) are not an option due to high search costs. Moreover, familiarity between transactors increases the probability of detecting opportunistic behavior on the other's part. However, North cautions that even parties in a repeated transaction have to bear the transaction costs of acquiring information about their business partner (Steffen, 1995). Whether the lower-cost repetitive fertilizer transactions (similarity) encourage vertical integration or spot market transactions (as hypothesized by North) is an empirical question which to be addressed in the analysis of the private-sector-led marketing system.

2.5.3. Importance of Market Institutions and Governments in Marketing

Markets play a number of roles in the economy. First, markets provide the physical and institutional setting for the transformation of agricultural commodities in time, place and form. Second, market provide mechanisms and institutions for transferring ownership[20]. Third, they allow price discovery through the interaction of numerous buyers and sellers. The coordinating role of prices determined in competitive markets generates the efficiency that market economies claim. But actual market performance and its impact on welfare depend critically on just how efficiently marketing activities are carried out and thus how efficiently markets generate and transmit price signals (Steffen, 1995).

However, markets in Kenya as in many developing countries are hampered by poor communications and transport facilities, suggesting potentially large efficiency and economic gains from improved coordination of the marketing systems. Low marketing margins may indicate a lack of increased services and coordination, whereas margins may be high but reflect "efficient but poor" markets where traders are making returns that are too low to enable expansion and the associated benefits to consumers. The primary function of the public sector, therefore, is to provide market facilitating services and an environment or institutional framework which enables markets to function properly (Abbott, 1993; Holtzman, 1986; Holtzman et al. 1993; Harrison et al., 1987; Lele 1990).

To paraphrase North, (1990) the institutional framework plays a decisive role in the performance of any economy. North defines institutions as a response to the

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[20]Ownership is defined by property rights, a set of institutions. Property rights describe the relation of an individual with respect to a resource or course of action. Property rights are politically created and socially sanctioned (Schmid, 1987).

constraints that society imposes on its members. Market institutions determine the opportunity set of market participants. The cost of information in exchange is high, including delineating the terms of the exchange and enforcing agreements. Well-designed institutions can help reduce uncertainty by providing critical information. In turn, this reduces transaction costs and the associated risk premium, whose size depends on the likelihood of the other party not living up to the bargain and the penalty to the party. In summary, market institutions lower transaction costs and in doing so, facilitate coordinated trade.

Secondly, improved market performance is unlikely to be achieved without the active participation of the government via provision of public-good type facilitating services or functions which include:

- transport infrastructure (especially highways and rural roads), making inaccessible areas more accessible;
- a reliable communications network (such as the postal and telephone system);
- a sound and stable currency (to encourage savings and investments);
- domestic security, or law and order (to protect lives and property);
- an independent judicial system and regulations (to uphold contracts, define property rights, minimize abuses and unfair play and resolve business disputes fairly and rapidly);
- the right to form political and economic associations, both to air grievances and articulate consumer preference.

2.6. Performance Indicators for the Fertilizer Subsector

Having considered elements of transaction cost economics, and the role of governments in promoting market efficiency, this section returns to the notion of market performance. The purpose of this study is to evaluate performance of the fertilizer subsector in Kenya in terms of the static efficiency and dynamic performance measures of the marketing system as well as key institutional and policy attributes, given their importance in market development. Given the research questions, and the scope of the research and resultant data availability, Figure 5 shows the performance criteria to be examined in the analysis of the subsector.

Figure 5. Fertilizer Subsector Performance Criteria

Efficiency Performance Criteria

- Extent to which marketing margins reflect the real costs of services, including normal returns to labor, management, and capital;
- Extent to which firms are large enough to realize available economies of scale.

Dynamic Performance Criteria

- Progressive innovations to reduce costs and increase consumer satisfaction;
- Progressive innovations to reduce, share and better manage risk;
- Progressive organizational arrangements to increase efficiency and improve market coordination over long distances;
- Extent to which the fertilizer market (or individual participants) generates and uses market information to improve market decisions;

Institutional and Government Policies Criteria

- Effectiveness of marketing institutions in organizing and regulating the fertilizer subsector;
- Extent to which the policy environment fosters competition, entrepreneurship and innovation in the market, including ease of entry;
- The income distribution of the resulting organization of the fertilizer subsector;
- Government policies with respect to integrating public good services (fertilizer aid, extension) into the private-sector-led fertilizer marketing system; and
- Quality, availability and timeliness of public marketing services.

2.7. Conclusion

This chapter presented the conceptual framework that will be used by this study to analyze the performance of the fertilizer subsector. The chapter began with a description of the commodity subsector analytical approach, which forms the framework for analysis of the fertilizer subsector in Kenya. This chapter introduced key economic concepts to supplement the perfect competition underpinnings of subsector analysis, namely workable competition, contestable markets and transaction costs economics. It also outlined the critical role played by market institutions and the government for well-functioning agricultural markets. The chapter concluded by enumerating selected market performance indicators for investigation in the analysis of the fertilizer subsector.

CHAPTER THREE
SURVEY DESIGN AND RESEARCH METHODOLOGY

3.1. Introduction

The results of this study are based on survey data obtained during the long-rains fertilizer-trading season in 1999, which extended from January to July, inclusive. Fertilizer traders, transporters, and representatives of government agencies concerned with the marketing and distribution of fertilizer to smallholders in what are referred to as Rift Valley, Western and Nyanza Provinces in Western Kenya were interviewed (See Figure 1, Chapter One).

The emphasis was on the marketing of DAP and urea fertilizer in Western Kenya because: a) 69 percent of the maize produced in Kenya is in these two provinces; b) maize receives more fertilizer than any other crop in Kenya - 37 percent of the total fertilizer applied in Kenya in 1997/98 (KAMPAP, 1997/8); c) the majority of this is DAP, which accounted for the 31 percent of the fertilizer consumed in Kenya in 1998; d) the majority of smallholder farmers use DAP and urea (Allgood and Kilungu, 1996).

3.2. Choice of Target Population and Construction of Sampling Frame

The study area, Western Kenya, was chosen because it contains the maize basket of Kenya. Within this geographical area, agroecology and rural infrastructure were used to further delineate the sampling frame because it was assumed that these factors were major determinants of the location of fertilizer supply chains for smallholders. Agroecological factors combine with demand patterns to determine the crop mix in an area, and thus influence the demand for fertilizer and the consequent establishment of fertilizer traders. Secondly, Omamo (1996) found that transport costs are a major component of fertilizer marketing costs, particularly transport costs from the retailer to the farm-gate, and that they decrease with higher incidence of all weather roads. Accordingly, the study area was delineated using agroecological zone and rural infrastructure to obtain a set of traders who operated in diverse circumstances with regards to agroecological zone and quality of road network. The final study area consists of five districts in Western Kenya. Four of these are major maize production zones and one is a low-potential maize zone.

The districts are located in different agroecological zones and certain divisions within the districts were selected based on whether their rural roads were of "good" quality (all-weather tarmac roads) or "bad" quality (tarmac but pot-holed and/or murram roads). Accessibility on the latter roads worsens substantially during the rainy season. Table 2 summarizes the districts in terms of their agroecological characteristics, potential for maize production, number of market centers and road quality, and is accompanied by a description of each district as follows:

1) **Trans-Nzoia District.** This is a upper midland zone (UM4) with high potential for maize and wheat as well as other cash crops including pyrethrum, wheat, tea and horticulture. It has a high equatorial climate with rain fairly well-distributed throughout the year due to the bimodal rainfall pattern; the long rains fall from April to June, while the short rains fall between July and October.

Table 2. Characteristics of the Study Site

District	Division	Agro-Ecological Zone[1]	Potential for Maize	Market Centers	Road Quality
Trans-Nzoia	Cherangani	UM4	High	Kitale, Moi's Bridge, Chepsiro	Good
				Kanjibora	Bad
Bungoma	Kimilili	UM2	Medium	Kimilili	Good
Lugari (Kakamega)	Lugari, (Upper Lugari)	UM4	High	Turbo,	Good
				Kipkarren	Bad
	Likuyani (Lower Lugari)	UM4	High	Soy	Good
				Nangili, Matunda	Bad
Uasin Gishu	Eldoret Township	n/a*	n/a*	Eldoret	

*n/a = not applicable. Eldoret is a supplier town only for farmers in the study area, none of whom were in Uasin Gishu district.
[1]AEZ's: LM = warm, humid and sub-humid lower midland zones; UM = temperate, humid and sub-humid upper midland zones. The numbers 1 - 4 relate to rainfall and humidity levels, ranging from relatively high (1) to relatively low (4).

The study site was Cherangani Division which contained four market centers - Kitale, Moi's Bridge and Chepsiro (good roads) and Kanjibora (bad roads).

2) **Bungoma District.** This is classified as Upper Midland 2 (UM2) and is the main coffee zone. However, it is also high potential for sugar, and over the past five years maize production has been increasing steadily. The study site was Kimilili division, Kimilili market center, which has bad roads;

3) **Upper Lugari District (formerly Kakamega District)**. This is classified as Upper Midland 4 (UM4) and is a maize and sunflower zone. The area has high yield potential for maize and one long cropping season, with rains beginning in March. The study site was Lugari division, containing Turbo (good roads) and Kipkarren (bad roads) market centers;

4) **Lower Lugari District (formerly Kakamega District).** This is also classified as Upper Midland 4 (UM4). The study sites was Likuyani Division, containing three market centers - Soy (good roads) and Nangili and Matunda (bad roads).

3.3. Delineating the Private Fertilizer Marketing System

The target population was identified as all traders selling fertilizer in the study area. Hence, an initial visit to all the study sites was undertaken in order to create the sampling frame. The total number of fertilizer traders in each market center was counted in order to develop a complete list of traders operating in the study area. In order to stratify trader respondents, traders were asked a series of preliminary questions designed to designate them as an importer, wholesaler or retailer. Importers are traders who purchase fertilizer from fertilizer manufacturers outside of Kenya, transport it to the port of Mombasa, clear it through customs, and sell it to wholesalers, large-scale farmers and estates, and less frequently, directly to retailers. Wholesalers are traders who purchase fertilizer from importers in large consignments (thousands of bags) and transport it to warehouses upcountry where they break it down into smaller consignments that can be sold to retailers, or directly to farmers, cooperatives and estates throughout the country. Retailers are marketing agents who purchase fertilizer from wholesalers and sell it to farmers. The traders were classified as retailers or wholesalers by asking them who their main customers were: if their main customers were farmers, the traders were classified as retailers; if their main customers were other traders, they were classified as wholesalers. The study identified 10 active importers, 25 wholesalers and 93 retailers in the study area.

Once the sampling frame had been constructed, the intention was to create the sample of traders using the proportional representation technique at the 50 percent level for each type of trader so that inferences based on the sample of traders could be made. However, obtaining the final sample of traders proved to be more complicated than was anticipated. First, of the 10 importers identified, only three imported fertilizer in 1999. Secondly, the sampling frame was constructed while the fertilizer trading season was still in progress in June. However, some of the wholesalers and retailers included in the sampling frame only operated during the peak fertilizer trading season between January and July. Consequently, at the time the surveys commenced in late July, the total number of wholesalers and retailers had decreased considerably and the numbers in each study area and category had also changed. Therefore, the study interviewed every importer, wholesaler and retailer in the study area who was still trading at the time of the survey instead of reconstructing the sampling frame.

As a result, the final set of traders who were interviewed consisted of the population of traders who were still active at the time the interviews were conducted. This population consisted of fertilizer traders in Western Kenya who continued to trade in agricultural and nonagricultural goods beyond the peak fertilizer season in 1999 (that is, fertilizer trading is not their only business), and who were willing to participate in the survey. Since the data only describes the characteristics of the population of fertilizer traders who were active at the time of the interviews, the results cannot interpreted as representative of all fertilizer traders in Western Kenya, and therefore general inferences cannot be made about fertilizer traders in Kenya. Rather the results provide information about this particular population of traders and can be used to develop hypotheses to test for a larger sample of fertilizer traders or for traders in other parts of Kenya.

The final population of traders consisted of seven of the 10 importers[21], 14 wholesalers and 47 retailers involved in fertilizer marketing and distribution in Western Kenya in 1999. These traders represented three districts and 11 trading centers[22].

The interviews took place between July and September, 1999. Separate survey instruments were prepared and pre-tested, one each for importers, wholesalers, and retailers.

The instruments covered information on:

- quantities of the various fertilizers sold;
- buying and selling prices;
- seasonality of sales;
- dates of entry into fertilizer trading;
- other activities engaged in other than fertilizer trading;
- principal suppliers and customers;
- methods of procurement of fertilizer;
- methods of price determination;
- access to key services such as transportation and credit;
- investment in market development;
- perceptions of the main problems besetting the fertilizer sub-sector.

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[21]This included the three that imported fertilizer in 1999. Four had their headquarters in Nairobi, one in Ruiru, one in Nakuru and one in Kitale in Western Kenya.

[22]To protect the identities of traders wishing to remain anonymous, names and other details specific to firms will not be provided.

Importers were only willing to give data in very aggregated form. There were 14 wholesalers and eight of them provided data on the quantities purchased, prices, and their supplier. There were 23 small-scale retailers and 24 large-scale retailers and thirty retailers provided data on prices, purchases and their supplier.

The research team also interviewed fertilizer transporters to obtain information about transport costs. Although a questionnaire was used, there was no attempt to create a formal sample. Instead, we targeted transporters who had been most frequently identified by fertilizer traders as their main transporters. Five transporters were interviewed. The data collected included the number of trucks owned; make and tonnage of trucks frequently used for transporting fertilizer; annual expenses on tires, tubes, insurance etc.; monthly expenditure on drivers and loaders; transport charges for different routes; and number of 50 kg bags carried before and after the imposition of the axle weight law.[23] Similarly, we interviewed clearing agents and personnel at the Kenya Port Authority in Mombasa and bankers in Nairobi to obtain information on the costs involved in importing and clearing a fertilizer shipment.

The findings in this research are also based on information obtained from secondary data sources. The secondary sources utilized are the following: the Ministry of

[23]The axle load enforcement law came into effect in October, 1998 under the traffic act cap 305. It was enforced to ensure that overloading of trucks would be eliminated in order to reduce the wear and tear on roads and increase their lifespan. The recommended tonnage per axle was been reduced to eight tons, so that transporters who used to carry up to 60 tons on a 32 ton truck were now only allowed to carry 32 tons. As a result, transporters increased their transport charges; for example, in 1999 road transporters increased their rate for the Mombasa-to-Nairobi route from Kshs 1700 per ton to Kshs 2500 per ton.

Agriculture for post-liberalization fertilizer prices, fertilizer importation and consumption, and maize production and maize prices; the Central Bank of Kenya for exchange rates and interest rates; and the Ministry of Finance for fertilizer prices in the pre-liberalization period. The study has also been enriched by informal interviews with members of government regulatory bodies and other industries involved in fertilizer marketing such as the Kenya Port Authorities, Kenya Railways, Kenya Revenue Authority, and Kenya Bureau of Standards.

The administration of the questionnaires and collection of secondary data involved the use of enumerators who had been hired earlier and trained to administer the fertilizer marketing survey. The enumerators were taken through the questionnaire so that they could administer it in both English and Kiswahili. They were also involved in the initial rapid reconnaissance and pre-testing of the questionnaires before the actual data collection started.

3.3.1. Data Limitations

A number of drawbacks limit the usefulness of the data. First, as discussed above, there was a difference between the number of traders in the sampling frame, and the final population of traders because some traders had already exited the market at the time the survey was conducted. Therefore, the results are biased towards traders who are involved in fertilizer trading permanently as opposed to speculatively when they think they can make a quick return. Second, the data collected on marketing activities and prices were collected with one-time surveys when the trading season had already ended. As a result, the data are recall data and are only as good as traders' memories and record-keeping skills. Third, the magnitude and character of fertilizer marketing activities varies by month and on an annual basis whereas some results from the analysis only pertain to the specific period during which the survey was implemented.

CHAPTER FOUR
FERTILIZER IN KENYA: AN OVERVIEW

4.1. Introduction

This chapter describes the basic conditions of the fertilizer sub-sector. Section 4.2. describes the evolution of the sub-sector, Section 4.3 describes fertilizer consumption trends, and the institutional environment is presented in Section 4.4. Section 4.5 concludes the chapter.

4.2. Evolution of the Fertilizer Sub-sector

Kenya's fertilizer sub-sector has been through a number of phases, as the government has responded to changing conditions with changing policies. However, the goal of government policy has always been to keep the farm-gate price of fertilizers as low as possible as a way of increasing fertilizer use among smallholder farmers.

4.2.1. Pre-Independence Era, 1949 - 1962

The pre-independence era witnessed the introduction of modern farming methods and the intensification of agricultural operations by white farmers farming large tracts of land in Kenya's "White Highlands". Fertilizer use was restricted to cash crops such as wheat and maize, and coffee, tea and sugarcane for export. Since African smallholders were not allowed to grow these crops (with the exception of maize for subsistence), these large farmers consumed the bulk of fertilizer imports. Importation and distribution for these farmers was undertaken by the Kenya Farmers Association (KFA) and a few private companies. Almost all imports were sourced from European firms via their local representatives. The fertilizer importers operated as an oligopoly: they produced a common price proposal which was reviewed and accepted by the government before a price list for the important consuming areas was circulated. It was only in the late 1950's that African farmers were allowed to grow coffee and tea and sugarcane, and also become fertilizer consumers.

4.2.2. 1963 - 1973

At independence in 1963 the Government of Kenya (GOK) formed a working party to investigate why Kenyan farmers used so little fertilizer. The main constraints were found to be high prices and a marketing system that was geared to the serve the needs of large farmers. The solutions suggested by the working party were that subsidies be paid on certain types of fertilizer and that cooperatives and private traders be allowed to sell fertilizer. Nevertheless, growth in fertilizer use among smallholders remained sluggish. A second working party was formed in 1970 to look into why adoption was so slow among smallholders. They found oligopoly in the marketing system to be the major problem. Two firms controlled 60 percent of imports and almost all wholesale distribution. The largest of these importers recommended a price list that all others agreed to. The report on the findings of the second working party proposed legislation against collusion by importers. Each importer was required to present a separate ex-Mombasa price list, and changes were made in the way wholesale and retail margins were calculated by the Treasury. Recommendations were also made for the extension of credit to small traders and the introduction of smaller 25 kg bags to alleviate farmers' purchasing power constraint. In addition, the abolishment or complete restructuring of KFA was recommended.

4.2.3. Government Controlled Fertilizer Sub-Sector

Then came the oil crisis of 1973/74, which wreaked havoc on global markets for fertilizer and transportation. One result was a doubling of fertilizer prices. However, even after fertilizer prices stabilized, and returned to equilibrium, European suppliers and their local representatives were alleged to be maintaining high fertilizer prices in an effort to recoup earlier losses. The GOK reacted strongly. Fertilizer subsidies were abolished, as they were not assisting the expected beneficiaries. Import quotas were introduced to regulate types and quantities of fertilizer imported and hence conserve scarce foreign exchange. This policy change was also aimed at breaking up the oligopolistic import structure, as no one importer was allowed to control supplies of a particular type of fertilizer. The government investigated the possibility of manufacturing fertilizer locally at a factory to be built in Mombasa, but due to the small market, the lack of domestically available raw material, and the high capital requirement, it abandoned the idea. Through donor-supplied fertilizer, the government also became an important fertilizer importer; it imported 174,000 tons of fertilizer and nominated the Kenya National Federation of Cooperatives to distribute it via cooperative unions. This promoted a dominant role for the cooperative sector in fertilizer marketing and allowed a larger number of smaller firms to compete on equal footing with the large private firms involved in fertilizer importation. Price controls were instituted in 1976, whereby the Price Controller in the Treasury of the Ministry of Finance announced maximum retail prices for 42 major commercial centers.

Although these actions increased government participation in the market, and encouraged the entry of more firms thus challenging the oligopolistic structure, this government action did not improve the responsiveness of the system to smallholder farmers whose consumption levels remained low. Moreover, by involving itself so heavily in the fertilizer sector the government alienated the private sector. The large European firms that had been supplying the market through their local offices withdrew; their offices closed or were sold to local Kenyans. Private imports dwindled and the government turned to the donor community to seek fertilizer as aid in kind. The government pushed for aid fertilizer as a means of maximizing external resources and saving foreign exchange.[24]

Following Kenya National Federation of Cooperatives (KNFC) poor performance with a 174,000 ton consignment in 1974, all aid fertilizer was distributed through the KFA and later through its successor, the Kenya Grain Grower's Cooperative Union (KGGCU). The sole agency agreement between the government and KFA lasted for almost 10 years. By 1980, the KFA's dominant position in the market, price controls, the withdrawal of European firms from the market, and difficulties in obtaining foreign exchange, resulted in there being relatively few serious players in the market. The shortfall was being met by increasing amounts of donor fertilizer; KFA alone accounted for over 80 percent of domestic fertilizer sales in some years. The two largest importers, KFA and a private firm called Mea Ltd., had their own outlets through which they supplied fertilizer to end users, cooperatives, parastatals, and other commercial firms involved in the trade such as smallholder production schemes. Another large importer, Devji Meghji, imported and

[24]An important reason for this need to save foreign exchange was due to the overvaluation of the exchange rate at this time. The Government lifted exchange rate controls in the early 1990's and Kenya now has a floating exchange rate.

supplied coffee estates and cooperatives, but without its own network of distribution outlets.

The agreement between the government and the KFA was not without its problems. KFA also imported fertilizer in its own right and preferred to sell its own stocks before the government stocks, and charged the government storage charges for aid stocks held. The KFA also wanted greater say as to types and timeliness of aid fertilizer imports and prompt payment of storage charges. Disagreement over these issues led to termination of the sole agency agreement with KFA in 1985. Nevertheless, donor-supplied fertilizer continued to take central place in the industry and constituted a record high of 67 percent of total imports in 1986/87. USAID was an important fertilizer donor in this period and the pivotal condition attached to its fertilizer aid was that the GOK take steps to improve the public sector's management of the fertilizer sub-sector to make it more attractive for the private sector to get involved.

Accordingly, in the 6th development plan (1989-1993) the GOK initiated the following steps to facilitate increased private sector participation in the distribution of donor-supplied fertilizer:

- Recategorization of fertilizer in the import allocation system to allow import licenses for fertilizer to be granted;
- Removing restrictions on fertilizer trading so as to render the market more competitive to allow more efficient distribution and give better margins to retailers;
- Channeling fertilizer acquired by the public sector through greater use of cooperative and private entrepreneurs
- Introduction of distribution of fertilizer in small packets to facilitate access to small farmers who may not afford larger packets;

- Strengthening of the extension system to propagate education on the right types, quantities, and timing of the fertilizer. To this end the Ministry of Agriculture was to establish a farm inputs branch or fertilizer unit to monitor fertilizer supply and demand conditions in the country, and produce, reproduce, and distribute educational leaflets and pamphlets on fertilizer use.

The agreements included stipulations that were designed to make government price setting and allocation mechanisms transparent and fair. Specifically, the government was to announce its controlled market prices well in advance, minimum quantities to be bid for were gradually reduced, and firms were to be guaranteed at least as much allocation as their proven needs the year before. The government also instituted a benchmark import pricing system in which controlled prices were set based on a formula that added distribution costs to landed prices at Mombasa, and which increased retail margins to allow the private sector to cover the costs of distribution beyond major towns and packaging in smaller bags.

Due to these gradual policy changes, the private sector gained prominence in the fertilizer business and by the time liberalization (deregulation and privatization) commenced in 1990, the private sector was already a major player in the fertilizer sub-sector. For example, prior to 1983, only the KFA distributed donor fertilizer. However, six private firms participated in USAID's first delivery of 20,800 tons in 1983 and in 1985 16 firms participated.

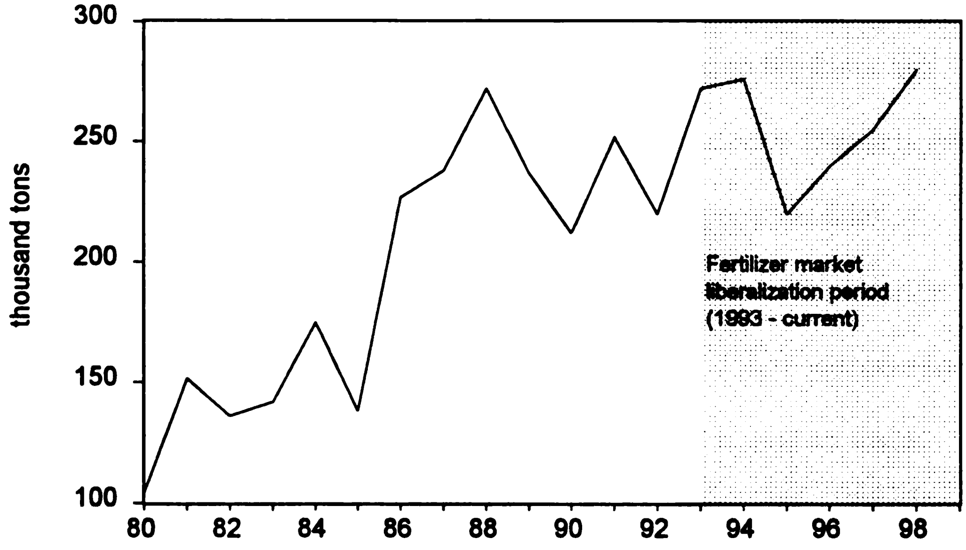
4.2.4. Liberalization of the Fertilizer Sub-Sector

Within a decade fertilizer supply in Kenya shifted from a system of controlled prices and monopoly supply to a market-driven sub-sector. All importation and domestic marketing restrictions had been eliminated, with the expectation that the inefficiencies that resulted from government involvement in the market - delayed imports, limited retail distribution beyond major towns or in smaller bags - would be removed. Between 1990 and 1993, fertilizer prices were decontrolled, import quotas and import licenses were abolished, and foreign exchange controls were eliminated, and the KFA retail outlets were closed down. Hence, by 1993, the government had completed disengaged from the marketing and distribution of fertilizer. Today, once fertilizer lands at the port of Mombasa, its distribution and sale is handled almost exclusively by the private sector.

4.3. Fertilizer Consumption Trends

Annual fertilizer imports exhibited an upward trend between 1980 and 1998 (Figure 6). Until 1985, due to the sole-agency agreement between the government and the Kenya Fertilizer Association, private-sector activity was minimal, there were few players in the market, and fertilizer imports remained below 200,000 metric tons.

Figure 6. Trends in Fertilizer Consumption in Kenya, 1980 - 1998

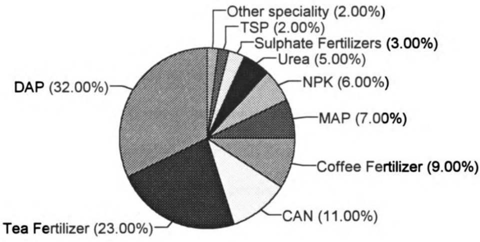


Source: Ministry of Agriculture, 1999

In 1985, the government terminated its sole agency agreement with the KFA and started distributing fertilizer via private traders. It also began to loosen the restrictions on import quotas and foreign exchange. This resulted in the dramatic increase in fertilizer imports in 1985/86 to over 200,000 metric tons. Market reforms spurred an additional increase in fertilizer imports, as illustrated by the upward trend in consumption between 1990 and 1994. However, many of those who imported fertilizer in 1994, the year after all foreign exchange and import controls were removed, lost money when the Ksh/US$ exchange rate rose as high Kshs 80 before falling to Kshs 40 in a matter of months. A number of 1994 importers subsequently left the industry, leaving 20 firms (compared to 36 in 1994) to import for the 1994/1995 fertilizer year. This explains the reduction in quantity imported during this year. Since this time, overall fertilizer consumption has exhibited a steady upward trend.

The main types of fertilizers consumed in Kenya are compound fertilizers that provide both nitrogen and phosphate. Planting fertilizers for grain, namely Diammonimum Phosphate (DAP), Monoammonium Phosphate (MAP) and various combinations of nitrogen-phosphate-potassium fertilizers (NPK), comprise the majority of the fertilizer consumed in Kenya, while straight nitrogenous fertilizers such as calcium ammonimum nitrate (CAN) and Urea are used for top-dressing (Figure 7). DAP is used on maize, MAP on wheat, NPK 25:5:5 is used in tea, NPK 17:17:17 and MOP (Muriate of Potash) in coffee, and speciality fertilizers are used in horticulture, particularly in the flower industry (Figure 7).

Figure 7. Fertilizer Consumed by Type (1999-2000)



Key

DAP	= Diammonimum phosphate
MAP	= Monoammonium phosphate
NPK	= Nitrogen, Phosphorus, Potassium. Different types with numbers representing different percentages of the three nutrients: 23:23:23; 20:20:0 are the most common types of NPK used in Kenya
CAN	= Calcium Ammonium Nitrate
TSP	= Triple Super Phosphate
Specialty fertilizers	= Mainly horticultural fertilizers

Source: Ministry of Agriculture data files, 1999

4.3.1. Levels and Distribution of Fertilizer Use

This section draws on a national rural household survey implemented under the Kenya Agricultural Monitoring and Policy Analysis Project (KAMPAP), a joint collaboration between Tegemeo Institute/Egerton University, Michigan State University, and Kenya Agricultural Research Institute.[25] The following analysis is based on the 612 households in 18 districts aggregated into six agro-regional zones for 1996/97 and 1997/98: Eastern Lowlands; Western Lowlands; Western Transitional; High Potential Maize zone; Western Highlands; and Central Highlands. The six zones differ greatly in population density, rainfall, and cropping patterns. Total rainfall ranged from a high of 1,211 millimeters per season in the Western Transitional to a low of 266 millimeters in the Eastern and Western Lowlands. The Western Lowlands Zone is the most densely populated, while the Eastern Lowlands is the least populated. Maize was the main cash crop in four districts in the High Potential Maize zone, and one district in the Western Highlands.[26] Other cash crops were wheat, vegetables, sugarcane, tea, and coffee. In general, the type of cash crop grown varied with the agro-ecological potential of the zone and population density.

The household data indicate that fertilizer nutrient use varied substantially across agro-regional zones, by crop, and by whether or not households use hybrid seeds.[27] On

[25]The survey was conducted in the 1996/7 season for 1540 households in 24 districts in Kenya, and repeated for a sub-sample of these households (n=612) in the 1997/98 season. The analysis here is based on the 612 households for which data were available over the two-year period.

[26]Main cash crops were defined as crops that were sold by at least 40 percent of the households sampled in a zone during the 1996/97 season.

[27]At this juncture it is important to make the distinction between fertilizer use (the amount of fertilizer material applied in kg per acre) and fertilizer nutrient use (the amount of fertilizer nutrients applied in kg/acre). Typically, a bag of fertilizer will contain both nutrients (nitrogen, phosphorus, potassium, sulphur) and fertilizer material which is just dry non-chemical matter which facilitates the packaging, handling and spreading of fertilizer. The actual nutrient content of a bag of fertilizer is indicated on the label of the bag in percentages; hence the label of 50 kg bag of DAP fertilizer will indicate that it is DAP 46:18:0. This means that the actual nutrient content of the bag is 46 percent nitrogen, 18 percent phosphorus, and 0 percent potassium. Therefore a 50 kg bag of DAP actually holds 23 kg of nitrogen, 9 kg of phosphorus, and the remaining 18 kg is dry fertilizer material. The data on fertilizer use patterns presented in the following sections is in terms of fertilizer nutrients per acre, not fertilizer use per acre.

average, more than 70 percent of the sampled households used mineral fertilizers in 1997 and 1998, and 57 percent of them used manure (manure data is only available for 1998), (Table 3). Manure use varied across zones, with the highest level of use found in the Eastern Lowlands and Central Highlands, where 84 percent and 91 percent of the households respectively, used manure. Dosage rates for manure were not available. However, with the exception of the central highlands, zones where a higher percentage of households used manure had a lower percentage of households using fertilizer, and vice versa. In addition, usage of both manure and mineral fertilizer was very low among households in the Western Lowlands. The highest levels of mineral fertilizer use were found in the High-Potential Maize Zone, the Western Highlands and the Central Highlands where on average 90 percent of the households in each of the three zones used fertilizer in 1997 and 1998 (see Table 3).

Table 3. Fertilizer Nutrient Use Per Acre in 1996/7 and 1997/8

Zone	Year	Percent of house-holds used manure	Percent of house-holds using fertilizer[1]	Fertilizer Nutrient applied[2]	Fertilizer nutrient application per acre				
					0 kg	0-10 kg	10-30 kg	30-50 kg	50 + kg
		----- Percent -----		-kg/acre-	-------- Percent of Households --------				
Eastern Lowlands	1996/7	n.a.	45	5.31	55	35	11	0	0
	1997/8	84	51	6.54	49	37	13	0	0
Western Lowlands	1996/7	n.a.	11	8.79	89	7	2	1	0
	1997/8	18	13	13.7	87	6	7	0	0
Western Transitional	1996/7	n.a.	69	15.1	31	29	32	5	3
	1997/8	48	79	16.6	21	31	32	16	0
High Potential Maize Zone	1996/7	n.a.	92	32.2	8	10	35	37	11
	1997/8	48	88	33.5	12	9	32	29	18
Western Highlands	1996/7	n.a.	91	19.5	9	27	50	10	4
	1997/8	51	86	19.4	14	27	46	10	3
Central Highlands	1996/7	n.a.	99	37.6	1	12	43	20	24
	1997/8	91	97	47.9	3	8	22	24	42
	1996/7	n.a.	74	27.3	26	17	31	17	9
Total	1997/8	57	73	30.4	27	17	26	17	14

Note: The total number of households is 612 for both year. 1) DAP is applied on 48 percent of the total 2216 plots on which fertilizer was applied; CAN 21 percent; NPK 16 percent; Urea 5 percent. 2) Among households who used fertilizer.

Fertilizer use levels were also reasonably high in the Western Transitional and Eastern Lowlands (79 percent and 51 percent for 1998, respectively), but then they fall off dramatically for the Western Lowlands; in 1998 only 13 percent of these households used mineral fertilizer. Dose rates (i.e., the amount of fertilizer nutrient applied per acre among fertilizer users) also vary across zones. In 1998, only households in the Central Highlands and High-Potential maize zone applied more than 30 kg of mineral fertilizer nutrients per acre (47.9 and 33.5 kg per acre, respectively). Although the percentage of households that used fertilizer was high in the Western Highlands, the average dose rate was much lower than the Central Highlands and High-Potential maize zone. The difference emanates from a lower number of high-end users. In the Western Highlands, only 14 percent of households used more than 30 kg of fertilizer nutrient per acre in 1997, and in 1998 that figure was 13 percent, while more than 40 percent of households used more than 30 kg of fertilizer nutrients in the Central Highlands and High-Potential maize zone.

The household survey found that maize took up the largest share of cropped area in all the zones. It also received the lion's share of fertilizer allocated to crops in all the zones in 1998 except the Central Highlands and Western Lowlands (see Table 4). In the Western Lowlands (Siaya district) in 1998, 94 percent of the fertilizer used was applied to other cereals (mainly sorghum), followed by sugar (7 percent in 1998); and in the Central Highlands, tea was the main consumer of fertilizer (35 percent in 1998), followed by maize (15 percent in 1998).

Table 4. Allocation of Fertilizer Use by Crop (percent of fertilizer used on each crop) by Zone, 1997/98.

Zone	Year	Eastern Lowland	Western Lowlands	Western Transitional	High Potential Maize Zone	Western Highlands	Central Highlands	National
Maize	1996/97	32	7	44	47	47	13	47
	1997/98	34	0	43	34	38	15	40
Other cereals	1996/97	0	95	2	15	2	0	11
	1997/98	0	94	1	24	4	3	25
Coffee	1996/97	16	0	0	0	56	10	3
	1997/98	8	0	0	0	35	8	2
Sugar	1996/97	1	5	46	0	0	2	4
	1997/98	3	7	46	0	0	1	3
Tea	1996/97	0	0	0	7	29	31	14
	1997/98	0	0	00	8	24	35	14
Banana	1996/97	10	0	1	1	8	9	4
	1997/98	11	0	6	0	11	5	2
Roots	1996/97	8	0	4	2	0	15	6
	1997/98	8	0	2	0	2	14	4
Horticulture	1996/97	22	3	5	23	7	9	5
	1997/98	24	0	0	19	16	11	5

Source: KAMPAP data, Tegemeo Institute/MSU, 1998.

4.4. The Institutional Environment

The political and legal environment in Kenya plays an important role in facilitating fertilizer trading practices. The regulatory framework for fertilizer trade in Kenya is comprised of three main bodies: the Kenya Port Authority; the Ministry of Agriculture; and the Kenya Bureau of Standards.

4.4.1. Kenya Port Authority

The Kenya Port Authority carries out two roles to facilitate the movement of fertilizer to the farm-gate. First, it allows ships carrying fertilizer to dock at the port of Mombasa to unload the commodity and collects fees for this service. Secondly, the KPA provides "gangs" or groups of young men to unload the fertilizer (stevedoring), for additional fees. It is mandatory that importers and their clearing agents use these "gangs" to minimize theft; they may not bring their own unloaders to the port for this purpose. Since these "gangs" have a monopoly on this activity, it is common knowledge that they have to be bribed to unload a consignment in a timely manner; otherwise, they can hold it up for days or even weeks.

4.4.2. Ministry of Agriculture (MOA)

The Farm Inputs Branch of the Ministry of Agriculture was established during the early 1990's to meet USAID stipulations that the government take steps to create a conducive environment for the private sector to take over the importation, marketing and distribution of fertilizer. Access to all the information regarding sources and outlets for fertilizer, and prevailing market prices and costs is crucial for increasing market efficiency by reducing transaction costs.

The Farm Inputs Branch collects and compiles data on fertilizer imports and consumption each year by keeping in close contact with personnel at the KPA and the banks, as well as private importers, parastatals, cooperatives and estates that import their own fertilizer. In doing so, it attempts to coordinate supply and demand each year by projecting what demand for fertilizer will be in the coming year and liaising with importers to make sure they import enough fertilizer to meet this demand. To this end, the Branch collects information on how much each importer is planning to import and shares this information with other importers to prevent oversupply as well as to avoid a shortage, while maintaining the anonymity of each importer. Thus, it acts as an informal clearinghouse for the fertilizer industry at the importer level. Based on the evidence - in 1999 there was a severe shortage of fertilizer whereas in 2000 there was oversupply - there is room for the FIB to improve how it carries out its responsibilities. There is also room for the FIB to improve its performance with respect to dissemination of market information. The FIB does not collect and disseminate data about sources and outlets of fertilizer, and prevailing market prices and costs. As a result, traders rely on their own private means of obtaining such information. Hence, some traders may be at a disadvantage because they have less accurate knowledge of market conditions, which reduces their efficiency and bargaining power.

A second mandate of the MOA is to teach farmers about the proper use of fertilizer through its extension agents. The premise is a widely accepted hypothesis among analysts and researchers that input markets in developing countries perform poorly in the distribution of modern factors of production such as fertilizers, pesticides, and insecticides to small farmers due to the difficulty of transmitting technical knowledge to these farmers.

The MOA also coordinates the KRII Japanese-funded program, which provides participating countries with funds to import fertilizers, pesticides, and agricultural and industrial machinery from Japanese companies as described in Chapter Two.

4.4.3. Kenya Bureau of Standards

The implementation of marketing grades and standards for fertilizer is of paramount importance for the flow of goods and services along a supply chain. Standardization refers to grading, standards of identity, standardization of containers and packaging, standardized quotations, price posting, and product tests. Without the guidance provided by standardization as to the respective formulations and nutritive properties of fertilizer in the form of proper analysis, labeling, and packaging of all fertilizers, trade between traders and between traders and farmers would be hampered as the parties to a transaction would be unsure of the what is being offered and of the relative price-worthiness of the goods for sale. Secondly, lack of or poor labeling precludes ordering on the basis of description, which increases the transaction costs of trade. The implementation of such regulations also familiarizes traders and farmers with the products, and therefore it facilitates competition on the basis of brand names.

The main body responsible for implementing and monitoring this regulatory framework is the Kenya Bureau of Standards (KBS). The role of the KBS is two-fold: first, to test the quality of fertilizers imported into Kenya and, second to enforce bagging and the correct labeling of bags (which is undertaken by importers). The KBS has devised a standard for each type of fertilizer consumed in Kenya, based on specifications and standards applied in other user countries like the United States, Malaysia and India. In doing so, it uses the following quality parameters:

- Particle size for ease of application, as most of the fertilizer is hand applied.
- Moisture content
- Guaranteed nutrient content for the compound fertilizers.
- Limits on contamination with heavy metals like cadmium, selenium, mercury, and arsenic.
- Proper documentation
- Re-bagging into the right sizes
- Proper and correct labeling.

In general, trading specifications and standards are operating well in the fertilizer sub-sector, allowing fertilizer to be traded over long distances and hence, reducing the costs of transacting. Since Kenya's standards for fertilizer are set according to world market standards, Kenyan importers can specify what type and form of fertilizer they require in their international orders and be sure that is what they will receive without having to see the fertilizer first. Similarly, a wholesaler in Kitale can order fertilizer from an importer in Nairobi by telephone for a fertilizer consignment that is in a warehouse in Mombasa. Once they agree on the type of fertilizers, the number and size of bags of each type, and the price and transportation costs, the transaction can take place without the wholesaler having to see the fertilizer first, or the importer having to be physically present to make sure the correct number and types of bags are loaded and sent. The same scenario is played out numerous times at different levels of the market channels until the farm-gate.

The Kenyan government has made strides in establishing a legal and regulatory framework to facilitate the marketing and use of fertilizer. In assessing the performance of the sub-sector the study will seek to identify policy changes that may reduce transaction costs, minimizing risk, and reduce uncertainty in fertilizer marketing and distribution.

4.5. Summary

This chapter has described the evolution of the fertilizer sub-sector in Kenya, fertilizer consumption patterns, and presented the institutional environment that facilitates fertilizer marketing and distribution. The following chapter presents the conceptual framework and develops the research hypotheses that will guide this study.

CHAPTER FIVE
ORGANIZATION OF THE PRIVATE-SECTOR-LED FERTILIZER MARKETING SYSTEM

5.1. Introduction

This chapter combines elements of the functional and institutional approach to provide an overview of the private-sector-led fertilizer marketing system in Kenya. Section 5.2 describes the characteristics of the commodity and how these determine the type of marketing functions required to move a commodity from the producer to the consumer. Section 5.3 describes the marketing intermediaries and their characteristics. Section 5.4 delineates the supply chains that comprise the private-sector-led marketing system.[28] Section 5.5 concludes this chapter.

5.2. Characteristics of the Commodity and Marketing Functions

Certain characteristics of fertilizer determine the marketing functions and activities performed in the marketing system to move the commodity from the port to the farm-gate in Western Kenya. The fertilizer imported and consumed in Kenya is in granular form, which means it is easily divisible into small quantities such that any volume can be marketed. It is also bagged, which makes it easy to handle and transport without the use of special equipment. Second, fertilizer is not quickly perishable. Under proper conditions, fertilizers can be stored up to several years. These two characteristics allow traders to capture returns to temporal and spatial arbitrage risks. However, fertilizer can lose its potency through improper handling and storage. Since it is hygroscopic, its

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[28]A marketing system is comprised of numerous supply chains. Kohls and Uhl (1998) defined supply chains as "alternative routes of product flows from producers to consumers."

chemical composition can be affected by exposure to heat and humidity. Moreover, once exposed, it will 'cake' or harden into a product that is difficult or impossible to apply. Third, the quality of fertilizer cannot be determined by simple visual inspection. Fourth, since it is an input into a production process, the benefits of using fertilizer can only be garnered months after its application. This means that some type of financing (credit) is required to facilitate the distribution of fertilizer to the final consumer, the farmer.

These physical characteristics have influenced the type of marketing functions performed in the fertilizer marketing system in Kenya. The importation of fertilizer is location-specific, while its consumption is highly dispersed and located at a distance from the port. Therefore, an efficient transportation system is required to move fertilizer to farmers. In fact, transportation is the backbone of the fertilizer marketing channel. It is the single activity most responsible for making fertilizer available to farmers in the required quantities, at the right time. In the absence of a reliable and efficient transportation system, even the best possible marketing efforts will not bear any fruit. Secondly, fertilizer is a bulky commodity and its consumption is highly seasonal. Therefore, off-season storage is essential. Moreover, during peak periods such as harvest time, fertilizer competes with other goods for transportation services. This adds to the need for storage facilities between the port and the farm-gate.

The majority of fertilizer imported into Kenya is imported in bulk and bagged at the port. Bulk handling is applied when large volumes of a commodity are being handled. The main objective of bulk handling of fertilizers is to save packaging costs and to reduce labor costs in loading and unloading, which is an important cost item. It is particularly popular in international trade, where costs may be cut if exporting countries have high labor costs and are shipping a commodity in bulk for bagging in the importing country, which has lower labor costs. The bagging can be done either at the ship or in a special store at the harbor. In Kenya, the majority of fertilizer is bagged as it is being unloaded from the ship.

Since the value of bagged fertilizer cannot be ascertained through simple visual inspection (the fertilizer is sealed in bags by weight), this leaves room for opportunistic behavior whereby traders can unseal the bag, add impurities such as sand or dirt, and reseal the bags. This adulteration can go undetected before a sale, thus increasing the risk for the farmer of investing in fertilizer. This may form an entry barrier since established suppliers or larger companies who have invested in branding their fertilizer may have an advantage in a market in which they already have a presence. In Kenya this barrier has been reduced by a regulatory framework that classifies fertilizers by nutrient content, reducing the need for visual inspection and reducing uncertainty.

5.3. Marketing Intermediaries

Two types of marketing intermediaries were identified; traders and facilitating intermediaries. Traders were identified as importers, wholesalers or retailers on the basis of their main suppliers and their main customers. Importers were the principal commercial purchasers of fertilizer in the marketing system. They purchased the fertilizer from suppliers overseas and sold it primarily to wholesalers (they also sold the fertilizer to estates, cooperatives, parastatals. However, their sales to wholesalers are the primary interest to this study). Wholesalers purchased the fertilizer from importers and sold it mainly to retailers (they also sold fertilizer directly to large farmers and estates and cooperatives. Again, retailers are the main customers of interest for this study). Retailers purchased mainly from wholesalers and sold the fertilizer to large and small farmers. Each group of traders were further sub-divided into large and small sub-groups on the basis of their total volume of purchases over the trading season. In each group, the small traders were those whose total purchases were below the average for the whole population. The large traders were those whose total purchases were above the average for the entire population of traders.[29]

5.4. Facilitating Intermediaries

Facilitating organizations assist marketing intermediaries in carrying out their activities. They do not directly participate in the marketing process. Rather they provide the physical and institutional infrastructure for the movement and handling of commodities. Examples of institutional infrastructure are agencies that establish and enforce the 'rules of the game' (North, 1997) that must be followed by marketing intermediaries such as hours of trading, terms of sale, legalities, grades and standards. Many such organizations are public-sector entities that obtain their funding from general tax revenues not user fees. The previous chapter discussed the role played by government regulatory agencies (the Kenya Port Authority, the Kenya Bureau of Standards, and the

[29]Given the nature of the data, the most suitable cut-off point for distinguishing between large and small traders was not obvious. That is, the wholesaler and retailer population both consisted of clusters of a few large traders, a few medium size traders, and a relatively larger number of small size traders, and there were large difference in the number of bags purchased by each group, particularly between the number of bags purchased by the large traders, and the number purchased by the medium and small traders. Hence, for both wholesalers and retailers, using the median or the mode would have resulted in a group of large traders whose size (in terms of number of bags) varied greatly. Therefore, the mean was used since this central measure enabled the categorization of traders into groups of large and small which had less variation in the number of bags purchased per trader.

Ministry of Agriculture) in fertilizer marketing and distribution. Private sector firms that also facilitate fertilizer trading are agents and transporters.

5.4.1. Agents

Agents were absent in the fertilizer trading industry in Kenya, with the exception of clearing agents at the port of Mombasa. Since the service they perform is very specialized, using them minimizes the transaction costs for importers. Clearing agents cleared the fertilizer through customs at the port and in some cases they also transported it upcountry to importers in Nairobi, Kitale or wherever else they were located. In general, fertilizer traders did not use purchasing agents or brokers (to sell) either because the volume of the business did not justify it, they had family members who could act in that capacity, or because it was too risky.

5.4.2. Transporters

Road transportation dominated the distribution of fertilizer within Kenya in 1999. Road transporters distributed 72 percent of the grain fertilizer imported into Kenya, and 80 percent of the total amount of fertilizer imported into Kenya in this year. The remainder was transported by rail (Kenya Railways, 1999). Traders at every stage of the marketing system provided delivery of fertilizer as part of their customer service. However, the majority of this transportation was hired, as very few traders owned their own trucks.

5.5. Specification of Fertilizer Supply Chains

The private-sector-led fertilizer marketing system is comprised of a multiplicity of supply chains of varying lengths and breadth. Figure 8 provides a graphical illustration of the multiplicity and diversity of supply chains via which fertilizer reached farmers in 1999.

Each supply chain was identified by linking the purchasing activities that took place between traders. For example, in the case of a small-scale importer who sold fertilizer to a small-scale wholesaler who sold it to a farmer, these two transactions comprise one supply chain.[30]

Therefore, to delineate the number of supply chains by which fertilizer reached the farm-gate, the following information was used: buying and selling price for each consignment; the type and size of the seller and buyer of the consignment; the location of the seller and buyer; and the transport costs for the consignment for each transaction. Using this information, the route taken by each consignment was mapped out. The consignments that followed the same route to the farm-gate were grouped together to delineate the respective supply chains. In this way, the supply chains that existed in the fertilizer industry in 1999 were identified.

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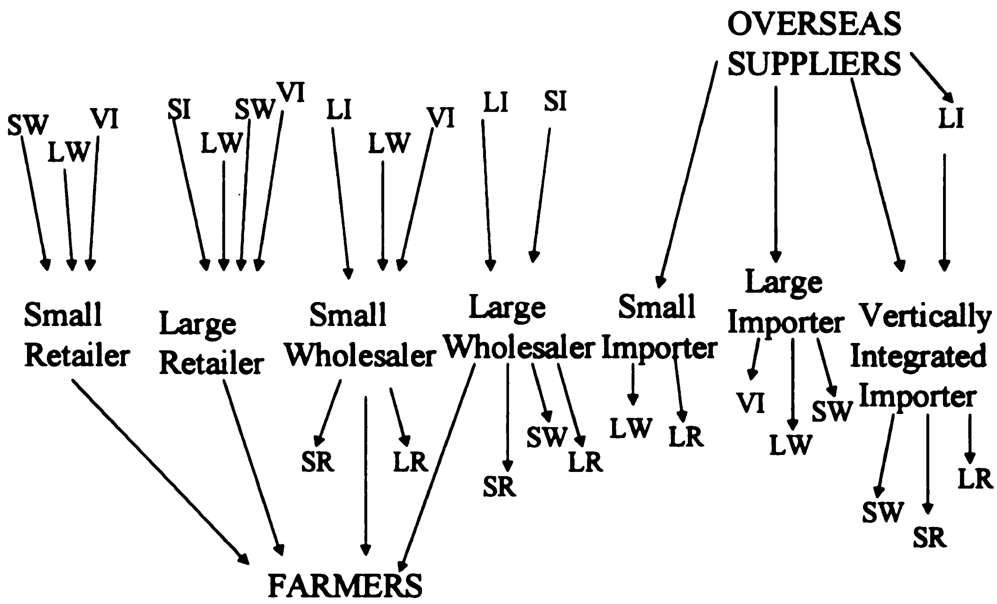
[30]Due to unavailability of records, the supply chains are based on the purchasing behavior only. It was not possible to follow the same consignment of fertilizer from the port to the farm-gate. It was possible to find out from whom a trader purchased fertilizer, and who purchased fertilizer from each respective trader.

Figure 8. Multiplicity of Fertilizer Supply Chains



Source: Compiled by author

Key:
LI = Large Importer
SI = Small Importer
VI = Vertically integrated Importer
LW = Large Wholesaler
SW = Small Wholesaler
LR = Large Retailer
SR = Small Retailer

A distinctive feature of the fertilizer marketing industry in 1999 was that all of the wholesalers in the population were wholesaler-retailers, performing the dual function of retailing directly to farmers in addition to selling to retailers. Wholesalers sold to farmers at the wholesale price if farmers bought a certain number of bags. This broadened the appeal of their outlets and widened their market share. However, wholesale behavior may have eroded profit margins at the retail level since, to remain competitive, retailers were forced to offer farmers a lower retail price than would otherwise be the case. Consequently, a significant number of large retailers purchased their fertilizer directly from small importers in 1999, by-passing wholesalers completely. This increased the number of supply chains and may have increased competition between wholesalers and large retailers. In summary, two supply chains were identified that had large wholesalers as the penultimate stage; four had small wholesalers; eight had large retailers; and four chains had small retailers as the penultimate stage. Although importers and wholesalers also sold fertilizer directly to farmers, farmers received the majority of their fertilizer from retailers. Therefore, the remainder of the analysis focuses on supply chains that have retailers as the penultimate stage before the farm-gate. These supply chains will be described and discussed in more detail in Chapter Nine.

5.6. Summary

This chapter has provided an overview of the private-sector-led fertilizer marketing system in Kenya. The private-sector-led fertilizer marketing system in 1999 was comprised of a multiplicity of supply chains of varying lengths and breadth, and type; they varied from vertically integrated supply chains to supply chains that were characterized by spot market transactions. These supply chains were formed by marketing and facilitating intermediaries who performed a variety of marketing functions and used these institutional arrangements to coordinate their activities. The remainder of the dissertation focuses on describing the private-sector-led marketing system and evaluating its performance. The industrial organization paradigm, supplemented by the sub-sector approach is used to describe the structure and conduct of the market at each stage of the marketing system and performance in each market is evaluated using static efficiency and dynamic performance measures. Overall performance of the supply chains that comprised the marketing system is evaluated in Chapter Nine using sensitivity analysis to examine the impact of increased marketing efficiency on the profitability of fertilizer use for maize.

CHAPTER SIX
THE STRUCTURE, CONDUCT AND PERFORMANCE OF THE IMPORTER MARKET

6.1. Introduction

Since approximately 97 percent of the fertilizer consumed in Kenya in 1999 was imported, importers played a critical role as the initial suppliers of fertilizer into the marketing system.[31] In 1999, the activities of importers' in the population included: a) determining the quantity of fertilizer to import for the coming season by taking into account how much other importers would be importing, weather conditions and maize prices; b) sourcing fertilizer from overseas and placing and processing orders; c) establishing credit arrangements with suppliers and local banks; d) soliciting and processing orders from customers; e) credit extension to clients; f) risk bearing, primarily due to the uncertainty of demand, exchange rate fluctuations, and changes in world market conditions; g) storage of fertilizer; and h) sorting, allocation, and assorting the various types of fertilizers;[32] i) bagging and labeling the fertilizer with their own brand name and other relevant information; and j) arranging delivery to customers.

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[31]A small quantity of sulphur-based fertilizers like Single Super Phosphate(SSP) and Triple-Super Phosphate (TSP) are produced by the only domestic fertilizer manufacturer in Kenya, Kel Chemicals, primarily for the sugar industry.

[32]Sorting out involves breaking down a heterogenous supply into separate lots that are relatively homogenous, using a grading system. Allocation refers to the breaking down of supplies into smaller lots. Assorting involves the building up of an assortment of associated products in accordance with consumer preferences, for sale to consumers. Generally speaking, importers carry out the sorting function, wholesalers build assortments of goods for retailers, and retailers build up assortments for consumers (Sterns, 1996).

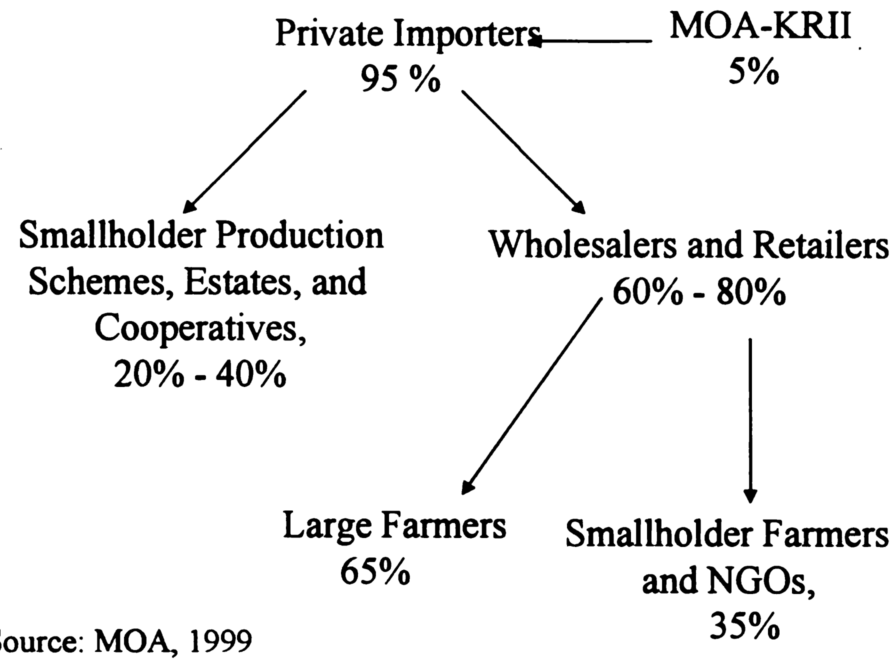
This chapter applies the industrial organization approach to examine the market structure, conduct and performance of the fertilizer import market in 1999. This analytical framework is complemented by the subsector analytical approach which focuses on vertical linkages and vertical coordination (see Chapter Two). In addition, each section includes a discussion of the theoretical concepts that guide the analysis in the import market in this chapter, the wholesale market in Chapter Seven, and the retail market in Chapter Eight. Section 6.2 describes importer market structure. This section also includes a discussion of the theory of spatial markets and how it will be used to define market spheres and measure market concentration. Section 6.3 discusses importer conduct and defines price discovery. Performance of the importer market is evaluated in Section 6.4 . This section also provides a discussion of the measures of profitability and describes the measures that will be used to estimate returns to trade at each level of the marketing system. Section 6.5 concludes the chapter.

6.2. Structure of the Import Market

The fertilizer imported into Kenya in 1999 was sourced from the U.S., Europe, the Middle East, and South Africa. Depending on the source, a shipment took 7-14 days from the port of exit (from the Republic of South Africa) to 3-4 weeks (from the USA), barring any occurrences such as a breakdown on the high seas. Once the fertilizer arrived, port taxes were paid by the importers, and the fertilizer was cleared for distribution. Importers sorted it out into separate, homogenous, large stocks for distribution to their customers which included wholesalers, estates, cooperatives, parastatals and non-governmental organizations. Figure 9 presents a diagrammatic representation of fertilizer distribution by importers. It can be seen from the diagram that in 1999 importers distributed approximately sixty to eighty percent of their total fertilizer imports via the private-sector-led marketing system, which consisted of wholesalers and retailers as well as large and small farmers. The remaining fertilizer was distributed mainly via private treaty agreements directly to its other customers.[33]

[33]Importers also purchased donor fertilizer from the Ministry of Agriculture and sold it to its various customers. Information on the breakdown of this donor fertilizer among the importers was not available. However, according to an MOA official, the donor fertilizer was sold using an open tendering system and there were no restrictions on who purchased it as long as the buyer could show they had legitimate distribution outlets. The MOA also took care to place limits on the total quantity that could be purchased by any single buyer. However, some importers and wholesalers claimed that the process by which the MOA distributed donor fertilizer was corrupted by political favoratism whereby ministers bought it cheaply and resold it to private importers at a profit, and some importers were favored over others due to their political connections. The research team attempted to investigate these claims by interviewing one of the importers who was identified as being involved in this scheme. However, this firm refused to participate in the survey. Therefore, none of these claims could be verified.

Figure 9. Diagrammatic Representation of the Fertilizer Trade



Source: MOA, 1999

This chapter considers the following elements of importer market structure: number and size of participants, location, and activities; market concentration; and entry conditions.

6.2.1. Number and Size of Participants, Location and Activities

In 1999, there were 46 importers registered with the Ministry of Agriculture (MOA). However, only 22 imported more than 1,000 tons of fertilizer per year, and of these, only 10 imported over 10,000 tons in 1999. These latter 10 are generally regarded as "serious" importers by the MOA, since they can be relied upon to import and/or distribute fertilizer every year. The rest tend to enter the market on a speculative basis to take advantage of projected high demand for a particular year. Seven of the 10 'serious' importers were interviewed for this study. Four of them had their headquarters in Nairobi, one in Ruiru, one in Nakuru, and one in Kitale. Five of the seven importers were Kenyan-owned companies at the time of the interviews, and two were subsidiaries of international fertilizer manufacturers.[34] Only one of the seven importers entered the sub-sector after 1993; the rest had been involved in fertilizer trading for at least 10 years. All the importers interviewed were diversified into agriculturally related businesses such as agricultural inputs and chemicals, grain trading, and hardware, with the exception of Norsk Hydro, for which fertilizer importing and distributing was its only activity in 1999.

Importers stored fertilizer at the port of Mombasa and in their own warehouses in preparation for distribution. One reason for port storage was so that the fertilizer could be unloaded from the ships even though importers may not yet have paid customs duties. This enabled importers to avoid the high demurrage charges by shipping companies. A second reason was the sheer quantity of fertilizer purchased compared to inland transport available, particularly during peak periods, when fertilizer competed with other crops, which made direct unloading onto truck or rail for transport upcountry impossible. Under ideal conditions, 1,000 tons of fertilizer could be unloaded per day in 1999, whereas the typical size of truck used by importers was 32 tons. A third reason for port storage was that storing in Mombasa gave the importers more flexibility regarding where to send the fertilizer subsequently. Importers reported that storing their fertilizer in Mombasa gave them the

[34]One of these importers is Norsk Hydro, the largest fertilizer manufacturer in the world. It has been selling fertilizer in Kenya under a USAID donor grant since the 1960's, and its fertilizer, DAP, dominates the grain market in Kenya today. The MOA estimates that on average, Norsk Hydro imports and distributes 70 percent of the DAP fertilizer consumed in Kenya.

option of transporting it directly to their customers upcountry instead of bringing it to Nairobi first and incurring unnecessary costs. An additional reason could be that the cost of using storage at the port of Mombasa was cheaper than owning or renting more facilities in Nairobi and upcountry.

All of the seven importers interviewed for this study said that on average they imported a minimum of 5,000 tons (100,000 bags) per consignment of different types of fertilizer at one time.[35] Less than this amount would be uneconomical because the F.O.B. price and freight rates increase with smaller tonnages and the resultant costs will not allow the importers to make a positive return. Six of the seven importers said that in a typical year they imported three to four consignments of at least 5,000 tons each. Therefore, total quantities per importer ranged from 15,000 tons to 20,000 tons. In contrast, one importer typically imported at least two consignments of 25,000 tons (one million bags) each per year. Therefore, this importer was categorized as large and the remaining six importers were categorized as small. Three of the six small importers were vertically integrated in 1999, having absorbed the importing, wholesaling and retailing functions under the ownership of one firm. The final population of importers consisted of three types of importers: one large importer; three small non-vertically integrated importers; and three small vertically integrated importers. In summary, the domestic supply of fertilizer in 1999 was characterized by a small number of importers with one dominant market leader. All firms purchased large quantities and broke them down into smaller units to sell to large

[35]A consignment is a shipment of fertilizer from a supplier (consigner) to a buyer (consignee). The size of a consignment varies depending largely on who the consignee is; it can range from one bag for a small retailer to up to one million bags if the consignee is a large importer.

customers such as wholesalers, estates and cooperatives, as well as smaller customers such as retailers and farmers. These activities were labor-intensive and time-consuming, since the fertilizer industry as a whole is not mechanized; apart from the bagging machines in 1999, the handling of fertilizer in Kenya is done by manual labor.

The remainder of Section 6.2 describes the structural characteristics of the import market. This will be preceded by a discussion in Section 6.2.2. of the concept of market concentration and the theory of spatial markets and its application to delineate market spheres in each market.

6.2.2. Market Concentration in the Private-Sector-Led Fertilizer Marketing System: Some Comments

Market concentration refers to the percentage of sales (or purchases) held by a given set of firms in that industry. The most common variable used to measure market concentration is the concentration ratio. Concentration ratios are conventionally expressed in terms of the market share held by the largest one, two, four and eight firms (abbreviated as CR_1, CR_2, CR_4, CR_8). A high concentration ratio may signal an underlying oligopolistic market structure, where a relatively few traders are able to influence prices by colluding to manipulate supply. Alternatively, low concentration ratios may reflect easy entry and hence a more competitive structure. Bain (1968) maintains that the critical level at which market concentration levels are positively correlated with economic profits occurs for a CR_4 of 40 percent.

Alternatively, one can use a function of all the individual firms' market shares to measure concentration. The most commonly used function is the Herfindahl Index (HI) which aggregates information about the relative sizes of firms into a single measure. It equals the sum of the squared market shares of each firm in the industry. Researchers can use the index to evaluate the impact of market structure on performance by relating variations in HI with some measure of performance, such as price. This study will calculate the level of market concentration at each level of the marketing system using both the concentration ratio and a variation on the Herfindahl index, the Herfindahl-Hirshman Index (HI). Market structure is measured by buyer concentration because the survey was unable to obtain sales data from fertilizer traders in 1999. Secondly, the number of firms operating at each level of the marketing system was relatively small, so buyer concentration was measured using the CR_2 and CR_4.

6.2.2.1. Spatial Equilibrium Models and the Delineation of Market Spheres

Market spheres or 'marketsheds" are defined spatially from a central or reference market with respect to changes in prices.[36] For a measure of concentration to be meaningful, the market sphere must comprise the relevant economic markets. The relevant economic market for traders in an industry is defined as all the traders whose presence significantly influenced the price for the fertilizer (Steffen, 1995). Let there be two market centers, market center A and market center B. If buyers have the option of buying from the two market centers, the boundary between the market centers is determined by the price in each market center plus the cost of transferring the good from the market center to the buyer. Where natural barriers (mountains, rivers) and artificial barriers (political boundaries,

[36]The following discussion is drawn from Tomek and Robinson, 1981 pp. 150 - 164. It is based on the work on optimal land-use models by Von Thunen (1966).

dams) do not exist, prices plus transfer costs paid by buyers increase as the distance from each market increases. Given a free choice, buyers will always purchase from the market center offering the lowest total cost (purchasing costs plus transfer costs). But some buyers may be located at points where the total cost is the same whether they buy from one market center or another. Then these buyers are indifferent between market center A and market center B and the boundary between the market centers is delineated by drawing concentric circles around each market and connecting the points at which buying prices plus transfer costs facing buyers are the same whether they buy from market center A or market center B.[37] This statement can be formalized algebraically. Let P_A = price at Market Center A, P_B = price at Market Center B, T_A = transfer cost from the supplier in Market Center A to the buyer, and T_B = transfer cost from the supplier in Market Center B to the buyer. Then the boundary between the market centers is defined as the locus of points where: $P_A + T_A = P_B + T_B$.

Accordingly, Market Center A's market sphere is comprised of any buyer for whom $P_A + T_A \leq P_B + T_B$. That is, if the price plus transfer costs from Market Center A are equal to or less than the price plus transfer costs from Market Center B, there are no opportunities for spatial price arbitrage and the market centers are in equilibrium. Equivalently, if the price difference between Market Center A and Market Center B is equal to or less than the transfer costs between the two market centers, ($P_A - P_B \leq T_{A\,+} + T_B$) buyers in Market Center A will have no incentive to purchase from Market Center B. Therefore, Market

[37]The circles will be concentric only if the transport costs are uniform throughout the area surrounding the markets. To the extent that roads and rivers, for example, make travel cheaper along some routes than others, the "circles" will be bent into other shapes.

Center A and Market Center B have separate market spheres and do not compete for the same buyers except along the boundary line where buyers are indifferent between the two market centers.

However, if the price difference between the two market centers is greater than the transfer costs, then opportunities exist for spatial price arbitrage whereby buyers in the higher-priced market sphere will have an incentive to travel to the lower-priced market to purchase the fertilizer. In this case, suppliers in the two market centers are competing for the same buyers and therefore, they are in the same market sphere. This price arbitrage will continue until the price difference is equal to transport costs. If the opportunity for price arbitrage continues at least in the short-run, this is indicative of other barriers to trade between the market centers such as lack of or poor information transmission which raise transaction costs and eliminate the incentive for buyers to take advantage of the opportunity for price arbitrage.

This study used the theory of spatial markets as described above to delineate the market spheres that existed at each stage of the private-sector-led marketing system in 1999 and draw some conclusions regarding buyer concentration. First, the study uses DAP prices because DAP is the most popular fertilizer consumed by smallholders in Kenya and also comprised the bulk of fertilizers purchased by the population of traders. Second, the delineation of market spheres was based on the assumption that in deciding where to purchase their fertilizer, traders and farmers chose the market which had the lowest total cost. However, this assumption was qualified by the empirical reality. That is, the survey results revealed that some traders and farmers preferred to travel to a market center that was further away and maybe even had a higher buying price because they had established a relationship with a particular supplier, or simply due to lack of information. Some traders and farmers also chose a particular supplier so that they could do one-stop shopping, that is, purchase other items in addition to fertilizer which they may not have been able to do at the closer market. These factors were taken into consideration in the delineation of the market spheres. Third, the analysis assumed that large traders and small traders at the same level of the marketing system and located in the same towns and locations competed with each other. That is, a large farmer who wanted to purchase 100 bags of fertilizer could purchase them from one large retailer or purchase 30 to 40 bags each from three small retailers in the same market sphere. Having summarized the analytical framework used to delineate the market spheres in this study, Section 6.2.3. will examine market concentration in the importer market.

6.2.3. Market Spheres and Market Concentration in the Importer Market

The study used price data to define importer market spheres for the population of importers. Since data on importer selling prices was not available from importers themselves, buying prices for wholesalers and retailers who purchased fertilizer from importers in 1999 were used instead. These data were available for three of the five importers in the population: one large importer in Nairobi; one small non-vertically integrated importer in Nairobi, and one a small vertically integrated importer in Kitale. The weighted average buying price for DAP for wholesalers and retailer who purchased fertilizer from importers in Nairobi was Kshs 1309/bag, which was not substantially higher than the weighted average buying price in Kitale for DAP of Kshs 1324/bag (a difference of Kshs 15/bag). The transport cost per bag between Nairobi and Kitale was Kshs 70. Therefore, for both DAP and urea, the price difference between the Kitale and Nairobi markets was less than the transport cost. This result indicates that there was no opportunity for price arbitrage between the Nairobi and Kitale market.

Nevertheless, the survey results show that some wholesalers and retailers in Eldoret and Kitale purchased fertilizer from importers in Nairobi, instead of from the vertically integrated importer in Kitale, and that they did so on a consistent basis throughout the year. Therefore, it is unlikely that this procurement behavior was driven mainly by seasonal price variations which are being masked by the weighted average price. A more likely explanation is that importers in Nairobi had been successful in creating incentives for price arbitrage where none existed in order to expand their market sphere such as supplier credit or free delivery which were not captured fully in their prices. Therefore, the study concludes that the population of importers in Nairobi and Kitale were in the same market sphere.

Data from the Ministry of Agriculture for the population of importers was used to calculate concentration ratios for the importer market. Importers typically imported at least three to four consignments of a minimum 5,000 tons each per trading season. Given that the Kenyan market was approximately 300,000 tons, in theory approximately 15 to 20 importers could have operated in the Kenyan market. However, only 10 importers had consistently imported fertilizer since the market reforms were completed in 1993. The largest typically imported 50,000 tons over the trading season. The rest imported between 10,000 and 20,000 tons each per trading season. If the market was equally distributed among these 10 importers, four importers would only account for 40 percent of the market.

According to the MOA in 1989, four firms imported 73 percent of the fertilizer brought into Kenya. In 1999, buyer concentration at the importer level was 60 percent, which is indicative of a concentrated market (see Table 5). However, this figure may underrepresent the level of concentration at the importer level of the private-sector-led marketing system for two reasons. First, it includes the fertilizer which was imported directly by private estates, smallholder production schemes and cooperatives. Therefore, whereas the four largest importers in 1999 accounted for 60 percent of imports, and the largest importer (which was a private firm which distributed its fertilizer via the private-sector-led marketing system) may have accounted for 34 percent of the fertilizer imported into Kenya in 1999, it is likely that this same importer accounted for a much higher percentage of the fertilizer distributed via the private-sector-led marketing system. For example, out of the three importers who provided data for the 1999 trading season, reported quantities were as follows (approximately): the large importer imported 50,000 tons; the small vertically integrated importer imported 15,000 tons; and the small non-vertically integrated importer 13,000 tons.[38] Second, individual importers specialized in certain types of fertilizer and dominated that particular market. For example, the largest importer dominated the DAP market, and another importer only imported top-dressing fertilizers like urea and CAN. On the basis of this discussion, the study concludes that the importer market was concentrated (CR_4 = 60 percent) and furthermore, the importer level of the private-sector-led marketing system was also concentrated.

[38]According to MOA data, the total quantity of fertilizer imported in 1999 was 330,099 tons.

Table 5. Buyer Concentration Ratios for the Population of Fertilizer Importers, Kenya, 1989 to 1999 [1]

	1989	1994	1999
No. of registered importers	32	37	44
Total tons imported	304,127	366,932	330,009
% of total fertilizer imported by the largest four importers (CR_4)	73	56	60
% of total fertilizer imported by the largest importer (CR_1)	36	17	34

[1] The identities of the importers have been concealed at their request.

However, Baumol et al.(1980) argued in their theory of contestable markets that potential rather than actual competition is what counts. In other words, market concentration is not a problem as long as entry and exit barriers are absent. Potential competitors can then enter the market as soon as 'monopoly' profits are observed, and existing competitors can leave whenever profits came under pressure. Accordingly, the next section examines entry conditions in the importer market.

6.2.4. Entry Conditions into the Importer Market

The number and size of participants in a market depends on entry and exit conditions. This section examines entry conditions in the import market. In 1999, entry into the import market (and in the wholesale and retail markets) was unrestricted in the legal sense. The main requirement was that fertilizer traders possess a valid operating licence in order to engage in business during the fiscal year. In the case of importers, it was also necessary to be registered with the Ministry of Agriculture.

6.2.4.1. Economies of Scale

One explanation for market concentration in the fertilizer industry is the presence of scale economies, whereby the level of output (purchases) at which average total costs reach their minimum is large relative to the size of the market. As a result, only a small number of firms can operate profitably in the industry. Generally speaking, in addition to the cost of fertilizer, costs that could be directly attributed to fertilizer trading included operating costs and transaction costs. The sources of transaction costs in the import market will be discussed in Section 6.3.4. Operating costs included costs of transport, storage, handling, bagging, and administration, and transit losses.[39] The cost structure for the large importer and small vertically integrated importer are presented in Table 6 below. These are costs per bag estimated by using the average number of bags purchased by each importer in 1999.

[39]See Appendix 6.2 for an explanation of the calculation of the costs.

Table 6. Cost Structure for DAP Fertilizer for the Large Importer and the Vertically Integrated Importer, Fertilizer Trader Survey, Kenya 1999

Cost Item (Ksh/50kg bag)	Large Importer	Vertically Integrated Importer
Total Purchases (all types of fertilizer)	1 million	300,000
Buying Price (DAP C.I.F. Mombasa)	742	1,050
Port Charges	80	95
Bagging Costs	38	38
Handling costs	20	10
Transportation Costs	148	175
Storage costs	36	49
Transit Losses	13	16
Administration	20	15
Bank Letter of Credit Charges	22	32
Total Marketing Costs	377	430
Total Costs	**1119**	**1480**

Source: 1999 Fertilizer Trader Survey data

Table 6 shows that there were scale economies in fertilizer importing; total costs for the vertically integrated importer were 32 percent higher than those for the largest importer. However, these scale economies emanated mainly from purchasing costs, not marketing costs. While marketing costs of the large importer were 14 percent lower than those of the vertically integrated importer, purchasing costs of the large importer were 42 percent lower than those of the vertically integrated importer. There are considerable scale economies in purchasing because F.O.B. prices and freight rates increase with smaller tonnages.

With regard to the other sources of scale economies, the large importer had lower costs per bag for port charges, storage costs, transit losses, and the bank letter of credit. The cost differences ranged from 19 percent for port charges to 45 percent for the bank letter of credit.

In addition, transport costs per bag for the vertically integrated firm were substantially higher than those incurred by the large importer. However, this was not due to scale economies. Rather, this was because the vertically integrated firm was trying to gain market share by improving timeliness of delivery and investing in a wide distribution network to increase sales. To this end, it had its headquarters in Kitale and had higher transport costs because it transported its fertilizer directly from Mombasa to Kitale (a distance of 900 km) whereas the large importer transported its fertilizer from Mombasa to Nairobi which is a shorter distance (a distance of 530 km).

Costs per bag were higher for the large importer than for the vertically integrated importer for bagging costs, handling costs and administration. Bagging costs were standard per unit costs, that did not vary with scale. Handling costs for the large importer are double those for the vertically integrated firm because the bags of the large importer were handled twice, once in Mombasa and once in Nairobi. Third, the large importer had higher per bag administration costs than the smaller vertically integrated importer because they had more salaried staff on their payroll. These cost differences ranged from 33 percent higher for administration costs per bag to 100 percent higher for handling costs per bag.

6.2.4.2. Product Differentiation: Branding

Firms develop a variety of marketing strategies in an effort to differentiate their product and themselves from their competitors and gain customers. This implies that competing on the basis of price and using price to attract customers is not sufficient; firms also have to engage in non-price competition. One type of product differentiation employed in the fertilizer industry in 1999 was branding.[40] It was being undertaken exclusively at the importer level in an aggressive manner. All of the importers in the population used this form of product differentiation, typically using the name of their company as their brand name. The trend was catalyzed by the success of the largest fertilizer importer in Kenya which successfully used its brand name "Chapa Meli" to build up a brand loyalty, with the result that in 1999 it accounted for 70 percent of the DAP market in Kenya (MOA, 1999).

Despite the evidence that importers had successfully used branding to differentiate their product, advertising had not been embarked upon in a major way in Kenya in 1999. Only two importers in the population advertised their brands, and this was limited to billboards at town and city entrances. Fertilizer traders did not advertise in newspapers, on the radio, on television, or even via pamphlets. According to importers, this dearth of advertising was because farmers viewed fertilizer as a homogeneous good, that is, DAP fertilizer is still DAP fertilizer whether it is from 'Chapa Meli' or another importer.[41] Therefore, importers argued that if only one or a sub-group of importers advertised their DAP fertilizer by brand, all importers would benefit from the increased sales; in other words, there is the potential for free-riding by those who did not spend money on advertising their brands.[42]

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[40]No advertising or branding took place at the wholesale or retail level.

[41]This is literally true since sometimes fertilizer 'importers' don't actually import. Instead, they purchase DAP from the largest importer, rebag it in their own branded bags, and sell it to wholesalers at importer prices.

[42]This rationale was provided by importers themselves during a discussion session at the Fertilizer Seminar held in Nairobi in February, 2000, which was organized by the research team and funded by Michigan State University and the Tegemeo Institute of Agricultural Policy and Development.

However, the importers' argument is contradicted by traders' reports that farmers were aware of the various brand names. Farmers asked for a type of fertilizer by its brand name (the most popular brands in 1999 were "Chapa Meli" and "Mea Ltd"), and if the trader did not have it in stock, farmers would shop around for it first and only if they were unsuccessful would they purchase a different brand. Therefore, a more likely explanation for lack of advertising by fertilizer importers in Kenya is that due to the small market size, branding is a sufficient means of reaching consumers and the potential increase in sales revenue from advertising would be smaller than the associated cost. In contrast, larger markets with more variety of needs among their customers and therefore a larger number of market niches, have to advertise to win over customers. The prevalence of branding at the importer level, and the popularity of certain brands over others implies that branding posed a barrier to entry in 1999. Therefore, potential entrants would have to be willing to incur the additional start-up costs of investing in an aggressive marketing campaign in order to gain product recognition among consumers and attract them away from the more stable and proven brands in the industry. As a result, they would have to enter the market at a higher unit cost than incumbents.

6.2.4.3. Stiff Capital Requirements and the Complicated Importing Process

Fertilizer importing is a capital-intensive venture. First, suppliers often have minimum quantity requirements that impose stiff capital requirements on importers. For example, U.S. DAP can only be ordered in 25,000 ton shipments, which required Kshs

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Michigan State University and the Tegemeo Institute of Agricultural Policy and Development.

15,925,000 million to purchase in 1999 (F.O.B.), equivalent to US$227,500. Few Kenyans can raise this kind of money at one time, and stiff collateral requirements and high interest rates make borrowing from financial institutions impossible for many. Therefore, importers have to use a letter of credit, which typically has a grace period of 90 to 180 days. However, it is impossible to ship and sell such a large quantity in Kenya in this time frame, so domestic interest rates, 25 percent to 30 percent in 1999, become a factor.[43]

To obtain the credit facility, the importer has to have a solid business record and reputation, and collateral to provide the local bank with some assurance the importer would be able to pay the letter of credit when it matures. To meet these requirements importers have to adopt standard business practices such as accounting and forward planning and establish distribution outlets by which to unload the fertilizer and receive payment within the grace period afforded by the letter of credit. Importers also have to have international fertilizer trading experience and constant access to information about domestic and world market conditions. It follows that education is also a barrier to entry at the importer level since a minimum level of literacy is required before a trader can deal effectively in markets where contracts are written and, in the case of international markets, strictly enforced by a court system. Therefore, these requirements - sufficient collateral, a

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[43]According to Arwings-Kodhek (1997) upcoming expiry dates for letters of credit have been responsible for sudden unexplained falls in the domestic price of particular fertilizers as importers rush to avoid paying high interest charges on bank overdrafts. Importers said they typically get suppliers' credit at about six to eight percent interest per annum arranged offshore. Those without the ability and contacts to obtain credit at equivalent interest rates and a distribution network to dispose of the fertilizer quickly were better off buying fertilizer from the large importer (a not infrequent occurrence) so the 90 - 180 day limit becomes less of a concern.

solid financial and business record in order to obtain a letter of credit, business and accounting skills, international trading experience, access to information about domestic and world market conditions, and reliable distribution outlets for their fertilize once it arrives - pose barriers to entry at the importer level.

In summary, the results indicate that there was market concentration in the importer market in 1999. This concentration may have had a dampening effect on competitiveness since barriers to entry existed in the form of economies of scale, product differentiation, and the complicated and demanding nature of the importing process.

6.3. Conduct

This section looks at the following elements of coordination to describe market conduct: sources of information and the process of price discovery; evidence of non-price competitive behavior; financing arrangements for fertilizer transactions; modes of importing; and conflict and cooperation between traders.

6.3.1. Price Discovery and Sources of Information

Price discovery is the process by which buyers and sellers attempt to arrive at the final sale price during a transaction, consistent with supply and demand conditions.[44] The outcome of this process depends on access to reliable market information. In general,

[44] Essentially they are trying to find out at what price and quantity the market is at an equilibrium. Therefore, price discovery is different from price determination, which describes a theoretical equilibrium point at which supply is equal to demand. It is in traders' best interest to try to approximate the equilibrium price in their transactions if demand is elastic because if they transact at a price that is lower that the equilibrium price, then demand will exceed supply, creating a shortage in the market, and traders will lose money. Conversely, if trade takes place at a price that is above the equilibrium point, the market will be in disequilibrium as supply will exceed demand, and traders will lose sales. However, if demand is inelastic a particular trader who manages to sell her/his entire inventory at the non-equilibrium ("too high") price will be better off.

traders reported that they obtained market information by word of mouth either from their own suppliers or other traders. None of the traders cited transporters as their source of information, although it is likely that they played a role. Moreover, none of the traders reported that they paid someone (other than hired staff) for the express purpose of reporting market price information to them. Therefore, in 1999 fertilizer traders obtained their market information informally. The following section focuses on price discovery and sources of market information in the importer market. Chapter Seven will provide this information for the wholesale market and Chapter Eight will provide it for the retail market.

6.3.1.1. Price Discovery and Sources of Information in the Importer Market

In general, fertilizer importers were price takers[45] in the buying market (i.e., when they purchased fertilizer from the world market). The overseas suppliers quoted the price and the importers either accepted it or rejected it in favor of another price. With regard to setting the selling price, all of the importers used mark-up pricing.[46] The head

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[45]Price-takers are "quantity adjusters" because they can only decide to adjust output (in this case, purchases) to a given price. They cannot influence the price by adjusting how much they decide to release onto the market (or as in this case, purchase from the market).

[46]Mark-up pricing means that these traders had some leeway to set selling prices to cover costs and make a normal profit (that is, zero economic profit). This behavior is in keeping with what economists would expect; that firms will try to take their costs and desirable margins into account and set their prices accordingly within the constraints set by market conditions. Depending on competitive conditions, eventually traders will be constrained by market forces to take the prevailing market price as the determining factor. Alternatively, traders may be able to exert their market power to set prices closer to monopolistic competition than perfect competition and obtain above normal returns.

office of the vertically integrated firm also set the wholesale and retail prices and distributed the price list.

6.3.2. Non-Price Competitive Behavior

6.3.2.1. Monopoly Rents

Provided a firm faces the entire market demand curve and it is successful in mitigating the threat of entry, it may be able to gain monopoly rents in a market. The price of DAP fertilizer reached unprecedented heights during the 1999 trading season and the vertically integrated firm was able to capture monopoly rents. The reason was a series of events which resulted in fewer importers operating in the market and less DAP fertilizer being imported than was anticipated in 1999. The situation was as follows: of the 10 importers that normally import fertilizer into Kenya each year, five generally do not import DAP fertilizer, preferring to import top-dressing fertilizers like CAN and urea since the DAP market has already been cornered by the large importer. The sixth firm had made a loss on fertilizer importing in the previous year and as a result decided not to import in 1999. Furthermore, it was considering withdrawing from the industry altogether. The seventh importer did not import fertilizer in 1999; instead it purchased fertilizer from the largest importer and rebagged and sold it under its own brand name. The seventh and eighth import firms were normally the main rivals for the DAP market. However, they were unable to import any fertilizer in 1999 because their local bank was under receivership.

Consequently, only two firms imported DAP fertilizer in 1999; the large importer and the vertically integrated importer. Initially, they ordered their quantities in

October/November 1998, taking into account information from the Ministry of Agriculture about how much DAP fertilizer their two rivals were planning to import. At this time, these other two rival firms had reported the quantities they were planning to import to the Ministry as they were not yet aware that their local bank was having problems.

Once it became known that the other two rival firms were not going to be importing fertilizer, two things happened. One, the vertically integrated firm bought as much DAP fertilizer as it could from the large importer. Since the vertically integrated firm was located upcountry in the maize belt, whereas the largest importer had its headquarters in Nairobi, it is likely that the vertically integrated importer became aware that there was a shortage much sooner than the large importer and this information guided its decision to buy. Secondly, once the large importer became aware of the situation (at the beginning of March) it immediately reordered more DAP fertilizer but had to wait for at least one month to receive it from the US Gulf. As a result, the vertically integrated importer was the only fertilizer firm with DAP fertilizer in Western Kenya for a period of approximately 10 days during the peak planting period in 1999 (March/April). At the prevailing market price, demand exceeded supply, which enabled this importer to increase its selling price to unprecedented levels; in April 1999 the retail price of DAP reached Kshs 2000 per 50 kg bag. In comparison, the average retail price of DAP fertilizer during the same period in 1998 was between Kshs 1400 and Kshs 1500.

This hypothesis of structural change in the fertilizer marketing system in 1999 is supported by the data. The mean selling price of DAP fertilizer at the retail level during the period of the shortage or the non-competitive period was Kshs 1570 compared to the mean selling price of Kshs 1372 that prevailed during the competitive period. The selling price during the noncompetitive period was higher than the selling price during the competitive period; a statistically significant difference at the one percent level of significance.

6.3.2.2. Collusion

During informal interviews, retailers claimed that price cartels at the importer and wholesale level were squeezing retailer margins, that is, these traders colluded to set selling prices. Importers and wholesalers denied this claim, stating that price competition undermined any attempt to fix prices by collusion because someone was bound to "cheat" by offering a lower price. Secondly, they claimed that information circulates so rapidly that the selling price is already known.

However, the conditions existed for importers to engage in tacit or overt collusion in 1999. All of the 10 serious importers knew each other since the Kenyan fertilizer market is relatively small (approximately 300,000 metric tons) and eight of the ten main importers had their head offices in Nairobi. They could easily find out from the Ministry of Agriculture - which encourages importer collaboration with regards to quantities imported to ensure that market demand will be satisfied - how much fertilizer each of their competitors had imported, and it was common for some of the smaller importer-distributors to purchase fertilizer from the large-scale importer and/or combine their shipments with them.

Secondly, two of the major importers were known to set their prices based on their total costs and an undisclosed percentage mark-up. They published and distributed a price list to their representatives and customers at the beginning of the trading season and maintained these prices throughout the season, regardless of market conditions, thus setting a price ceiling for other firms. Releasing a price list to other firms can be interpreted as evidence of tacit collusion among importers. First, it indicates that these importers were price-setters in the selling market (i.e., when they sold fertilizer domestically) since evidently they were able to set their price by altering the general quantity of fertilizer available in the market. Second, releasing a price list serves as control mechanism to keep other importers from straying too far and breaking up the tacit cartel.

Third, all the importers acknowledged that there was a price leader in the industry; the large importer that accounted for 34 percent of total imports in 1999 and 70 percent of the DAP fertilizer. In addition to this substantial market share, the popularity of its fertilizer brand, "Chapa Meli", among farmers enhanced its market power. Importers agreed that this large importer had the ability to influence their market price up or down as a function of its larger volume. That is, the price could be set tacitly through price leadership without explicit agreement or that under supply scarcity this supplier was in a position to dictate the price to other traders. This finding is in keeping with the claim by the Ministry of Agriculture that, in general, this price leader plays the role of placing a ceiling on fertilizer market prices. Indeed, the 10 day period of shortages in 1999 when the large importer did not have DAP fertilizer was when prices shot up to unprecedented levels.

6.3.3. Financing of Fertilizer Consignments by Importers

The initial finances lubricating the entire private-sector-led marketing system in 1999 flowed from the importers, whose links with international fertilizer manufacturers offered them access to supplier credit at interest rates ranging from six to eight percent per annum with 90 to 180 day grace periods. All of the fertilizer importers financed their fertilizer purchases using supplier credit.[47]

With respect to credit extension, all the importers in the population sold fertilizer on credit to select customers at zero or low interest rates.[48] Importers said they were selective about their credit recipients and never extended credit to new customers. The reasons given for providing credit-in-kind were to attract more buyers, counter competition, and build and maintain trading relationships. The criteria used to determine the creditworthiness of customers included their past payment record with the importer, their demonstrated ability to distribute the fertilizer in a timely manner, and the stability of the firm which was gauged in terms of bank records and length of time it had been in business.

6.3.4. Modes of Importing

There are three modes of importing available to fertilizer importers. These are: a) F.O.B., or free on board, which means the importer pays for the cost of the fertilizer plus

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[47]Two importers were subsidiaries of international fertilizer manufacturers.

[48]If the credit was short term, for example, less than one week, then charging low to zero interest rates is understandable since interest charges would be insignificant anyway. But for credit to be extended for as long as two months at no interest in an economy like Kenya that is characterized by severe capital scarcity and high interest rates, is unlikely. It is more likely that importers charged hidden interest in the form of higher prices for traders who bought fertilizer using credit-in-kind. However, the type of empirical evidence needed to support or refute this hypothesis - identification of which consignments were sold on credit and which ones were not - was not available. The same is true for wholesalers and retailers who sold fertilizer using credit-in-kind arrangements.

the cost of loading the fertilizer onto the ship. The importer has to arrange for the freight and pay for off-loading; b) C&F free out - this includes the cost of the fertilizer and the cost of freight, but it does not include the cost of offloading. The importer (via their clearing agent) pays for offloading; c) C&F liner out - this includes the cost of the fertilizer, the cost of freight, and the cost of offloading.

C&F liner out is the most popular method used by importers, followed by C&F free out, primarily because it requires the least effort on the part of importers (for a detailed description of importer's procurement practices, see Appendix 6.1.). However, C&F liner out is also potentially the most expensive option since the importer has no flexibility to control costs, and the supplier has the opportunity to maximize its mark-up, subject to how well-informed the importer is about world market conditions. There are at least two reasons for this. First, the supplier is making the total bid (cost of fertilizer, cost of freight and cost of offloading) to the importer, so the supplier has numerous opportunities to overcharge the importer without their knowledge. First, they can overstate the freight rates when in reality they may have chosen the cheapest vessel possible (with the attendant risk to the importer of break downs on the high seas) and just inflate the bid. Second, the importer may order fertilizer in October but the supplier may send the fertilizer three months later (reasons for delays may include waiting for letters of credit to be approved and waiting for ships to fill up). In the interim a number of changes may occur in the market with respect to number of buyers and sellers, number of ships traveling a particular route and so forth, which the supplier will take into account when they are quoting their price to the importer. As a result, the cost of fertilizer and/or freight may be inflated since it includes a risk premium.

F.O.B. is potentially the cheapest option since it provides importers with maximum flexibility to minimize the landed cost of fertilizer. However, this option can be time consuming and tricky for the importer since it depends on factors such as the tonnage of the ship, the season of the year, how many ships are servicing a particular route at that time. However, it is likely that the importer will seek the most competitive bid on its own behalf and therefore (depending on the search costs) its cost and freight will be cheaper than the cost and freight the supplier may have quoted if the importer had used C.I.F.

6.3.5. Inter- and Intra-Stage Coordination

In general, how traders arranged to obtain and distribute their fertilizer in 1999 reveals a great deal about efforts to improve interstage and instrastage coordination and reduce transaction costs. Hence, examination of these behaviors suggest areas for improved coordination of the marketing system. This section presents evidence of the role of importers in coordinating the efficient transfer of fertilizer to the final consumer via the private marketing system. Chapter Seven will provide a similar discussion for wholesalers and Chapter Eight will provide the same for retailers.

With respect to intra-stage coordination, all of the importers combined freight and some combined purchases of fertilizer. This means that importing firms kept their activities separate but shared some marketing functions to reduce costs per unit. Sharing freight and/or purchases was particularly important for small importers because they could only afford to import 5,000 to 10,000 tons at a time. Unless they combined shipments with other importers they would have to wait for the shipping company to fill the ship which would delay the time of arrival. Alternatively, by sharing freight, importers could fill a ship more quickly, which meant the ship could leave the port of exit sooner and take a direct route to the port of Mombasa rather than stopping along the way to pick up cargo. Firms chose partners to combine with based on mutual trust and an established business relationship.

The sources of transaction costs in the importer market in 1999 were imperfect information about conditions in the buyer market (as evidenced by the shortage of DAP in 1999), the risk of opportunistic behavior by a partner with whom a firm had combined activities, and the uncertainty of guaranteed outlets for their fertilizer.[49] With respect to

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[49] As discussed in Chapter Two, asset specificity was not a source of transaction costs in the fertilizer industry in 1999. There was no information asymmetry with respect to the quality of fertilizer at the importer-wholesale level (although there may have been some at the wholesale-retail level and between retailers and farmers) or access to information vis-a-vis suppliers. First, although quality of fertilizer was the second most frequently cited problem in the fertilizer industry in 1999 (after high prices), fertilizer traders used a number of signals to inform their buyers about the quality of their fertilizer, and hence mitigate the problem. One signal was the open labeling of fertilizer, whereby the name, type, nutrient content, and quantity of fertilizer was printed on the bag after inspection by the Kenya Bureau of Standards at the port of entry. This provided some initial guarantee regarding the legitimacy of the contents of the bag. Secondly, importers printed their name, address and telephone number on the bags of fertilizer they sold. By using their company name as a brand name importers were sending a signal that they were guaranteeing the quality of their product. Wholesalers and retailers did not brand their fertilizer, and some of these traders reported quality problems with their fertilizer. However, they typically allowed customers who experienced quality problems to return defective bags and compensated them in the next consignment. In this way they sent a signal that they were willing to guarantee the quality of their fertilizer. In addition to signals from sellers, buyers also emulated the buying behavior of market leaders who had established reputations for only buying quality fertilizer. One large wholesaler in Eldoret reported that other traders came to his warehouse to see which brand names he purchased and which ones he did not. If he did not purchase a particular brand of fertilizer, other traders would also avoid this brand since to they took this as a signal that the brand was of poor quality.

Importers did not experience information asymmetry vis-a-vis their suppliers. Their high level of access to modern telecommunication facilities (telephones, the internet and fax machines) and their high level of use of these facilities to conduct their fertilizer importing business made it relatively easy for importers to obtain domestic and international market information. All the importers had overseas contacts to inform them about world market conditions and/or they could conduct their own research on the internet. Importers also had contacts in the Farm Inputs Branch of the Ministry of Agriculture who kept them informed about demand conditions and quantities other importers were planning to import.

the risk of opportunistic behavior by a partner to an agreement to combine purchases and/or freight, or transportation, the risk lay in the partner reneging on his or her promise to honor the letter of credit, or to purchase the full amount of their fertilizer. Given the large quantities importers typically deal in, this risk was high, and hence the potentially high transaction costs may have outweighed the potential benefits of such arrangements, and deterred importers from participating in them more often.

Uncertainty of having assured distribution outlets was another important source of transaction costs in the fertilizer importing in 1999.[50] In general, fertilizer traders need guaranteed outlets for their goods to avoid missed sales and loss of revenue. Their buyers can also be a source of reliable information concerning demand conditions, which can assist importers in planning their ordering and delivery schedules to minimize storage costs. If firms lack distribution outlets or are unaware of the ones that exist, and the value of the fertilizer falls below its marginal value product, exit costs are high because the value in alternative uses is lower. As a result, there are quasi-rents for market participants to capture, and firms incur transaction costs trying to minimize these rents. If the transaction costs become too high, firms may internalize the transactions by integrating forward. Conversely, if there are a sufficient number of distribution outlets and firms are knowledgeable about them, the quasi rents to be protected will be insignificant since the

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Third, importers sent employees to pose as buyers from other importers to obtain price information. Fourth, importers regularly sent their sales and marketing agents into the field to obtain information about price and demand conditions.

[50]With privatization and deregulation of the fertilizer subsector, uncertainty of an assured supply was not a source of transaction costs in the import market. Subject to business acumen and financial wherewithal, and taking into account the usual delays in delivery such as breakdowns on the high seas, an importing firm was assured of its supply of fertilizer from an overseas supplier.

transacting parties can easily switch to alternative outlets without incurring high exit costs. Then there would be no need for firms to engage in institutional arrangements to avoid opportunism and behavioral uncertainty. That is, having numerous buyers and sellers creates competition between firms and limits the scope for opportunistic or rent-seeking behavior.

With respect to the importer market, importers needed to sell fertilizer as quickly as possible in order to: a) honor the LC when it matured and; b) to avoid any risk associated with a change in input-output price ratio due to macroeconomic forces such as an increase in the exchange rate between the time they purchased the fertilizer and the time they sold it. However, importers may have had a limited number of traditional outlets (wholesalers) through which to sell their fertilizer imports. Previous studies have found that the number of fertilizer wholesalers (nationwide) remained stable since 1993 while the number of importers increased over the same period (Arwings-Kodhek, 1996). Consequently, competition between importers for same distribution outlets is fierce.

The competitive nature of the parallel channels of distribution is exemplified by the fact that even though all the wholesalers and retailers in the respective population of traders said they had a main supplier they purchased fertilizer from, all of them had purchased fertilizer from each of the importers at various times during the fertilizer trading season in 1999. This means that opportunities for price arbitrage existed such that it did not take much in the way of a lower price from a competitor for a wholesaler or retailer to shift to a different importer. As a result, importers keenly seek out information about the selling prices available from their competitors and use it to undercut competitors and retain customers. Wholesalers and retailers are aware of this and play one importer against another. Importers respond by making increasingly attractive offers to wholesalers (delivery, credit-in-kind) such that price will not be the only factor determining whether a sale, preferably followed up by repeat business, is made.

Nevertheless, it appears there were still quasi-rents to be captured since importers decided to undertake distribution functions themselves (forward integrate) or entered into contractual arrangements with traders they identified as reliable and able to undertake these functions on their behalf.[51] Consequently, whereas one small importer chose to vertically integrate, the large importer and small importer chose to forge informal contractual relations. In this latter case, throughout the year the large importer and small importers sent their sales and marketing agents on frequent trips to Western Kenya to identify reliable wholesalers and retailers and appoint them as the firm's representatives. It was not possible to obtain the exact details of the contract. However, from informal discussions with the importer and its agents, it appeared that the contracts included guaranteed supply of the fertilizer at a predetermined price with payment in the form of a post-dated check. That is, at the time they took physical possession of the fertilizer, the buyer provided the importer with a check that had been post-dated for seven days. The purpose of the check was to provide the buyer with a form of credit, that is, the trader had seven days to sell the fertilizer and put the money in the bank in time for the check to

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[51]Vertical integration (VI) refers to the ownership of two or more adjacent stages in a supply chain by a single firm. A firm will vertically integrate when the costs of using the market to carry out certain transactions exceeds the cost of doing so internally (Coase, 1937).

clear.[52] The trader had to prove themselves to be trustworthy (no complaints of adulteration); and creditworthy (provide evidence of the ability to carry out repeated transactions with importers throughout the year and purchase consignments of a minimum number of bags). Thus, these importing firms saved the costs of establishing distribution outlets.[53] However the benefits of this strategy were mitigated by search costs and the opportunity costs of time, particularly since the majority of the potential clients were new in the fertilizer business and had yet to build up a reputation regarding their reliability and credit-worthiness. A second strategy these importers used to increase their distribution alternatives was to broaden the type of clients they were willing to accommodate. They sold to wholesalers as well as to retailers, and even directly to farmers, and they had a price to match each type of client.

These importers may have been able to choose contractual arrangements over vertical integration (and hence avoid the associated administrative costs of the latter institutional arrangement) because of their market share. In the case of the large importer, the popularity of its brand of fertilizer had translated into a significant market share, and one of the small importers dominated the market for top-dressing fertilizer in 1999. Hence, these importers may also have been able to use their market advantage to discipline traders who were acting as their agents. These wholesalers knew that by selling this fertilizer,

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[52]It was not clear whether the purpose of the check was also to lock-in the predetermined price, although it may have been since all of the wholesalers and retailers who used this credit facility said the final price they paid was the same as the price they initially agreed upon with their supplier.

[53]During interviews, importers stated that they consciously sought out wholesalers and retailers who would be suitable agents. Wholesalers and retailers confirmed that they knew of traders who acted as agents for importers. However, all the parties were unwilling or unable to identify exactly which wholesalers and retailers acted as agents for importers.

particularly the brand sold by the large importer ("Chapa Meli"), they had a guaranteed market. Therefore they had an incentive to be reliable and trustworthy and maintain their end of the contract to avoid jeopardizing such a good business opportunities.

The evidence indicates that the motivation for vertical integration by the small importer was to compete by improving the timeliness of delivery and by expanding the firm's distribution network, rather than to reduce the marketing and transaction costs of procurement. Retailers and small wholesalers reported that they preferred the vertically integrated importer to the other suppliers because the integrated importer owned a fleet of trucks that it used to make regular delivery runs along customer routes two to three times a day. During the peak period it was common for this importer to telephone retailers and small wholesalers to inform them that it was sending out a truck of fertilizer on a delivery run and ask whether they needed any fertilizer. In the event that a trader did not have the cash available to pay, the integrated importer would tell them they could take the fertilizer anyway and pay for it once they had sold it. In addition to being able to get fertilizer on a credit-in-kind basis, retailers and small wholesalers could order as few (five bags) or as many (200 bags) as they wanted - there was no minimum requirement on the number of bags since the vehicle was traveling on that route anyway. A third advantage of dealing with the integrated importer was that delivery was fast; a trader could order fertilizer at 10 a.m. and have it by noon the same day. In comparison, if they ordered fertilizer from the large wholesaler or directly from the non-integrated importers, retailers and wholesalers had to order a minimum number of bags and, in the case of the importers, meeting this requirement would only guarantee that the importer would organize delivery to the trader, but delivery was at cost.

The effectiveness of this strategy for the vertically integrated firm is illustrated by the data. In 1999, 83 percent of the fertilizer purchases by the population of wholesalers and retailers were made from the large importer; 11 percent from the small importers; five percent from the vertically integrated importer; and the remainder from large and small wholesalers (Table 7).

Table 7. Total Purchases from the Population of Importers by Type of Trader (number of bags) Fertilizer Trader Survey, Kenya 1999

Buyer			Seller			Total Purchases by type of trader
	LI	SI	VI	LW	SW	
LW	762,609	80,000	---------	--------	--------	842,609
SW	9120	2600	14588	--------	--------	26,308
VI	39,757	--------	--------	--------	--------	39,757
LR	15,560	25,240	29,302	7,358	954	78,414
SR	--------	--------	7,908	4,298	198	12,404
Total	827046	107840	51,798	11,656	1152	999492
Percentages	83	11	5	1	negligible	100

Source: Compiled by author

Key:

VI= Vertically Integrated Importer
LI = Large Importer
SI = Small Importer
LW = Large Wholesaler
SW = Small Wholesaler
LR = Large Retailer
SR = Small Retailer

Although the majority of fertilizer was purchased from the large importer, if total purchases are analyzed by type of trader, it is apparent that the vertically integrated importer was an important player in the private-sector-led fertilizer marketing system in 1999, particularly with regards to small wholesalers and retailers. The majority of the fertilizer purchased from the large importer was purchased by large wholesalers, whereas the vertically integrated importer was the main source of fertilizer for small wholesalers (55 percent), large retailers (37 percent), and small retailers (65 percent), (see Table 8).

Table 8. Percentages of Purchases from the Population of Importers by Type of Trader, Fertilizer Trader Survey, Kenya 1999

Type of Trader	Seller					Total
	LI	SI	VI	LW	SW	
LW	91	9	--------	--------	--------	100
SW	35	10	55	--------	--------	100
VI	100	--------	--------	--------	--------	100
LR	20	32	37	9	2	100
SR			65	35	negligible	100

Source: 1999 Fertilizer Trader Survey data
Key:
VI= Vertically Integrated firms
LI = Large Importer
SI = Small Importer
LW = Large Wholesaler
SW = Small Wholesaler
LR = Large Retailer
SR = Small Retailer

Therefore, the vertically integrated firm was following the strategy of using nonprice tools to expand market share. The firm competed by providing an improved set of services vis-a-vis its competitors such as more timely delivery and wider availability of fertilizer, both of which are of critical importance to farmers, particularly once the rains begin and farmers want to plant as soon as possible, so their demand for fertilizer is high. However, it appears that the small quantity of throughput resulted in higher costs per unit for transportation, storage, and handling.

On the one hand, the performance outcome of importers' behavior was to increase the availability of fertilizer in the marketing system. A single importer's stocks became available in a particular town through her/his own distribution outlet (in the case of the vertically integrated importer) and through the store of a fertilizer representative (in the case of the non-vertically integrated firms), through a number of large wholesalers who purchased from importers, and from retailers who bought from any of the above sources. On the other hand, importers' procurement and distribution strategies increased the market share of the more aggressive importers, making the markets more concentrated. The small number of importers and high barriers to entry at this level of the marketing system created the conditions under which importers could potentially either use their dominant position vis-a-vis buyers and/or collude to inflate their profits. However, as discussed earlier, most importers claimed it was impossible to organize such arrangements so they could be enforced because wholesalers play the importers against each other and the incentive to "cheat" by offering a lower price is high. So competition between importers remains fierce.

6.4. Performance: Some Introductory Comments[54]

6.4.1. Performance Indicators

Chapter Two outlines the static efficiency and dynamic performance criteria, as well as institutional and government policies criteria, for evaluating the performance of the fertilizer subsector. Accordingly, the evaluation of the performance of each level of the subsector (importer, wholesale and retail) will be guided by one or more criterion from each category.

6.4.1.1. Efficiency: Marketing Margins and the Rate of Return

Marketing margins are defined as "the price of a collection of marketing services which is the outcome of the demand for and supply of such services" (Tomek and Robinson, 1987). These marketing services include storage, transportation, wholesaling, and retailing. Marketing margins may differ among firms in the same market or industry because their marketing services differ and/or because their marketing costs differ.

In order to set the stage for the analysis, it is essential to clarify the definition of return to fertilizer trading used by this study. In general, the rate of return (ROR) is defined as net profit earned per dollar of capital investment, or net profit earned per dollar of equity invested, or it can be defined as a return to capital investment plus equity, that is, net profit earned per dollar of capital investment plus equity. This is because net profit alone provides very little information about the profitability of a firm. For example, a fertilizer wholesaler could have made net profit per bag of Kshs 50 but invested Ksh100

[54]These comments are also applicable for wholesale and retail enterprise budgets.

per bag in a season. Therefore, this firm made a return per bag of 50%. In comparison a second wholesaler could have made net profit per bag of two Kshs but invested one Ksh per bag. Consequently, the second wholesaler made a higher return to capital per bag (200%) than the first wholesaler despite the former's higher net profit per bag. In summary, the rate of return or profitability is estimated as a return to capital investment, equity, or both.

The rate of return can be calculated for any time period, but it is usually calculated on an annual basis. It can be calculated as a return to capital investment as follows. All of the inputs and outputs are valued at their opportunity cost of capital to give an economic profit rather than an accounting profit. These economic profits equal revenues minus labor, inputs, and capital costs. The economic profit divided by the capital costs yields the rate of return (ROR) on capital investment, which is a measure of the profitability that controls for differences in capital investment across firms.

Measuring revenues, labor costs and input costs is generally simple. The challenge is measuring capital costs. In the case when the capital assets are owned, the cost of capital is the depreciation or the decline in economic value that results during the period the capital is used. In the case when all the capital assets are rented, then annual capital costs equal annual rental fees. Total rental fees equal the rental rate per unit of time as a percentage (for example per month) times the value of capital.[55] Then the firm's economic profit is:

[55]That is, the appropriate cost measure of capital is a flow (the price of renting capital per time period) and not a stock (the cost of capital, such as a machine, which lasts for many periods).

$$\pi = R - \text{input costs} - \text{operating costs} - \text{capital costs} \tag{2}$$

where R is revenue, input and operating costs are economic costs, and capital costs are the rental rate of capital, r, (after depreciation has been deducted) plus the rate of depreciation, δ, times the value of capital. The value of capital is $P_K K$ where P_K is the price of capital and K is the quantity of capital. If the rental rate is $(r + \delta)$ then profit is:

$$\pi = R - \text{input costs} - \text{operating costs} - (r + \delta)P_K K \tag{3}$$

The rental rate, r, is also the annualized rate of return (ROR) on the asset since the total rental payment minus the deprecation is the return on the total value of the asset. Therefore, the ROR can be obtained by setting economic profit, π, equal to zero and solving for r to obtain:

$$ROR = \frac{R - \text{input costs} - \text{operating costs} - \delta P_K K}{P_K K} \tag{4}$$

That is, the ROR is net profit divided by the value of assets where net profit is revenues minus input costs minus operating costs minus depreciation. Alternatively, the ROR is defined as the rate of profit expressed as a proportion of capital stock (of land, buildings, equipment, and machinery) plus working capital or equity. The ROR is annualized because the calculation includes the turnover ratio $(\delta P_K K / P_K K)$ which is the number of times the firm's capital was turned over during the year. Therefore, to obtain the ROR it is necessary to have information on: a) the ratio of the cash flow (revenues minus input and operating costs) to assets $P_K K$, and; b) know the number of times the firm turns over its capital which is $(\underline{\delta P_K K}/P_K K)$ or (Costs/Assets). This section has described the formal method for calculating the rate of return. However, insufficient data precluded the calculation of the annualized rate of return (ROR) to capital, equity, or both. Therefore, alternative measures had to be used to assess the profitability of fertilizer trading for each category of traders. These measures appear in the profit and loss accounts for each category of traders in this chapter for importers, in Chapter Seven for wholesalers, and in Chapter Eight for retailers. The following section will describe each of these measures.

6.4.1.2. Performance Indicators for Fertilizer Trading in Kenya

6.4.1.2.1. Rate of Return per Trader

The rate of return for each trader is calculated as a weighted average of the percent net returns per consignment over the trading season for the trader as follows:[56]

$$\% \text{ WANR} = \Sigma_{i=1}^{n} (\Theta_i \times \Pi_i) \qquad (5)$$

for i = 1,....,n consignments per trading operation, where:

% WANR = Percent Weighted Average Rate of Return per trader

$$\Theta_i = \frac{\text{number of bags in consignment i}}{\text{total number bags purchased by the trading operation}}$$

Π_i = Percent net return for consignment i,

= ((Selling price - total variable costs)/total variable costs) x 100

[56]The ideal indicator of firm profitability would be return on equity. However, obtaining data on equity investment in firms in developing country is very difficult. Many empirical studies in developing countries use return on working capital to proxy returns to trade. For example, in the classic empirical studies of agricultural markets in India the rate of return was proxied by the price differences net of marketing costs expressed as a proportion of unit sales price (Harris-White, 1995). The figure is most useful as a proxy for firm profitability when, as in petty trade, investment in fixed capital is low.

where: total variable costs = buying price + marketing costs

The survey was unable to obtain data on capital and equity invested by fertilizer firms. Therefore, the rate of return is a return to variable costs, risk and entrepreneurship. The weighted average is used instead of the average which would assign an equal weight or number of bags to each consignment, because the size of trader consignments varied considerably. A positive rate of return indicates that the trader had a profitable enterprise and a negative rate of return implies a non-profitable enterprise.

6.4.1.2.2. Rate of Return over the Trading Season

To get the rate of return over the trading season per trader, it was necessary to determine how many times the same set of capital was rotated during the trading season. The empirical data indicated how many consignments each trader purchased, the buying price and selling price for each consignment, and the supplier from whom the consignment was purchased. Traders also indicated that they used the proceeds from previous consignments to purchase subsequent consignments. However, there was no information on which consignments were purchased using the same set of capital, how much of the return earned on each consignment was reinvested, or how long it took to sell each consignment.

Therefore, to calculate the rate of return per trader over the seven-month trading season, the study made the following assumptions: a) each consignment was purchased sequentially (from the same or different supplier). This is the same as assuming that one set of capital was used to purchase fertilizer over the seven month trading season and the number of times it was rotated was equal to the number of consignments purchased; b) the amount of capital used for each new consignment was independent of the amount previously invested and the return obtained from the preceding consignment. Therefore, the amount of capital invested each time was equal to the purchasing cost plus marketing cost for that consignment. This assumes that traders earned simple interest on their investments; that is, they did not reinvest their returns from the preceding consignment and compound their return; c) the trading season was the same for each trader, seven months; d) for each trader, each consignment was invested for the same time period, determined by the length of the trading season (seven months) divided by the number of consignments purchased.

Based on these assumptions, the rate of return over the trading season for an individual trader is calculated as follows:

$$\text{ROR} = \frac{\text{\% WANR x no. consignments}}{\text{no. of suppliers}} \qquad (6)$$

That is, the analysis used information given by the traders about the number of consignments and number of suppliers to make assumptions about the number of different sets of capital each type of trader used over the trading season. Specifically, the number of suppliers was used as a proxy for the number of different sets of capital used by traders. For example, a trader could purchase 120 consignments over a seven-month trading period. If the weighted average rate of return per consignment was three percent and these consignments had been purchased sequentially with a single set of capital, then the rate of return over the trading season would be 360 percent (120 x 3 percent). This is the maximum rate of return a trader could have earned from these 120 consignments over the trading season. However, if the trader used 5 different sets of capital during the trading season to purchase these 120 transactions, then more than one set of capital was being used simultaneously. Then the rate of return over the trading season would be 72 percent (360 divided by 5), that is, it would be adjusted downwards to account for the larger capital base the trader was using. This would be the minimum rate of return this trader could have earned over the trading season.

6.4.1.2.3. Annualized Rate of Return

To assess whether these annualized returns could be considered to be above normal, they were compared to the return a trader would have been able to make in their next best alternative, which is assumed to be employment by someone else. Hence, wholesalers and retailers were asked how much they would have to be paid in order to relinquish self-employment in the fertilizer business to go and work for someone else. This amount was compared to their return (in Kenya shillings) to reach a conclusion regarding the profitability of fertilizer trading in the wholesale and retail industry. However, the same analysis could not be carried out for importers since information on their reservation was not forthcoming. Therefore, in the case of importers, their annualized rates of return were compared to the return the large importer indicated would be an acceptable (annualized) rate of return once risks and costs had been accounted for (15 percent).

To annualize the rate of return to fertilizer trading, it was necessary to make some assumptions about the return these traders would have if they invested the same amount of capital elsewhere during the off-peak season. If fertilizer traders could not or did not invest this capital anywhere else for the remaining five months of the year, then their annual return would be equal to their rate of return over the trading season. However, this study assumes that fertilizer traders could make a comparable return during the off-peak season (the remaining five months) by investing in another business, by lending their capital, or by putting the money into a savings account.

To annualize the weighted rate of return over the seven month trading season for each trader, it is assumed that traders reinvested their principal plus total (simple) interest earned over the seven month period for the remaining five months of the year. Therefore, the annual rate of return is calculated using the compounded interest rate for just under two periods (one period of seven months and the second period of 5 months) as follows: $(1 + r)^{12/7} - 1$.

6.4.1.3. Drawbacks of the Rate of Return Measure

The measure of profitability used in this study has a number of drawbacks. First, the measure of the rate of return is also underestimated to the extent that the numerator does not include current assets such as inventory, cash balances and accounts receivable; instead it assumes that current assets approximated the sales revenue generated by the sale of each consignment. To the extent that a firm had a substantial amount of any of these current assets, the rate of return for that firm was underestimated. However, on average fertilizer generated 80-100 percent of the sales revenue of importers, 80 percent for wholesalers and 60-80 percent for retailers and during the peak season for many of these traders fertilizer trading was their only business activity. Therefore, the study assumes that their current assets approximated the sales revenue generated from the sale of each consignment.

Second, the denominator of the formula for the rate of return does not include the cost of depreciation, risk, credit and hidden costs such as transaction costs and the cost of services traders provide at no charge such as delivery, quality control and rebagging. Therefore, the resulting percentages will be overestimated because they are the return needed, in reality, to cover not only a return on total variable costs invested plus risk and entrepreneurship, but also these other costs. Had data been available on these costs, such as the level of the firms' fixed investments, those figures would have also been included in the denominator of the rate of return calculation, leading to a smaller percentage return.

The reason these costs are not included in the denominator is they could not be captured. For some of them it was because they were unobservable as in the case of transaction costs; those costs arising from risk of opportunistic behavior by trading partners and uncertainty of reliable supply and distribution outlets, search costs for information and trading partners, and the costs of monitoring and enforcing contracts. Although these are included in the marketing costs, how they are built into the margins is not readily observable.

Observable data that were difficult to obtain were the capital costs (storage, trucks, vehicles, equipment) and the costs of depreciation. Although some traders reported that they owned storage facilities and vehicles that they use to transport their fertilizer, hard data on fixed assets (buildings, vehicles, equipment) such as number, value, age, and rates of depreciation were not available. The inability to collect this data was because traders were either unwilling to provide the data, or they were willing but were literally too busy to take the time to do so. Alternatively, traders were willing but did not have reliable records. The measurement method used in this study was a mixture of "recall interviews" and record-keeping. Therefore, the accuracy of the data depends in part on when the interviews were conducted relative to when the trading activities were carried out, on the memory of the individual traders, and on the quality of their individual record-keeping skills.[57]

However, there is reason to believe that some of these costs of fertilizer trading were not substantial. First, the costs of handling equipment were negligible since the fertilizer industry in Kenya is labor-intensive. The only handling equipment used by the industry in 1999 were bagging machines, but the majority of bagging was hired out to private bagging companies at the port and importers paid these costs on a per bag basis.[58] Second, over 90 percent of fertilizer transportation was hired out to transport companies rather than carried out by fertilizer traders using their own vehicles. Therefore, depreciation costs for the traders who owned one or two vehicles to supplement their transport needs during in peak periods were not significant.

The fixed costs that were substantial were storage costs since all of the importers and some wholesalers owned storage facilities in 1999. However, no data were available on

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[57] These obstacles to data-collection are in keeping with Harris-White's (1995) observation that sensitive firsthand data on investments, costs and profits are notoriously hard to find and that "successful field methods would involve the deployment of a variety of means of approach to sensitive questions," (Harris-White, p.316, 1995).

[58] At the time of the study only one importer owned bagging machines and it did not import fertilizer in 1999.

the initial cost of building warehouses or rates of depreciation. Secondly, these facilities were only used for fertilizer for part of the year and even then fertilizer was not the only item stored. For these reasons, it was not possible to include the cost of depreciation for storage facilities in the enterprise budgets. In contrast to importers and wholesalers, retail firms had most of their capital tied up in their working capital, they had not invested in any fixed assets such as trucks and storage facilities. They rented their retail stores which doubled as storage spaces for fertilizer.

In summary, the study assumes that current assets for individual traders approximated the sales revenue generated from the sale of each consignment. However, importers' and wholesalers' rates of return are overestimated to the extent that they had more fixed capital that they had to amortize; and are underestimated to the extent that their sales revenue does not fully capture their current assets. In comparison, the rate of return calculations for retailers are a more accurate calculation of their actual rate of return because most of them have very little fixed capital..

Other drawbacks to this measure of profitability are as follows. First, it cannot be used to compare the performance of fertilizer firms in the same industry. It can only be used to compare a firm's performance to its next best alternative. For example, Firm A may have a larger weighted average net profit margin per consignment than Firm B, and the two firms may have the same rate of turnover. Comparing these two firms could lead to the conclusion that Firm A with its higher rate of return has performed better than Firm B. However, this conclusion may be erroneous. For example, Firm A may have a larger profit margin per consignment than Firm B not because it better business acumen but because it is operating in a riskier environment and therefore has a higher risk premium built into its margins.

Second, the study has no information on the riskiness of fertilizer trading and risk premiums. However, it is useful to know the risk tolerance level of a firm when assessing its profitability. If a firm is risk averse and specialized, ceteris paribus, it will prefer a relatively low expected rate of return in exchange for lower variability of returns across consignments. In comparison, a nonspecialized firm which has other sources of funds will be willing to accept higher variability if its expected rate of return is high because in the event of a loss it can compensate for its losses via its other businesses. Therefore, when the rates of return to trade for a firm is being assessed, knowledge of its risk tolerance and the degree of specialization is very useful to obtain an accurate picture.

Since the study has no information on risk premium for individual firms, the analysis will assume that traders at the same level of the marketing chain face the same level of risk from the market environment and have the same level of risk tolerance. However, some firms may have a higher variability in their rates of return than other firms for reasons that primarily have to do with different business practices and the quality of their relationships with suppliers and transporters. These firms can be expected to include a risk premium in their margins which may partially explain the observed differences in levels of profitability between firms. To obtain a sense of the riskiness of the rate of return to fertilizer trading, the distribution of the rates of return per consignment over the trading season for select traders in the wholesale and retail markets will be presented and discussed.

Finally, the study had no data on sales volumes, only purchases and therefore the analysis assumes that all the fertilizer purchased was sold. To the extent that this was not the case, net profits were overestimated. However, the validity of the assumption is supported by the fact that at the time of the survey, only importers had stock remaining from the trading season; the majority of wholesalers and retailers had no stock or had stock ranging from one bag for retailers to 100 to 200 bags for large wholesalers. Although traders purchased 50 kg, 25 kg and 10 kg bags, the profit and loss accounts assume that traders only purchase 50 kg bags of fertilizer. The other bag sizes comprised a small percentage of total fertilizer purchases in 1999 and were excluded from the analysis to allow the comparison of margins and returns across traders.[59]

Although this measure of the profitability of fertilizer trading has its drawbacks, it is a useful first step since there have been no studies to date of the profitability of fertilizer trading in Kenya based on individual records of traders, although there have been continuous claims that importers and wholesalers are making excessive profits. Previous studies have made estimates of gross margins using buying and selling prices provided by traders at different stages of the marketing chain. Using a more data intensive approach this study makes the first attempt to measure the profitability of fertilizer trading by taking into account the cost of marketing functions performed. Secondly, the study analyzes market structure and traders behavior, in addition to the profitability results, to reach some

[59] Specifically, all of the consignments purchased by the population of wholesalers consisted of 50 kg bags and only 40 of the 423 consignments purchased by the population of retailers were of 25 kg and 10 kg bags.

conclusions about the performance of the private-sector-led fertilizer marketing system in Kenya in 1999.

6.4.2. Estimated Profit and Loss Accounts

The profit and loss account for the large importer and the vertically integrated importer are presented in Table 9.[60] Given the oligopolistic structure of the importer market, the low threat of entry, and the fact that importers operate in an environment that is conducive to collusion, the percent net returns to importers are hypothesized to be above normal. The results of the analysis revealed that the annualized rate of return for the large importer was 27 percent, and for the vertically integrated importer the annualized rate of return was 18 percent.[61] These annualized returns are both higher than the annualized return of 15 percent the large importer reported that it aimed to make. These rates of return are overestimated since the denominator does not include the cost of fixed investments which for importers are substantial (office space, warehouses, trucks), nor does it include a number of hidden costs that accrued to these importers such as allowing wholesalers and retailers to purchase fertilizer on credit.

[60]Data from the small importer was insufficient to construct a profit and loss account.

[61]The data needed to calculated the weighted average return per consignment for importers was not available. Therefore, the percent net return per bag which is calculated using data from the profit and loss accounts is used as a proxy for the weighted average percent return per consignment. This figure is then used to calculate the rate of return over the trading season for importers and the annualized rate of return. In contrast, the weighted average rates of return per consignment is calculated for wholesalers and retailers and used as the basis for other two measures of profitability.

Table 9. Profit and Loss Accounts for the Large Importer and Vertically Integrated Importer, Fertilizer Trader Survey, Kenya 1999 (all figures in Ksh unless otherwise indicated)

	Large Importer	Vertically Integrated Importer
Total Purchases (50kg bags)	1,000,000	300,000
Sales Revenue	1,180,000,000	408,000,000
Total Purchasing Costs	760,000,000	269,000,000
Gross Profit Margin	420,000,000	139,000,000
Less Marketing Costs		
Port Charges	77,800,000	25,840,000
Bagging Costs	34,200,000	8,740,000
Transportation Costs	148,000,000	52,500,000
Handling Costs	20,000,000	12,600,000
Storage Costs	36,000,000	14,700,000
Transit Losses	12,000,000	3,810,000
Administration	20,000,000	4,500,000
Bank Letter of Credit	20,600,000	8,830,000
Total Marketing Costs	368,600,000	131,520,000
Total Costs	1,128,600,000	400,520,000
Net Margin	51,400,000	7,480,000
Performance Measures		
Gross Profit/bag	420	463
Net Profit/bag	51	25
Working Capital (Kshs)*	413,333,333	86,100,000
Rate of Return (%)	15	10
Annualized Rate of Return (%)	27	18

*Working capital for each trader is calculated as the final total purchasing cost plus total marketing costs. The final total purchasing cost for an individual trader depends on whether the trader used capital simultaneously or sequentially to purchase their fertilizer throughout the trading season. If a trader used more than one set of capital simultaneously (from different suppliers) to purchase their consignments, this trader was operating with a larger capital base. To take this into account, the final total purchasing cost for this trader is total purchasing cost divided by the number of consignments times the number of suppliers. If a trader only used one set of capital at any given time during the trading season to purchase her or his consignments, this trader was operating with a smaller capital base. Hence, the final total purchasing cost for this trader is total purchasing costs divided by the number of consignments.

Source: 1999 Fertilizer Trader Survey

The rates of return for each of these two importers are compared to their respective market shares to assess whether their returns are in any way associated with their market share. The importer market is concentrated with high barriers to entry. Therefore, the hypothesis is that importers' rates of return are positively correlated with market share since the threat of entry does not exist to exert downward pressure on their return. The results revealed that the large importer accounted for approximately 34 percent of all of the fertilizer imported into Kenya in 1999 (and 65 percent of the fertilizer purchased by the population of importers in this study) and had a higher annualized rate of return (27 percent) than the vertically integrated importer who had a smaller share of the market of the population of importers (19 percent) and a lower annualized rate of return (18 percent). These results are underestimated to the extent that the numerator does not include current assets and overestimated to the extent that costs of depreciation and other hidden costs are not included.

6.5. Summary of Main Findings

The main research question of this chapter was whether the importer market was competitive or whether importers were in a position to exert their market power to inflate their margins and make above normal rates of return.

The large importer reported that results of the analysis revealed that in 1999 the large importer made annualized returns of 27 percent and the vertically integrated importer made annualized returns of 18 percent. The annualized rates of return exceed the annaulzied return of 15 percent that the large importer indicated would be an acceptable rate of return once risks and costs had been accounted for. However, the returns are overestimated to the extent that they do not take into account the cost of fixed capital investments, the cost of credit and other hidden costs. Therefore, based on these results alone it is not possible to reach any firm conclusion regarding whether importers were making economic rents. However, it is possible to make a judgement about whether the importer market could be characterized as noncompetitive and therefore, whether the possibility existed for these returns to include economic rents.

On the one hand, the evidence supports the conclusion that the importer market in 1999 was oligopolistic. The study concluded that the importers market was concentrated with high barriers to entry, namely economies of scale which emanated primarily from purchasing costs not marketing costs, stiff capital requirements, and branding. Secondly, there was evidence of nonprice competitive behavior, (all importers used branding to differentiate their products in 1999), and tacit collusion (importers distributed price lists and engaged in the informal exchange of information about prices and quantities imported). Under these structural conditions, the incumbents could increase their price above marginal cost and earn above normal returns.

However, there is evidence to support the conclusion that the upward pressure on importer margins was dampened by competitive forces. Fertilizer importers competed intensely for scarce wholesale outlets, and sometimes even competed with wholesalers for the retail market. This was because importers were under pressure to unload their fertilizer as quickly as possible in order to honor their letters of credit and minimize interest costs. Hence, competitive pressure in the importer market, emanating from the relative scarcity of distribution outlets, may have put downward pressure on rates of return.

In light of the above analysis, the study concludes that in 1999 importers were in a position to inflate their margins above marginal cost and make returns that were higher than they would have been if the market structure was more competitive. That is, while there were some competitive forces at play that may have put downward pressure on importers' returns, in general the importer market was oligopolistic with high barriers to entry, and there was strong evidence of the associated nonprice competitive behavior, both of which tend to result in lower volumes and higher prices than would have existed in a more competitive structure.

With respect to improving performance of the importer market, one source of market concentration may be the small market size and scale economies in purchasing. Therefore, a change in market structure may have undesirable effects on other aspects of performance such as unit costs. However, the results of the analysis of the importer market did indicate areas for improved performance. First, there may be room for importers to reduce the landed price of fertilizer at the port of Mombasa by changing their mode of procurement to F.O.B. instead of C.I.F. However, the actual costs of the three options have to be compared, and the factors determining importers' preference for C.I.F. should be investigated, before any conclusions can be reached. Second, a stronger legal framework could encourage the adoption of cost-reducing innovations such as combining procurement, transportation and storage.

CHAPTER SEVEN
STRUCTURE, CONDUCT AND PERFORMANCE OF THE WHOLESALE MARKET

7.1. Introduction

This chapter applies the industrial organization analytical framework, supplemented by the subsector analytical approach to examine the structure, conduct and performance of the wholesale market in 1999. The chapter is organized as follows. The rest of this section provides a definition of wholesaling and provides a description of fertilizer wholesaling in Kenya. Section 7.2 describes the market structure and conduct is discussed in Section 7.3. Performance of the wholesale market is evaluated in Section 7.4 and Section 7.5 concludes the chapter.

In general, wholesaling includes all activities involved in selling goods to those who buy for resale or for business use. Although in theory a clear distinction exists between wholesale and retail traders - namely that wholesalers do not sell in significant amounts to the final consumer - in reality, it is not accurate to talk of a pure wholesaling function in Kenya's fertilizer industry. Wholesalers do purchase large consignments of fertilizer from importers, disassemble them into smaller lots, and resell them to retailers, who then sell the fertilizer to the final consumers. However, all of the wholesalers in the population also occasionally reverted to retailing during the 1999 trading season. This occurred particularly when their supplies were low and they were waiting for another consignment so they sold their remaining supplies in smaller units directly to farmers. Alternatively, farmers came directly to wholesalers if retailers had run out of fertilizer.

In 1999, the fertilizer wholesalers in Kenya performed an important function as the main coordinator of the marketing system. Wholesalers' customers fell into three groups: a) large farmers requiring 50 or more 50 kg bags of product; b) retailers who purchased fertilizer from wholesalers to retail in nearby smaller towns and locations; and c) small farmers who purchased anywhere from one to 20 bags. Fertilizer wholesalers in the population performed the following functions: a) placing and processing orders with importers; b) establishing credit arrangements either with their suppliers, with a bank, or with a personal contact; c) soliciting and processing orders from customers; d) breaking the fertilizer into bulk and allocating and assorting it into suitable batches to meet the needs of their various types of customers; e) delivering fertilizer to customers; f) credit provision; and g) storage of fertilizer.

7.2. Structure

7.2.1. Number and Size of Participants, Location and Activities

The 14 fertilizer wholesalers interviewed for this study were located in four towns in three districts in the study area: Kitale (six) in Trans Nzoia district; Eldoret (three) in Uasin Gishu district; Matunda (four) in Lugari district; and Moi's Bridge (one) on the border of Trans Nzoia and Uasin Gishu.[62] Kitale and Eldoret were the largest towns in the survey area and Moi's Bridge and Matunda were growing in prominence as market centers in general and fertilizer trading centers in particular.

[62]The four importers who did not import fertilizer in 1999 were categorized as large wholesalers by this study.

The number and spatial distribution of wholesalers does not appear to have changed significantly in the past 5 years. Arwing-Kodhek's 1997 nationwide study on the evolution of fertilizer marketing in Kenya (which was carried out in 14 districts) found that in each major town visited in Western Kenya, between three and five firms dominated fertilizer wholesaling. Therefore, unlike the importer and retailer level, the wholesale level has not experienced a big influx over time. This suggests that there exists a small market size at this level of the marketing system such that only a few traders can operate profitably and/or other barriers to entry.

Data on prices and purchases over the trading season at the wholesale level were obtained from 10 of the 14 wholesalers. Total quantities purchased by individual wholesalers during the 1999 fertilizer trading season varied from 248 bags to 380,000 bags. Since there was such a large variation in the number of bags purchased, the analysis used the median of 8,250 in lieu of the average. On this basis, four of the 10 wholesalers who provided data were categorized as large wholesalers and six were categorized as small wholesalers. The large wholesalers purchased, on average, 128,000 bags of fertilizer and small wholesalers purchased an average of 4000 bags.[63]

The remaining four wholesalers, for whom sales data were unavailable, were categorized as large based on their location, their main customers, and a subjective assessment of their scale of operations vis-a-vis those traders that had been categorized by size based on the number of bags purchased. For example, large wholesalers sold primarily

[63]Although the median may not be natural breaking point between 'big' and 'small' firms, given the variability in the data it is more representative than the mean.

to large retailers located in the main distributing towns of Kitale, Eldoret, Moi's Bridge and Matunda, whereas small wholesalers sold primarily to small retailers located outside the main distributing centers who required quantities that were too small to be purchased from large wholesalers. Thus in summary, eight of the 14 wholesalers in the population were large wholesalers and six were small wholesalers. Five of the eight large-scale wholesalers were Asians, whereas all six of the small-scale wholesalers were Africans. Table 10 presents the distribution of wholesaler purchases (number of bags purchased) in 1999).

Table 10. Distribution of Number of Bags Purchased by the Population of Wholesalers by Size, Fertilizer Trader Survey, Kenya, 1999

Distribution of bags purchased	Number of traders (n = 10)[1]	No. of bags purchased per group	% of total fertilizer purchased by wholesalers
Small Wholesalers			
0 - 1000	0	0	0
1001 - 5000	4	16,279	2
5001 - 8250	2	16,500	3
Sub-total	**6**	**32,779**	**5**
Large Wholesalers			
8251 - 20,000	1	19285	3
20,001 - 100,000	1	41600	6
100,000 - 200,000	1	186000	28
200,000 - 400,000	1	380,000	58
Sub-total	**4**	**626,885**	**95**
Total	**10**	**659,664**	**100**

[1]10 of the 14 wholesalers interviewed gave us data on purchases; four were large-scale and six were small-scale (Source: 1999 Fertilizer Trader Survey data)

The reported quantities purchased by wholesalers in 1999 were biased by two factors: the 1999 shortage of DAP fertilizer, and poor record-keeping by traders. For example, a large wholesaler reported that his DAP purchases for 1999 were 5,000 tons, down from the 7,000 tons he purchased in 1998. His purchases of the other types of fertilizer were the same for both years. Regarding poor record-keeping, some wholesalers did not keep all their receipts, and it is unlikely that those who gave us their data for total purchases over the season had perfect memories and/or records. Therefore, some of the categorizations may be incorrect since traders who normally purchased large quantities of bags may be classified as small in 1999.

Like importers, wholesalers in the population were also involved in other business activities that were year round as opposed to seasonal like fertilizer trading. Fertilizer wholesalers had also diversified into agriculture-related activities such as grain trading, agricultural inputs, and hardware rather than into unrelated activities or product lines. However, wholesalers chose to limit their product mix to avoid competing with supermarkets (in the main distribution centers) that sold a large variety of household and business items. Hence, wholesalers reported that fertilizer generated, on average, 80 percent of their annual sales revenue in 1999. There was no noticeable difference in degree of specialization between large and small wholesalers.

7.2.2. Market Concentration in the Wholesale Market

To calculate concentration ratios for the wholesale market as accurately as possible, the wholesale market was divided into market spheres. Wholesalers in the population were located in four market centers (Kitale, Eldoret, Moi's Bridge, Matunda) which were all within a 100 km radius. The longest distance was between Kitale and Eldoret (70 km). Transportation charges varied from Kshs 25 per bag for a distance of 20 to 30 km, to Kshs 60 per bag for the maximum distance between Kitale and Eldoret. The eight large wholesalers in the population were located in Kitale, Eldoret, and Moi's Bridge, and the six small wholesalers in the population were located in two markets, Kitale and Matunda. The analysis assumes that large and small wholesalers competed for the same retail markets. Therefore, the analysis is for the wholesale market as a whole; it is not done separately for large wholesalers and small wholesalers.

Applying the static rule of price arbitrage, some wholesale market centers would be placed in separate market spheres. That is, the data indicate that on average, the difference in weighted average selling price between each of these wholesale market centers was less than or equivalent to the transfer cost, so that wholesalers in each market center were competing in separate market spheres. For example, the mean difference in the weighted average selling price between Kitale and Eldoret was Kshs 71 compared to transport cost per bag of Kshs 60. Strictly speaking, this opportunity for price arbitrage meant that retailers in Kitale (the higher priced market) had the incentive to purchase fertilizer in Eldoret. Thus, wholesalers in Kitale competed with wholesalers in Eldoret for the Kitale retail market and the Kitale wholesale market sphere consisted of Kitale and Eldoret. Obviously, the reverse was not the case; that is, retailers in Eldoret had no incentive to go to Kitale to purchase fertilizer. Therefore, wholesalers in Eldoret did not compete with wholesalers in Kitale for the Eldoret retail market, and the Eldoret wholesale market sphere did not include wholesalers in Kitale.

However, this mathematical delineation of wholesale market spheres is too static in that it represents one point in time during the trading season. Therefore, it was supplemented by a dynamic delineation of market spheres using the survey data collected over the seven-month period. Cross-tabulations of retailer purchases over the trading season by trader location and supplier location revealed that retailers in all of the towns and locations within a 100 km radius of Kitale and Eldoret purchased fertilizer from Kitale, Eldoret, Matunda and Moi's Bridge. This implies that selling prices changed often enough during the trading season depending on demand and supply conditions, creating opportunities for price arbitrage between these wholesale market centers.

Therefore, the wholesale market was comprised of one market sphere which consisted of the four major wholesale market centers, Kitale, Eldoret, Matunda and Moi's Bridge. Table 11 describes the characteristics of this market sphere and the degree of market concentration using the concentration ratio and Herfindahl index. An important caveat is that these concentration ratio results are based on data from the populatoin of wholesalers who participated in the study. Hence these measures of market concentration are overstated to the extent that these traders did not include all of the wholesalers who sold fertilizer in Western Kenya in 1999. Five of the eight large wholesalers and five of the six small wholesalers provided data.

Table 11. Buyer Concentration Ratios for the Population of Wholesalers, Fertilizer Trader Survey, Kenya, 1999

Wholesale Market Sphere	Composition of Market Sphere	No. of Wholesalers	No. of retailers	Concentration Ratio		Herfindahl-Hirshman Index (HI)	
				CR2	CR4	1/n	HI
1	Kitale, Eldoret, Moi's Bridge, Matunda	10	27	86	95	.10	.45

n/a = not applicable

Based on the concentration ratios, the wholesale market was highly concentrated in 1999. Two of the largest wholesalers accounted for 86 percent of the purchases and four of the largest wholesalers accounted for 95 percent of the market. However, there were 14 wholesalers in the survey population, whereas only 10 provided data, and these concentration ratios were calculated using data from this population of 10 wholesalers. Therefore, it is possible that the level of market concentration would have been substantially different if data for the population of wholesalers had been available. To assess the likelihood of this being the case, the study simulated what the market concentration ratios would have been if data for the population had been available. To do this, quantities purchased for the remaining 4 wholesalers were estimated by matching each one with one of the 10 wholesalers who had provided data. The most appropriate match for each of the 4 wholesalers was chosen from the population using location and easily visible physical assets such as store size. The results revealed that the estimated CR_4 for the population approximated the CR_4 for the sample (90 percent). However, the estimated CR_2 for the population (54 percent) was lower than the CR_2 for the sample (86 percent). Overall, the results for the sample approximate those estimated for the population, and the study concludes that the wholesale market in 1999 was characterized by market concentration.

Alternatively, rather than aggregating information about the relative sizes of firms into a single absolute measure, one could use a function of all the individual firms' market shares to measure concentration. The most commonly used function is the Herfindahl-Hirshman Index (HI), $(CV^2 + 1)/N$, where CV is the coefficient of variation[64] of firm size, defined as the volume of market share of individual traders or firms, and where N is the number of traders or firms. If all traders in the same market sold equal volumes, the CV would be zero and the Herfindahl-Hirshman index (HI) reduces to 1/n, or the reciprocal of the number of traders. A single trader in the market also would result in an index of 1/N, or one. Whereas the concentration ratio is an absolute measure, the HI is a relative measure; it is measured relative to 1/N, which indicates what market concentration would be if the market sphere was shared equally among firms (Steffen, 1995). These two measures, the concentration ratio and Herfindahl-Hirshman index, should produce similar results. Table 11 shows that the Herfindahl index is four times greater than 1/N and therefore, these results mirror those using the concentration ratio, that is, the wholesale industry is four times more concentrated than it would be if the market sphere was equally shared among the firms.

[64]The coefficient of variation is obtained when the standard deviation of a series is divided by the mean value of that series.

The results indicate that the wholesale market was highly concentrated. In addition, some of the wholesalers within the industry had market niches where a small number were the main or only supplier(s) and consequently they may have been able to operate as local oligopolies or monopolies in these markets.

7.2.3. Entry Conditions

7.2.3.1. Economies of Scale

Table 12 presents the cost structure for the largest wholesaler and the smallest wholesaler. These are costs per bag estimated by using the total number of bags purchased by each wholesaler in 1999.

Table 12. Cost Structure for DAP Fertilizer, Large and Small Wholesalers (Population), Fertilizer Trader Survey, Kenya 1999 (all figures in Ksh unless otherwise indicated)

	Largest Wholesaler	Smallest Wholesaler
Number of Bags Purchased	380,000	3120
	Ksh	Ksh
Cost Item (per 50kg bag)		
Weighted Average Buying Price (DAP)	1,300	1524
Handling costs	4	4
Weighted average transportation charges	60	56
Storage costs	3	8
Transit Losses	15	16
Overhead and Administration	4	12
Total Marketing Costs/bag	86	96
Total Costs/bag	1386	1620

Source: 1999 Fertilizer Trader Survey

Total costs per bag for the large wholesaler were 17 percent lower than those for the small wholesaler which indicates the presence of scale economies in fertilizer wholesaling. However, whereas total marketing costs for the large wholesaler were 12 percent lower than those for the small wholesaler, the difference in purchasing costs between the large and the small wholesaler was larger. This result indicates that scale economies in the wholesale market emanated from primarily from purchasing not marketing. With respect to marketing costs, costs per bag were higher for the small wholesaler for all cost components except handling costs and transport costs. Handling costs did not vary by size because they were the same in the busier and larger distribution centers of Eldoret and Kitale, where large wholesalers tended to be located, as they were and the smaller towns and locations within a 70 km radius where the small wholesalers were located. Transport costs were not a source of scale economies because the large wholesaler tended to source their fertilizer from longer distances and therefore had higher transport costs per bag, on average, than the small wholesaler. Transport costs per bag for the large wholesaler were seven percent higher than those for the small wholesaler. The small wholesaler had higher costs per bag for purchasing costs (17 percent), storage costs (116 percent), transit losses (6 percent) and overhead and administration costs (200 percent).

The evidence so far indicates that there was market concentration in the wholesale market and economies of scale in purchasing. With respect to barriers to entry, access to communication facilities did not pose a barrier to entry in the wholesale market. All the wholesalers in the population had telephones on their premises, and access to email and fax machines on their premises or nearby. They could use these facilities to obtain information on market conditions in Nairobi and other markets from importers and/or their contacts in the Ministry of Agriculture, and from retailers in other market centers who also had telephones.

Lack of access to credit may have posed a barrier to entry to the wholesale market in 1999. The benefit from using fertilizer can only be garnered months after its application, when the crop has been harvested and sold. However, farmers have a myriad of basic needs to fulfill (school fees, food, housing, medical expenses, etc.) at the same time as they need to put money aside to purchase inputs like fertilizer to increase crop production. Therefore, if farmers are to use this input, some type of credit to farmers is needed to bridge the gap between the time when the fertilizer is applied and the time the crop is harvested. However, if traders are to sell fertilizer on credit to farmers, they will themselves need some type of financing. To the extent that wholesalers require credit to purchase fertilizer a lack of credit facilities can pose a barrier to entry.

Ten of the 14 wholesalers in the population purchased fertilizer using a combination of cash and credit. Four were part of a vertically integrated supply chain, so they received their fertilizer from their head office; four purchased their fertilizer using credit in kind;[65] and two used a post-dated check with a duration of seven days. None of the wholesalers was required to make a down payment and none of them paid any interest. Out of the four of the wholesalers in the population that did not purchase fertilizer on credit in 1999, three were small wholesalers. That is, three of the five small wholesalers in the population

[65] This is a transaction which does not involve a transfer of funds but a request for (and acceptance of) fertilizer on consignment for repayment when sold.

were self-financed compared to only one of the five large wholesalers. All but two of the wholesalers in the population said their main source of cash was the revenue generated from non-agriculturally related businesses such as hardware and bicycle repair. The remaining two (both of them small wholesalers) had borrowed money from family members. The image emerging from these responses is that while large wholesalers enjoyed the advantage of benefitting from suppliers credit, small wholesalers had to be more self-reliant. In general, these results indicate that while access to credit did not pose a high barrier to entry to the wholesale industry (it was possible to enter the wholesale level without a credit facility in 1999), entry would be at a low scale, and the potential entrant(s) would have to be in another kind of business already so they could self-finance their entry. In summary, the wholesale market in 1999 was characterized by market concentration and economies of scale in purchasing, and low barriers to entry.

7.3. Conduct

This section looks at the following elements of coordination to describe wholesale market conduct: sources of information and the process of price discovery; non-price competitive strategies; and conflict and cooperation.

7.3.1. Price discovery

As discussed in Chapter Six, marketing strategies depend on access to reliable information in order to make rational decisions to the extent possible, for price discovery. With respect to the wholesale buying price, wholesalers reported that the prices tended to be fixed during the period of peak demand and negotiable during the off-peak period. Negotiable meant that haggling or bargaining was the mechanism for transacting and was aimed at establishing particular prices for specific transactions acceptable to both buyer and seller, within the price range that prevailed in the market. However, bargaining does not mean that price was necessarily reduced.[66]

With regard to setting the selling price, seven of the 14 wholesalers (all of them were non-vertically integrated) used mark-up pricing, whereas the four vertically integrated firms had their prices set by the parent company. The remaining three identified the prevailing market price and market supply and demand conditions as the most critical factors they considered when striking agreements on the selling price.[67] Effectively, there is little difference between these two factors. Under competitive market conditions, each factor expresses the other.

Information on market price was critical, as being able to undersell competitors was important to maintain market share and countervail buyer power. Some wholesalers indicated that a sudden drop in sales, even if sales were good an hour before, meant that a neighbor was undercutting you and you must respond. Second, retailers were well-informed, as any retailer would have gone round to a number of suppliers beforehand and would use this information to get a lower price by playing wholesalers against each other. As a counteractive measure, wholesalers sent employees around to pose as buyers and

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[66]The existence of price negotiation between wholesalers and their suppliers during the off-peak period indicates that by definition, wholesalers were not price-takers since they had a voice in helping determine the price.

[67]These were open-ended questions and these were the only options consistently cited by traders. That is, traders did not cite other possibilities such as: expected selling price in one month, in six months, or in one year; expected profit at sales location; market price of the day for complements like seed and pesticides; market supply and demand conditions for complements; availability of transportation; availability of storage.

hence remain informed about market prices and conditions. It is expected that such strategic behavior put downward pressure on margins.

These results illustrate that wholesalers conceptualized all transactions in terms of margins, and that the majority of wholesalers had some leeway to influence their buying price and their selling price in order to obtain a margin that they considered satisfactory to cover costs and generate a profit necessary to retain them in the industry. Most wholesalers claimed that they typically added a mark-up of between Kshs 30 to Kshs 50 per bag to their buying price which, in their view, was not excessive. Rather, it was just enough to cover their costs and give them a small return on their investment. The extent to which this claim is supported by the empirical data will be assessed in Section 7.4, when the performance of the wholesalers in 1999 is evaluated.

7.3.2. Non-Price Competitive Strategies

7.3.2.1. Cross-Subsidization

The evidence suggests that wholesalers had the ability to cross-subsidize across products and business activities to gain competitive advantage. First, in addition to fertilizer, wholesalers sold other agricultural inputs, agrochemicals, and hardware. Three of the wholesalers were also involved in grain trading and two were also in the transport business. All of the wholesalers in the population said they financed their fertilizer purchases with revenue generated from these other sales items and business activities. For the majority of firms, this was the only way they could obtain the necessary finance to enter and continue in the fertilizer trade given the lack of credit. Some traders reported that these products and business activities typically had higher price margins than fertilizer.

Since many of their costs (e.g., rent, storage, transportation) were shared jointly across more than one product and business activity, wholesalers had the ability to allocate a larger proportion of costs to these higher margin items.[68]

7.3.2.2. Financing

Providing interest-free credit-in-kind, whereby the consignment was paid for after it had been sold, was also an important source of competitive advantage in the wholesale market in 1999. Seven of the 14 wholesalers in the population sold fertilizer on credit in 1999.[69] All of them provided the credit in kind and none of them charged interest. Out of the seven wholesalers in the population who sold fertilizer on credit in 1999, one extended credit to 17 customers in 1999, three gave credit to over 10 customers, and three to fewer than 10 customers. Only one wholesaler gave credit for more than one month, and the remaining six extended credit for 7-14 days, for quantities that averaged at 70 bags per customer. The fact that all of these wholesalers had also received their fertilizer on credit probably influenced their ability and willingness to extend credit to retailers. Although data on what percentage of their sales was on credit was unavailable, there is evidence that wholesalers used variable credit terms as one more market device along with prices to ration supplies.

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[68]One wholesaler stated that for her business, fertilizer was a loss-leader but she continued to sell it to satisfy her customers' preference for one-stop shopping, and charged a higher price on other higher value products to compensate.

[69]The survey did not ask whether the credit wholesale sale price was more expensive than the cash wholesale sale price. However, in keeping with the principal of the time value of money, it is expected that it was. That is, one would expect that larger volumes of sales on credit did not offset the need for liquidity sufficiently to the point that would enable traders to make credit sales at the same price as cash sales.

7.3.3. Interstage Cooperation and Conflict

This section describes the actions taken by wholesalers in the population in 1999 to facilitate vertical coordination in the private-sector-led marketing system and reduce transaction costs.

Just as the source of transaction costs at the importer level was uncertainty of reliable distribution outlets, the source of transaction costs in the wholesale market was uncertainty about obtaining a reliable supply of fertilizer. The result was all of the wholesalers in the population had a main supplier they purchased fertilizer from throughout the trading season. Using the same supplier repeatedly resulted in relationships that were characterized by trust, obligation, and mutual understanding. This solidified relationships and hence reduced the transactions costs arising from uncertainty regarding quantity and reduced the likelihood of missed sales due to stockouts. Using the same supplier also increased the likelihood of purchasing fertilizer on credit since the absence of steady supplier-buyer relations, possibly characterized by regular transactions with suppliers and fixed quantity purchases, buying fertilizer on credit is less likely.

However, it may have created a barrier to entry and reduced competitiveness in the wholesale market. Competitive markets are characterized by reliable and frequent transactions between anonymous traders, where institutions exist that minimize uncertainty. In such a market, traders can shop around first and select the final supplier for a particular transaction depending on the price. However, coordination between importers and wholesalers in the population was characterized by repeated transactions between known parties which took time to cultivate. Therefore, potential entrants would not have had the opportunity to build relationships with suppliers. Hence initially they would have had to make their purchases from numerous suppliers (with the attendant higher transaction costs) at less favorable terms than incumbents. However, the evidence indicates that this fixity in trade relations at the importer-wholesaler level did not act as a barrier to entry because importers competed fiercely for wholesalers and offered very similar terms and conditions with respect to credit and delivery.

Despite regular transactions with suppliers, formal contracts did not exist between wholesalers and their suppliers. It is not clear whether the hesitancy to formalize these supplier relationships through contracts emanated from suppliers or buyers. However, despite the lack of evidence of explicit contracts between wholesalers and their suppliers, the study found that all of the wholesalers in the population used (informal) forward buying contracts and credit-in-kind arrangements. All but three of the wholesalers in the population used forward buying contracts by setting their buying prices at the time they placed their orders by phone. In all cases, the final price paid under the forward buying contract was the same as the one originally agreed upon, meaning that suppliers honored the verbal contracts. Moreover, at various times during the trading season, wholesalers bought fertilizer using credit-in-kind, which involved leaving a post-dated check or just promising to pay their supplier within seven days. These informal contractual arrangements and credit extension spread the risk of price fluctuations between buyers and sellers and improved the flow of the product to the farm-gate, thus increasing time and place utility.

In summary, wholesalers in the population used informal contracts to improve coordination and engaged in single-supplier trade relationships which reduced transaction costs. However, these trade relationships may also have acted as a barrier to entry thus reducing competitiveness in the wholesale market.

7.4. Performance

As was the case for importers, this section will use the static efficiency and dynamic performance criteria outlined in Chapter Two, as well as institutional and government policies criteria, to evaluate wholesale markets.

7.4.1. Efficiency Performance Criteria: Profit and Loss Accounts

7.4.1.1. Marketing Margins and Percent Net Returns: Large and Small Wholesalers

The profit and loss account for the five large wholesale firms in the population for which data were available are presented in Table 13. All of the profitability measures are positive, indicating that these trading enterprises were profitable in 1999. Gross profit per bag ranged from Kshs 129 to Kshs 215 and net profit per bag ranged from Kshs 60 to Kshs 121. The annualized rates of return over the seven month period ranged from 33 percent for large wholesaler number 32 to 87 percent for number 16.

Table 13. Profit and Loss Accounts for the Population of Large Wholesalers, Fertilizer Trader Survey, Kenya 1999 (All figures in Ksh unless stated otherwise)

	TRADER ID				
	#16	#32	#36	#41	#62
Total Purchases (50 kg bags)	19,285	41,600	4,981	186,000	380,000
Sales Revenue	20,081,800	49,221,000	5,745,210	218,000,000	460,000,000
Total Purchasing Costs	17,148,200	43,861,000	5,098,660	178,000,000	397,000,000
Gross Margin	2,933,600	5,360,000	646,550	40,000,000	63,000,000
Less Marketing Costs					
Transportation Costs	385,700	1,874,000	158,350	13,020,000	22,800,000
Handling costs	96,425	208,000	24,905	930,000	1,900,000
Storage costs	57,855	124,800	14,943	558,000	1,140,000
Transit Losses	200,818	480,010	57,312	2,175,000	4,596,000
Administration	77,140	166,400	19,924	744,000	1,520,000
Total Marketing Costs	817,938	2,853,210	275,434	17,427,000	31,956,000
Total Costs	17,966,138	46,714,210	5,374,094	195,427,000	428,956,000
Net Margin	2,115,662	2,506,790	371,116	22,573,000	31,044,000
Performance Measures					
Gross Profit/bag	152	129	130	215	166
Net Profit/bag	110	60	75	121	82
Working Capital (Kshs)*	5,962,398	17,473,543	1,550,099	106,427,000	120,178,222
Annualized Rate of Return (%)	87	33	18	39	69
Annualized Rate of Return (Ksh)	5,187,286	5,766,269	279,018	41,506,530	82,922,973

*Working capital for each trader is calculated as the final total purchasing cost plus total marketing costs. The final total purchasing cost for an individual trader depends on whether the trader used capital simultaneously or sequentially to purchase their fertilizer throughout the trading season. If a trader used more than one set of capital simultaneously (from different suppliers) to purchase their consignments, this trader was operating with a larger capital base. To take this into account, the final total purchasing cost for this trader is total purchasing cost divided by the number of consignments times the number of suppliers. If a trader only used one set of capital at any given time during the trading season to purchase her or his consignments, this trader was operating with a smaller capital base. Hence, the final total purchasing cost for this trader is total purchasing costs divided by the number of consignments.

The profit and loss accounts for the five small wholesale firms in the population for which data were available are presented in Table 14. The net profit per bag and percent net returns to buying price (per bag) for all the small wholesalers in the population were positive meaning that all these firms were profitable in 1999. The gross profit margins for population small wholesalers ranged from Kshs 97 to Kshs 324, while net profit per bag ranged from Kshs 45 to Kshs 218. The annualized rates of return over the trading season ranged from 10 percent for small wholesaler number 46 to 276 percent for small wholesaler number 45.

Table 14. Profit and Loss Accounts for the Population of Small Wholesalers, Fertilizer Trader Survey, Kenya, 1999 (Ksh)

	TRADER ID				
	#31	#44	#45	#46	#47
Total Purchases (50 kg bags)	4,950	3,120	3,228	8,320	8,180
Sales Revenue	5,792,000	4,904,600	3,452,950	12,480,000	9,741,800
Total Purchasing Costs	5,313,500	4,070,500	2,997,910	9,786,400	8,835,400
Gross Margin	478,500	834,100	455,040	2,693,600	906,400
Less Marketing Costs					
Transportation Costs	79,500	31,200	32,280	1,040,000	380,800
Handling costs	19,800	12,480	12,912	33,280	32,720
Storage costs	39,600	24,960	25,824	66,560	65,440
Transit Losses	57,745	49,046	34,267	123,760	96,278
Administration	59,400	37,440	38,736	99,840	98,160
Total Marketing Costs	256,045	155,126	144,019	1,363,440	673,398
Total Costs	5,569,545	4,225,626	3,141,929	11,149,840	9,508,798
Net Margin	222,455	678,974	311,021	1,330,160	233,002
Performance Measures					
Gross Profit/bag	97	267	141	324	111
Net Profit/bag	45	218	96	160	28
Working Capital (Kshs)*	3,207,989	1,511,959	427,605	6,256,640	2,087,062
Annualized Rate of Return (%)	20	98	276	10	44
Annualized Rate of Return (Kshs)	641,598	1,481,720	1,180,190	625,664	918,307

***Working capital for each trader is calculated as the final total purchasing cost plus total marketing costs. The final total purchasing cost for an individual trader depends on whether the trader used capital simultaneously or sequentially to purchase their fertilizer throughout the trading season. If a trader used more than one set of capital simultaneously (from different suppliers) to purchase their consignments, this trader was operating with a larger capital base. To take this into account, the final total purchasing cost for this trader is total purchasing cost divided by the number of consignments times the number of suppliers. If a trader only used one set of capital at any given time during the trading season to purchase her or his consignments, this trader was operating with a smaller capital base. Hence, the final total purchasing cost for this trader is total purchasing costs divided by the number of consignments.**

Source: 1999 Fertilizer Trader Survey

These rates of return are a reflection of turnover rather than profitability. To assess profitability these annualized returns (in Kshs) were compared to the earnings these traders could have made from their next best alternative, being employed by someone else. Based on the interviews, a large wholesaler in the population would have to be paid a monthly salary of at least Kshs 60,000 (US$ 857) to be employed elsewhere, or an annual salary of Kshs 720,000 (US$ 10, 286). The results revealed that fertilizer trading was a worthwhile investment for all but one of the 5 large wholesalers in population. That is, large wholesaler number 36 made a lower return (Kshs 279, 018) than he would have been able to make in his next best alternative. The remaining four large wholesalers made annualized returns that ranged from 29 percent to 75 percent of their total investment (after taking into account the opportunity cost of entrepreneurship). Similarly, a small wholesaler would have to be paid an annual salary of Ksh 240,000 (US$ 3,429) to be employed elsewhere. All of the small wholesalers made annualized returns that were higher than their potential earnings from their next best alternative, and these returns ranged from 6 percent to 220 percent of their total investment. Therefore, in general, fertilizer trading was a very profitable investment for the population of wholesalers in that it gave them a higher return than they would have earned from their next best alternative.

However, these returns are overestimated for three reasons. First, large wholesalers and some small wholesalers owned some fixed capital in the form of warehouses and trucks that were not included in the calculation. There are also other hidden costs wholesalers bear such as the cost of selling fertilizer on credit (in kind) and transaction costs. The main source of transaction costs was uncertainty of obtaining a reliable supply of fertilizer which may have varied according to the quality of the wholesaler's relationship with their main supplier. These costs were not included in the calculation of operating costs.

Third, there was quite a bit of variability in the returns per consignment of the individual wholesalers. For example, large wholesaler number 16 purchased 10 consignments in 1999, and made a weighted average rate of return per consignment of 13 percent, but his net returns per consignment ranged from two percent to 24 percent. To assess the relative variability in the data, the coefficient of variation of this trader was calculated.[70] The coefficient of variation was 61 percent which means that the values of the percent net returns for the individual consignments varied by an amount that was over half the size of the mean, 61 percent. If the net returns were normally distributed, 2/3 of them would vary between 11 percent +/- 6.66 percent, that is, between + 4.34 percent and +17.66 percent.

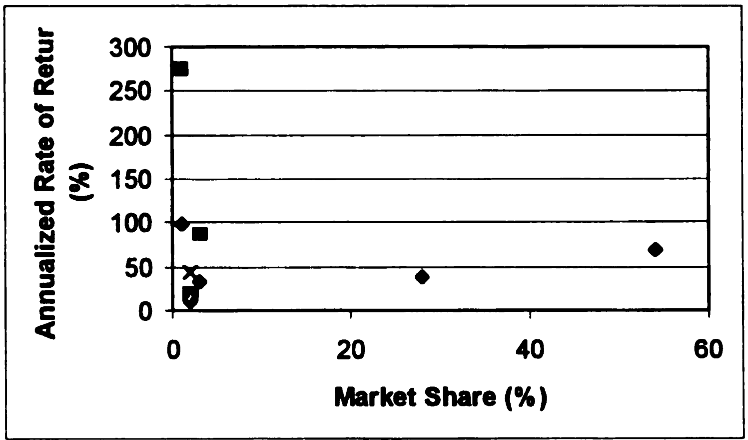
The variation in the net returns of all of the remaining wholesalers was also considerable; their coefficients of variation ranged from .29 to 1.30. In other words, their net returns varied from an amount that was 29 percent of the mean to an amount that was over 100 percent of the mean which implies considerable dispersion in the net returns of these traders. Therefore, although wholesalers in the population generally made positive

[70]The coefficient of variation is a relative measure of dispersion. It relates the standard deviation and the mean by expressing the standard deviation as a percentage of the mean (Levin, 1984).

returns on their consignments, the variability in these returns was high and hence, wholesalers may have included a risk premium in their margins to compensate. Once wholesalers had taken the variability in their returns into account by adding a risk premium to their margins, and made provisions in a similar manner for fixed costs, the cost of credit and transaction costs, it is likely that three of the five large wholesalers and three of the five small wholesalers would have made lower adjusted annualized returns

In order to assess whether the rates of return in the wholesale market could be associated with market structure, wholesalers' annualized rates of return were compared to their market shares. The study found that although the wholesale market is concentrated, entry barriers were low. Therefore, the hypothesis is that the adjusted annualized rates of return for wholesalers are not positively correlated with market share since the threat of entry prevented larger wholesalers from exerting their market power to increase their returns. Figure 10 plots the percent market shares of all the wholesalers against their annualized rates of return.

Figure 10. Percent Annualized Rate of Returns and Market Shares in the Wholesaler Market, (Population) Fertilizer Trader Survey, Kenya 1999



The results in Figure 10 do not support the hypothesis. On average, there is no relationship between market share and the annualized rates of return of fertilizer wholesalers. However, the results imply that some wholesalers enjoyed local oligopolies. The highest returns were in Matunda, a town in between Kitale and Eldoret with four small wholesalers. These wholesalers had market shares that ranged from one percent to three percent of the total purchases by wholesalers in the population, but on average, they made the highest annualized returns. For example, wholesaler number 47 had a market share of two percent and made an annual return of 44 percent and wholesaler number 44 had a market share of three percent and made an annual return of percent of 98 percent. In contrast number 62 with the largest market share (52 percent) made an annual return of 69 percent. These results imply that the wholesalers in Matunda enjoyed a local oligopoly, possibly because the transfer costs to the other wholesale towns were, on average, higher than the price differences which reduced the opportunities for price arbitrage. Therefore, they may have been able to collude to set market prices higher than marginal cost, and thus made above normal profits.

These results imply the existence of two wholesale market spheres, one consisting of Kitale, Eldoret and Moi's Bridge (Market Sphere One) and the second market consisting of Matunda (Market Sphere Two) where four small wholesalers may be enjoying a local oligopoly that has enabled them to obtain returns that are higher than their marginal cost. However, Figure 10 represents bivariate analysis and does not conclusively depict the relationship between market share and rates of return. It is very likely that there are other factors, such as seasonality and fertilizer type that could explain the variation in wholesalers' returns. For example, during the peak trading season the majority of wholesalers are selling fertilizer, therefore concentration is expected to be low whereas margins are expected to be relatively high. However during the off-peak season, a large number of traders typically exit the industry and only the larger firms for whom fertilizer is a more permanent business remain. The market will be more concentrated and the margins will be lower to reflect more elastic demand conditions. If a variable to capture the effect of seasonality on market concentration and gross margins is not included in the model, the marginal impact of the market concentration variable will be confounded by this variable. Therefore, the following section will use multivariate analysis in order to test more rigorously the hypothesis of market power in the wholesale market, and identify other variables that may be influencing rates of return.

7.4.2. Regression Analysis of Marketing Margins

7.4.2.1. Gross Marketing Margins as Performance Measures - A Brief History

Agricultural price spreads are commonly used as measures of the performance of agricultural industries. These spreads or 'marketing margins' are defined as the difference between buying and selling prices of a specific commodity (for the equivalent quantity of the product) at different stages of supply chains. As such, they are the price of marketing services (such as transportation, storage, financing) or marketing costs. The traditional approach to marketing margin analysis was to examine the relationship between prices at successive stages of marketing channels under the assumption of perfect competition in the relevant industry. The corresponding model specification which has been applied in marketing margin studies is the price spread model developed by Gardner (1975). The model allows for an analysis of how supply and demand forces influence the price of marketing services or marketing costs. Since the publication of Gardner's paper in 1975, numerous researchers have applied the framework to address a number of marketing issues. These studies have viewed the price spread as a performance indicator because it includes marketing costs and margins.

However, the model's applicability is limited by a number of restrictive assumptions, the most stringent one being that of perfect competition in the food industry. That is, to paraphrase Azzam (1997), the competitive approach does not address a fundamental question regarding agricultural price margins, namely, are margins competitive, or do they reflect, in part, the exercise of market power at various stages within the industry or marketing system? That is, the presence of imperfect competition means marketing agents are able to exercise some control over marketing margins and modify the absolute (and relative) marketing margins independently of marketing costs and/or alter marketing costs themselves.

In response to this shortcoming, an extensive literature has developed about the potentially noncompetitive conduct of firms in these industries and on determinants of marketing margins under imperfect competition, using the modified price spread model (Holloway, 1991; Kinnucan and Nelson (1993); Azzam (1997); Azzam and Schroeter

(1995). However, such analysis of marketing margins in input markets under imperfect competition has not been done in the African context; margin analysis has focused on output markets and has assumed perfectly competitive conditions. This research sets out to fill this gap in the literature and applies the analysis to the fertilizer industry in Kenya (For a full exposition of the conceptual framework and theoretical model, see Appendix 7).

7.4.2.2. Regression Analysis of Wholesaler Marketing Margins

The key policy question driving the analysis of gross margins is whether the structure of the wholesale and retail markets in 1999 allowed some traders to inflate their gross margins beyond what was necessary to make a normal return (that is, each firm sets price equal to marginal cost and operates at minimum average cost so that it is making zero economic profits or a competitive return on its investments). This section addresses this question using regression analysis of wholesaler margins. Chapter Eight carries out similar analysis of retailer margins.

So far, the analysis of the wholesale market reveals the following. First, the structure of the wholesale market is characterized by market (buyer) concentration and low barriers to entry, namely access to information and access to credit. Second, the profitability analysis indicate that in general wholesalers made annualized returns that were substantially higher than the return they could have made in their next best alternative. However, these rates of return were overestimated to the extent that they were also a return to risk, entrepreneurship, and fixed capital investments. Third, there was no correlation between market share and annualized rates of return, although there was evidence of localized oligopolistic behavior and therefore, two wholesale market spheres were identified, Market Sphere One and Market Sphere Two.

Since the profitability results do not provide a conclusive answer as to the nature of the relationship between market concentration and returns to trade in the wholesale market, this section uses multivariate analysis to test the following hypotheses: (1) Due to the threat of entry, wholesalers were not able to exert market power, that is, inflate their gross margins by lowering their buying prices and/or increasing their selling prices; (2) Wholesalers matched a one-unit change in marketing costs with a commensurate change in their selling price. Hence, they did not absorb any increase in marketing costs but passed on the full increase on to their customers.

A regression model was formulated for fertilizer wholesalers and data from the survey of traders were used to define variables that might influence trader marketing margins. The model was run for wholesalers in Market Sphere One and wholesalers in Market Sphere Two. In generalized form, the model reads as follows:

$$GM_{itm} = \beta_0 + \beta_1 TOTOPCOS_t + \beta_2 HI_{tm} + \beta_{3\text{-}8} MONTH_{it} + \beta_{9\text{-}13} FERTTYPE_{itm} + \alpha_t + \varepsilon_{itm} \quad (7)$$

where:

i indexes individual consignments (i is a subset of [1,....,167]);

t indexes individual traders who purchased the consignments (t is a subset of [1,...,10]) since 10 of the 14 wholesalers in the population provided data;

m indexes month the consignment was purchased (m = January to July, with March excluded as the base month). If the variable does not have a m subscript, it represents the whole trading season. The description of the variables is given below:

GM_{itm}	= the gross margin of the i^{th} consignment purchased by the t^{th} trader in the m^{th} month;
$TOTOPCOS_t$	= the total marketing costs per unit of trader t over the fertilizer trading season;
HI_{tm}	= market concentration as measured by the Herfindahl index, for trader t in month m;
$MONTH_{it}$	= a dummy variable indicating the month consignment i was purchased by trader t. The fertilizer trading season lasted from January to July. It will be used to clean up potential trending taking March as the base;
$FERTTYPE_{itm}$	= a dummy variable indicating fertilizer type of consignment i purchased by trader t in month m. Traders in the population purchased six types of fertilizer. This variable will be used to clean up potential trending taking the DAP fertilizer as the base;
α_t	= is trader specific error;
ε_{itm}	= is standard regression error;
β	= the coefficients associated with the explanatory variables.

Anticipated relationships between gross margins and the explanatory variables were established a priori. A variable for operating costs (TOTOPCOS) is included in the model to test whether wholesalers pass on the full cost of marketing to consumers, absorb some of the marketing costs or inflate their margins over and above what is necessary to cover marketing costs. The null hypothesis is that the coefficient on TOTOPCOS, β_{17}, is *not* significantly different from 1.0. That is, any increase in marketing costs is fully passed on to customers. If, on the other hand, the coefficient on TOTOPCOS is significantly larger than 1.0, wholesalers are able to influence their price (they are price-setters). If the coefficient is significantly less than 1.0, wholesalers are absorbing losses as market prices fluctuate.

To test whether the market is competitive or whether large wholesalers were able to exert their market power to inflate their margins, the model includes a measure of market concentration, the Herfindahl Index (HI). In the model, this variable measures market concentration in the wholesale industry for trader t in month m (HI_{tm}). The null hypothesis is that the coefficient is equal to zero, that is, if market concentration increases by one index unit the corresponding increase in the gross margin of the average firm in the industry will not be statistically significantly different from zero. MONTH is the month the fertilizer was purchased. Although the fertilizer trading season for the long rains lasts from January to July in Kenya, demand for planting fertilizer peaks in March/April, when the rains begin, and demand for top-dressing fertilizer peaks in May/June. Accordingly, in 1999, the price of planting fertilizers like DAP increased between January and April, peaking in April, and the price of top-dressing fertilizers like urea increased between March and July, peaking in May/June. To account for the impact of this seasonality on the margins the model includes six dummy variables, with one month, April, as the base month. The coefficients on the month variables will be tested for joint significance.

FERTTYPE is the type of fertilizer. Fertilizers are priced differently by type, and hence their margins may also differ. Alternatively, if the margins, in equilibrium represent the per-unit cost of marketing services, and if these do not vary by fertilizer cost, one would expect the per-unit marketing margins to be the same across fertilizer types. Accordingly, dummy variables for fertilizer types are included to account for any variation in margins due to the type of fertilizer, taking DAP fertilizer as the base fertilizer since in general DAP had higher prices and gross margins than the other fertilizers.

7.4.2.3. Econometric Considerations and Estimation Procedures

The study identified two problems with the model. The first problem with the model is endogeneity. In general, the problem of endogeneity means that some of the explanatory variables could be reflecting the effects of variables in the error term on the dependent variable. For example, due to lack of data the model does not include trader fixed assets, so this variable is in the error term. It could be correlated with the gross margins because traders with more assets are likely to be more efficient and have lower gross margins. It could also be correlated with an independent variable like market concentration (which is based on the number of bags purchased per trader) because traders with more assets are better suited to buy in large consignments to take advantage of price and quantity discounts. As a result, the impact of the market concentration variable on gross margins could also be reflecting the effect of traders assets on the same.

The key question driving the analysis of gross margins is whether the structure of the wholesale (and retail) market in 1999 allowed fertilizer traders to inflate their gross margins or whether the markets were contestable so that the margins approximated those that would prevail under competitive conditions. Formulating a hypothesis to answer this question (using a measure of market concentration such as the concentration ratio) will only be meaningful if the measure of market concentration is exogenous that is, it is determined before profitability and is not affected by profitability.

However, the most commonly used measures of market concentration, concentration ratios and Herfindahl indices, are not exogenous measures of market structure. They depend on the profitability of the industry. For example, many studies use the number of firms as a measure of the structure of an industry, the hypothesis being that industries with a larger number of firms are more competitive. However, this may not be the case since profitable industries induce entry (if there are no barriers to entry). Thus, in the short run, an inherently competitive industry may actually have a small number of firms, and in the long run many additional firms will enter if profits are high. Therefore, the assumption that structure is determined before profitability, and that profitability does not affect structure, is not necessarily sound. Failure to use exogenous measures of structure leads to the simultaneous equations estimation problem.

A typical solution to the problem of endogeneity and simultaneity is to use the two-stage least squares estimator. However, the gross margin models in this study cannot use this solution to address these two problems of due to lack of data. Therefore, in the case of the endogenous variables, caution will have to be used when interpreting the impact of the explanatory variables in the model on the dependent variable since it will not be possible to say with certainty how much of the effect on the dependent variable is due to the explanatory variable and how much is due to variables in the error term. In the case of simultaneity between the market concentration measures and profitability, one alternative would be to use exogenous barriers to entry variables to measure structure. For example, if the government historically prevented entry in a few industries, those industries with the barrier should have higher profits but the higher profits do not induce additional entry.

Unfortunately this option is not viable for this study due to lack of data. However, since the survey data is cross-sectional and for a short period of time, the analysis will assume that the feedback between profitability and the measure of market concentration in the model was not instantaneous. That is, it is reasonable in the short run to assume that all the explanatory variables in the model are exogenous variables. However, in the case of missing variables like the lack of information on trader assets, such an approach will not work since these variables are excluded from all cases so the potential bias remains regardless of whether the observations are short-run or long-run.

The third problem arises due to the configuration of the data set. It consists of different consignments of fertilizer purchased over a period of seven months by the same group of traders (10 wholesalers and 30 retailers), which makes it necessary to use panel data estimation methods. Secondly, it is hypothesized that there are locational factors and trader characteristics that are specific to individual traders that are correlated with an explanatory variable, marketing costs, but they do not vary over time for each trader.

These locational factors include but are not restricted to the following. First, geographical features like trader's location and factors specific to that location may affect some of the explanatory variables. Geographical features such as distance of the trader from his or her supplier, the quality of roads leading to the trader's location, and the frequency and different modes of transportation available to that location will all affect transport costs. Factors that are specific to locations can affect gross margins by influencing demand and market prices. Locations can have different levels of fertilizer use that are slow to change and certainly will not change over a seven-month period due to factors such as the agroecological characteristics of the location, which affects demand for fertilizer, and the sociodemographic features of the population (age, race, income, education), which affects attitudes regarding fertilizer use. These all affect operating costs and gross margins via their impact on market price and operating costs.

Second, the number of years a firm has been in the fertilizer industry is a measure of the amount of experience a firm has accumulated. As such, it is a proxy for human capital. The longer a firm persists in a line of business, the more advantages it can accrue over potential entrants. It has had more time to cultivate customer loyalty and establish contacts with suppliers and transporters, which enable it to source fertilizer more cheaply via price and quantity discounts. Therefore, the longer a firm has been in the business, the lower its purchasing and marketing costs will be; thus, the number of years is hypothesized to decrease total marketing costs, and therefore, gross margins.

Third, different traders have their own methods of carrying out business (their standard operating procedures), which are fairly constant over the trading period and influence marketing costs and whether the trader was able to take advantage of scale economies, such as whether the trader delivered fertilizer to its customers; trader's credit practices; whether the trader rebagged his or her fertilizer and whether the trader purchased from a vertically integrated supplier. All these locational and trader-specific characteristics do not vary over the trading period; they are fixed or time-invariant.

The impact of these locational and trader-specific characteristics on marketing costs is unobservable. For example, two traders may pay the same amount per month to rent a warehouse of the same size, but Trader A is more efficient in the use of storage space than Trader B. As a result, although their reported storage costs per bag/month are the same, trader A's actual storage costs per bag are lower. However, this difference in storage costs between Trader A and Trader B is not measurable using ordinary least squares and therefore it will be in the error term.

Applying this same principle to the marketing costs of a group of traders, the differences in marketing costs between individual traders that are due to their individual characteristics often are not measurable. Therefore, these difference will not be captured by the coefficient on total marketing costs. They will be in the error term and hence the probability distribution of the error terms will not be constant and equal for the different traders; they will vary with the trader specific characteristics. The usual ordinary least squares assumptions of the error term (that is, homoskedastic and uncorrelated with itself and with the explanatory variables) will not hold and therefore, ordinary least squares will not yield unbiased estimators. Instead the model requires a technique that allows the errors of the different traders to have different variances.

The appropriate model is a fixed effects model that uses a variable, α_t, to represent and control for the time-invariant unobserved effect and leaves the pure impact of marketing costs on gross margins. The model assumes that the unobserved effect is correlated with the dependent variable and the explanatory variable. (In contrast, the random effects model would be appropriate if the assumption was that the unobserved effect was uncorrelated with all the explanatory variables). α_t is a trader-specific error or trader fixed effect, where t denotes the different traders. It is the trader fixed effect because it represents all the trader characteristics affecting trader gross margins and the explanatory variables, but that do not change over time. Hence it differs between traders, but for a particular trader its value remains constant or fixed.[71] As a result, the fixed effects model allows a differential intercept for each trader, but only one slope parameter. This intercept (the fixed effect error term) is like a dummy variable that picks up all the variation in gross margins between traders due to their behavior and geographical location. However, since it is a trader-specific error, it will "pick up" a lot from these omitted variables, which

[71]There are some trader characteristics that affect gross margins and marketing costs that vary over time but are unobservable. For example, depending on the customer, a trader may deliver fertilizer for free or sell fertilizer on credit, and absorb these costs. These hidden costs were not captured by the data so they are not included in the calculation of marketing costs. Although they are unmeasurable, because they vary over time for individual traders, they are not captured by the fixed effect variable. Therefore, they are included in the error term.

makes the coefficient difficult to interpret. In contrast, ε_{itm} is assumed to be the standard error term for each observation i; it is unobserved, varies with each trader t, and is time-varying for each month m. It has the usual properties: a mean of zero, homoskedastic, uncorrelated with itself, the explanatory variables and the trader specific error.

7.4.3. Results and Interpretation

The linear model with gross margins per bag as the dependent variable was estimated using the fixed effects estimator. Table 15 presents the estimation results for both Market Sphere One (Kitale, Eldoret, Moi's Bridge) and Market Sphere Two (Matunda). The R^2 and significant F-statistic indicate that, together, the thirteen regressors explain a considerable degree of the variability in gross margins of fertilizer wholesalers in 1999. The coefficient on TOTOPCOS is not significantly (statistically) different from 1 at the 5 percent level of significance for either Market Sphere One and Market Sphere Two. That is, in both market spheres, a one unit increase in marketing costs was associated with a commensurate increase in the gross margin. That is, while wholesalers did not increase their margins above their marginal cost, they added a mark-up that reflected costs to their buying price. Therefore, they also did not absorb any cost increases but passed the full impact of any cost increase on to their customers.

The results of the test of the market power hypothesis indicate that an increase in the Herfindahl index, the measure of market concentration, could be associated with an increase in gross margins of Kshs 313 in Market Sphere One and of Kshs 274 in Market Sphere Two, and these coefficients are significant at the one percent level of significance.

Table 15. Estimation Results of the Fixed Effects Linear Model of Gross Margins, Population of Wholesalers, Fertilizer Trader Survey, Kenya 1999

Dependent Variable: Gross Margins	Market Sphere One (Kitale, Eldoret, Moi's Bridge)		Market Sphere Two (Matunda)	
Independent Variables	Coefficient	t-statistic	Coefficient	t-statistic
Intercept	39.49	0.64	139.72	4.59
HI	312.91	3.40*	273.57	8.48*
TOTOPCOS[1]	.12	-1.49	.75	1.38[1]
MONTH1	-81.11	-1.33	-79.46	-3.60
MONTH2	-43.86	-1.26	10.93	0.52
MONTH4	-5.71	-0.14	-77.41	-3.36
MONTH5	-97.52	-2.17	-97.66	-4.86
MONTH6	-47.55	-0.93	-142.22	-6.53
MONTH7	-15.55	-0.38	-121.13	-5.17
F-test for Joint Significance of MONTH (H0: equality of MONTH coefficients)	F (6, 27) = 1.11 Prob > F = 0.3815		F (5, 104) = 12.18 Prob > F = .0000	
FERT2	-41.04	-0.88	-71.37	-2.17
FERT3	-47.38	-1.44	1.52	.04
FERT4	-6.63	-0.24	-53.36	-2.98
FERT5	-69.10	-2.58	-128.15	-6.32
FERT7	-68.08	-2.21	-143.44	-7.83
F-test for Joint Significance of FERTTYPE (H0: equality of FERTTYPE coefficients)	F (5, 27) = 1.83 Prob > F = .1407		F (5, 104) = 13.76 Prob > F = .0000	
	No. of Observations = 46 Number of groups = 6 F (13. 27) = 3.82 Prob > F = .0016 R^2 within = 0.65		No. of Observations = 121 Number of groups = 4 F (5, 104) = 13.76 Prob > F = .0000 R^2 within = 0.79	

[1] The null hypothesis is that the coefficient on TOTOPCOS is *not* significantly different from 1.0, that is, wholesalers pass on the full cost of marketing to consumers. The absolute value of the observed t statistic (-1.38) is less than the critical t (1.96) at the 5 percent level of significance. Therefore, the model fails to reject the null; * Significant at the one percent significance level

The variables for seasonality (MONTH) and fertilizer type (FERTTYPE) were not jointly significant for Market Sphere One, but they were for Market Sphere Two. This difference may be a reflection of the lack of variation in months and fertilizer type in the data for Market Sphere One. In contrast, there is more variation in these variables in the data for Market Sphere Two and the results for this market sphere are in keeping with a priori expectations. The coefficients on the MONTH variables are all negative (with the exception of the coefficient MONTH2 which is not statistically significant), which indicates that gross margins during the base month of March were higher than those in all the other months. This is to be expected since March was the month when there was a shortage of DAP fertilizer, and as a result prices were significantly higher. The coefficients on FERTTYPE all have negative signs, which indicates that, as expected, DAP fertilizer had larger margins on average than any other type of fertilizer. Again, there is one exception, FERT3 (NPK 20:20:0) which is not statistically significant.

7.4.4. Dynamic Performance Criteria

This section evaluates the wholesale market using two dynamic performance criteria: product suitability and progressiveness.

7.4.4.1. Dynamic Performance Criteria

This performance dimension involves matching products with consumer preferences. The norm is that the fertilizer available to farmers should be made available at the right time and place, in the right quantity and quality. Secondly, fertilizer should be of the right type in that the variety of types of fertilizer available should be sufficiently varied to meet consumer preferences (price, nutrient content, bag size) without being excessively trivial or costly.

7.4.4.2. Delivery

In addition to prices, wholesalers competed for downstream business by offering extra services. Eleven of the 14 wholesalers in the population delivered fertilizer to their customers by using their own smaller short-haul trucks (3-ton canters or 7-10 ton lorries) or by arranging transportation with small transporters. Seven of the wholesalers who delivered did so to attract and maintain customers and four delivered on customers' request only. Delivery was "free" subject to a minimum purchase condition of 100 50 kg bags.[72] Otherwise delivery was at cost or not at all. It follows that any wholesaler who was unable to offer this service was at a competitive disadvantage as compared to his rivals who could.

7.4.4.3. Quality Control

With respect to quality control, all of the wholesalers in the population said they visually inspected their fertilizer purchases on a random basis for quality before payment. The indicators of fertilizer quality are weight of the bag, friability of the fertilizer, and the integrity of the bag (the seal should be firm and untampered with and the bag untorn). The agency responsible for implementing and monitoring fertilizer grades and standards, the Kenya Bureau of Standards (KBS), is supposed to test fertilizer for

[72]Presumably wholesalers took some of the cost of delivery into account when setting their mark-ups.

quality at the point of sale at the retail and wholesale level. However, in reality, testing only takes place at port of entry and the depots/godowns in Mombasa. As a result, 67 percent of the wholesalers in the sample reported quality problems in 1999, and quality control was the third most frequent suggestion for government intervention in 1999. The most common quality problem experienced by wholesalers in the population was underweight bags.

7.4.4.4. Progressiveness

This performance dimension requires an evaluation of how well the marketing system has adopted changes such as new organizational arrangements and handling methods that could reduce marketing costs and/or improve products and services relative to consumer wants. The norm is how well does an industry do relative to its opportunities. In 1999, wholesalers in the population adopted organizational arrangements to reduce unit costs. Five of the 14 wholesalers in the population combined marketing functions with one another in 1999. Transportation was the main marketing function combined, although some firms combined storage and financing. Wholesalers in the population said they combined these marketing functions because it enabled them to operate at or near full capacity, thus reducing costs per unit. It also allowed them to obtain price discounts, which widened gross profit margins. There were also logistical advantages to combining purchases: one party to the arrangement could go and take care of the transaction, while the other party continued running their business. This eliminated the necessity to stop operating while procuring supplies thus avoiding missed sales.

However, there were disadvantages to combining activities to take advantage of scale economies. These disadvantages included difficulties in managing the stock and opportunistic behavior. In the case of stock management, the problem was poor planning. In one instance where wholesalers combined storage, only one partner had the key to the warehouse. As a result, when he was absent, the other partner could not access the fertilizer, which resulted in missed sales. In the case of opportunistic behavior, one partner tried to claim more of the combined shipment than he had originally ordered.

Despite the potential advantages, the majority of wholesalers (nine) did not combine their activities with other traders in 1999. The reasons included financial constraints, company policy, and lack of necessity since the firms had enough resources to run their business independently. However, the main reason more wholesalers did not combine activities in 1999 was lack of trust. Therefore, it appears that in the parlance of Williamson (1985), uncertainty due to the ex post costs of monitoring performance, resolving disputes and enforcing contracts between business partners discouraged fertilizer traders from entering into the type of business partnership that could reduce marketing and transaction costs.

7.5. Summary of Main Findings

The main research question this chapter sought to address was whether the fertilizer wholesale market in 1999 was competitive and thus provided farmers with fertilizer that was as cheap as possible, or whether larger wholesalers were able to exert their market power to inflate their margins and make above normal (zero economic profit) returns.

The profitability results indicate that in general, fertilizer trading was a very profitable investment for the population of wholesalers in that it gave them a higher return than they would have earned from their next best alternative. However, it is very difficult to judge whether these returns are "too high" that is, include some economic rents. First, the returns are overestimated to the extent that they do not take into account the cost of fixed capital investments (mainly storage for large wholesalers), the cost of credit and other hidden costs. Second, to draw such a conclusion implies that the returns would be different (lower) if the structure of the market was different. Therefore, in addition to these profitability results, this study examines the structure of the wholesale market to reach some conclusions about the competitiveness of the wholesale market in 1999.

Based on the structural evidence, the study concludes that the wholesaler market in 1999 was contestable. First, although the study found market concentration in the wholesale market and economies of scale in purchasing, there were low barriers to entry. Second, for both wholesale markets, the coefficient on marketing costs is not significantly different from 1. This indicates that wholesalers were able to adjust their margins to pass on the full effect of any increase in marketing costs to their customers. This behavior is consistent with competitive market conditions, that is, wholesalers were making zero economic profits and had to pass on the full impact of a cost increase or go out of business.

However, for Market Sphere One, (Kitale, Eldoret, Moi's Bridge) and Market Sphere Two (Matunda), the coefficient on the market concentration variable, HI, is positive and statistically significant. This result implies that for a given level of gross margin in the wholesale market an increase in market concentration could be associated with an increase in the gross margin which represented economic rent. That is, wholesalers margins were comprised of marketing costs plus a constant amount of economic rent. This result is seemingly at odds with the other structural evidence (contestable markets, and passing the full impact of a cost increase onto consumers). However, there were variations in market share among wholesalers whereby some of the wholesalers located in the larger towns like Kitale and Eldoret, and the wholesalers located in the smaller towns like Matunda, had relatively large markets shares. Therefore, there were pockets of concentration whereby a few wholesalers in dominated each market sphere. In such situations, the conditions existed for these traders to exert market power and make above normal returns. In summary, the study concludes that the wholesale market in 1999 was contestable, with pockets of local oligopolies where some wholesalers may have been able to make above normal returns.

With respect to dynamic performance measures, wholesalers have taken some steps to improve the performance of the wholesale market vis-a-vis retailers (delivery, quality control, selling fertilizer on credit) and have adopted innovations that allow them to reduce unit costs. However, there is room for market and institutional support of these initiatives such as more vigorous quality inspection and a credit facility that will allow wholesalers to take advantage of scale economies in purchasing.

CHAPTER EIGHT
STRUCTURE, CONDUCT AND PERFORMANCE OF THE RETAIL MARKET

8.1. Introduction

Retailing refers to the activities involved in buying goods and selling them to the final consumer. The main task of a retailer is to provide an 'assortment' or wide variety of a good at a single location, making it convenient for customers to purchase all their needs from one location. Consequently, retailers are typically the most numerous of marketing intermediaries (Kohls and Uhl, 1998). Fertilizer retailers in the population purchased fertilizer from importers and wholesalers and sold it to farmers, the final consumers. In 1999, fertilizer retailing functions included: a) the buying and selling of fertilizer; b) rebagging into smaller quantities; c) provision of technical advice to farmers; d) delivering fertilizer to farmers; e) soliciting credit from their suppliers; and f) extending credit to farmers. This chapter applies the industrial organization framework, supplemented by the subsector analytical approach to examine the structure, conduct and performance of the fertilizer retail market in 1999. Section 8.2 describes retail market structure and Section 8.3 examines conduct. Performance of the retail market is evaluated in Section 8.4 and Section 8.5 concludes the chapter.

8.2. The Structure of the Fertilizer Retail Markets

8.2.1. Number and Size of Participants, Locations and Activities

The number of retailers in the population was large relative to the number of importers and wholesalers. In general, there were three types of fertilizer retailers operating in the private-sector-led fertilizer marketing system in 1999. Speculative retailers were general retailers who sold a wide variety of items throughout the year and only entered the fertilizer trade during the main trading season when they could make a quick return. For this reason, out of the 96 retailers counted in the initial sampling frame, only 47 were still selling fertilizer at the time the interviews commenced, which was just after the main trading season had ended. The rest had already exited the industry in search of more lucrative ventures. The second type of retailers were "permanent" retailers, for whom fertilizer retailing was a major part of their trade, and hence they continued to sell fertilizer even after the peak season ended in April/May. The third type of retailers were small-time traders who sold miscellaneous items on market days. During the fertilizer trading season, they bought one or two 50 kg bags of fertilizer on market days (which occurred once a week), typically from other retailers, and sold it in one or two kg quantities, along with their other sale items. The 47 retail outlets in this study comprise a biased population in that they represent "permanent" retailers.

Data on purchases and prices were obtained from 30 of the 47 retailers. The total quantities purchased by individual retailers over the season varied from 170 bags to 24,000 bags. Since there was such a wide variation in the number of bags purchased the analysis used the median of 1,000 bags as the point for differentiating large from small retailers, in lieu of the average. On this basis 13 of the 30 retailers were categorized as large and the remaining 17 retailers who purchased less than this median were categorized as small. The large retailers purchased, on average, 2480 bags of fertilizer and small retailers purchased an average of 550 bags.[73] Table 16 presents the distribution of retailer purchases (number of bags purchased) for large and small retailers.

Table 16. Distribution of Number of Bags Purchased by the Population of Retailers in 1999, by Size, Fertilizer Trader Survey, Kenya 1999

Distribution of bags purchased	Number of traders (n = 30)[1]	No of bags purchased per group	percent of total fertilizer purchased by retailers
Small Retailers			
0 - 500	6	1648	2
501 - 1000	11	8041	9
Sub-total	**17**	**9689**	11
Large Retailers			
1001 - 2000	6	9058	11
2001 - 10,000	5	21073	25
10,001 - 20,000	1	20740	25
20,001 - 25000	1	24000	28
Sub-total	**13**	**74,871**	89
Total	**30**	**84,560**	100

[1]30 of the 47 retailers interviewed provided data on quantities purchased
Source: 1999 Trader Survey data.

[73]The remaining 17 retailers for whom sales data were unavailable, were categorized as large or small based on their location, whether their main customers were large or small farmers, and a subjective assessment of their scale of operations vis-a-vis those traders that had been categorized by size based on the number of bags purchased. Ten of the 17 remaining retailers were categorized as large retailers and seven were categorized as small retailers.

Ownership at the retail level was dominated by Kenyan Africans, regardless of scale. Thirty-seven of the 47 retailers (82 percent) started trading in fertilizer after 1993. Unlike at the wholesale level, market reforms had improved entry conditions considerably at this level of the private-sector-led marketing system.

Fertilizer retailers were located in the major cities upcountry, the surrounding towns or locations, and in village markets in the interior rural areas. Retailers located in the major upcountry cities of Kitale and Eldoret tended to be large, serving both large and small farmers in the immediate surrounding area. The small retailers were located mainly in the hinterland towns and village market centers, and their main customers were the small farmers located in the interior for whom Kitale and Eldoret was too far a distance to travel, Table 17). With the exception of the two village market centers, Chepsiro and Kanjibora, all of the retail markets were located on tarmac roads and therefore were accessible year round. In contrast, the village market centers were in the interior close to the farm-gate and only reachable by murram roads which became impassable during the rainy season.

There was a higher degree of diversification at the retailer level than at the importer and wholesale level. Retailers handled a diverse line of merchandise, including processed food, candy, soap, stationary, and hardware. For both large and small retailers in the population, fertilizer sales generated on average 50-60 percent of annual sales revenues. However, the degree of diversification varied by size; 11 of the 23 small retailers were involved in general retail trade, compared to three of the 24 large-scale retailers.

Moreover, these latter three were located in the hinterlands, whereas the remainder of the large retailers are located in the major cities. As was the case with wholesalers, large retailers located in major towns chose to curtail their degree of diversification so as not to compete with supermarkets.

Table 17. Size and Location Characteristics of the Population of Retailers, Fertilizer Trader Survey, Kenya 1999

City/Town	Large-scale retailers (n = 24)	Small-scale retailers (n = 23)	Total
Eldoret*	9	1	10
Kipkarren	1	4	5
Soy		5	5
Turbo		2	2
Kitale*	5		5
Kimilili	3	2	5
Matunda		1	1
Nangili		5	5
Kanjibora		2	2
Chepsiro		1	1
Moi's Bridge	6		6
Total	24	23	47

**Main distribution center for market centers listed below it*

In contrast, retailers who were located outside the major distribution centers sold general retail items in addition to agricultural inputs and hardware. Since there were no supermarkets in the hinterland towns and locations, these fertilizer traders could diversify into general retail in addition to selling fertilizer.

8.2.2. Market Concentration

The analysis found buyer concentration in the retail market. All the retail market centers were within a 100 km radius and the greatest distance was between Eldoret and Kimilili (90 km) which had an associated transport cost per bag of fertilizer of Kshs 50. Five market spheres were identified for the retail market. These market spheres were identified using the static price arbitrage rule complemented by informal interviews with these traders and some farmers on the actual procurement patterns of farmers in the study area. Based on this analysis, Kanjibora which was a village market center, comprised market sphere 1. Kitale, the closest retail market was 30km away. Since the main form of transportation was by foot by boda-boda (bicycle), farmers in the surrounding villages preferred to purchase fertilizer from the retailers in Kanjibora. Hence, retailers in Kanjibora had what amounted to a local oligopoly.[74] Similarly, farmers living in or around the village market center of Chepsiro preferred to purchase from retailers in Chepsiro. Hence, retailers in Chepsiro also had a local oligopoly, and Chepsiro comprised market sphere 2.

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[74]However, if prices were too high in Kanjibora such that opportunities for arbitrage existed, or if the farmers wanted the services offered by retailers in Kitale (one-stop shopping, delivery) it is possible that sometimes they would go to Kitale to purchase their fertilizer. However, overall Kanjibora was the main supplier of fertilizer for farmers in this area.

Informal discussions with traders and farmers revealed that farmers located on the 70 km stretch of road between Kitale and Eldoret were willing to travel to any of the six towns along this stretch (Kitale, Moi's Bridge, Soy, Matunda, Nangili or Eldoret) to purchase fertilizer. This implied that at varying times during the trading season opportunities for arbitrage existed, that is, the differences in the selling prices exceeded the transfer costs between these towns, which ranged from Kshs 10 to Kshs 50 per bag. Other reasons farmers may have chosen one market center over another are desire for one-stop shopping, and supplier relations. Accordingly, these six towns comprise market sphere 3. Similarly, farmers located along the tarmac stretch of road between Turbo and Kipkarren purchased fertilizer from either of these towns depending on arbitrage opportunities and supplier relations (market sphere four) and farmers surrounding Kimilili purchased mainly from this town (market sphere five).

Table 18 presents these market spheres and the associated market concentration levels. Column two lists the retail markets that comprised each market sphere; column three indicates the number of retailers in the sample that were in that market sphere; column four presents buyer concentration using concentration ratios; column five shows the results of Herfindahl-Hirshman index (HI) analysis.

Table 18. Buyer Concentration Ratios for the Population of Retailers, Fertilizer Trader Survey, Kenya 1999

Retail Market Sphere	Composition of Market Sphere by town/location	No. of Retailers in Sample	Concentration Ratio		Herfindahl-Hirshman Index	
			CR_1	CR_2	1/n	HI
1	Kanjibora	2	52	100	.50	.50
2	Chepsiro	1	100	n/a	1	1
3	Soy, Nangili, Matunda, Kitale, Eldoret, Moi's Bridge	20	63	74	.05	.22
4	Kipkarren, Turbo	3	60	87	.33	.45
5	Kimilili	4	82	92	.25	.82

Table 18 indicates that there are varying degrees of market concentration in the retailer market. Retail market sphere two is characterized by a monopolistic situation and market sphere one is dominated by two retailers who share the market equally between them. Consequently, these markets are highly concentrated. Market sphere four and market sphere five also exhibit market concentration as does market sphere three even though in this latter case the number of retailers is relatively large. In general, the Herfindahl - Hirshman indices parallel their respective market concentration ratios; for example, the index for market sphere one is .50 which is an equivalent level of concentration as the CR_2 of 52 percent.

However, as was the case for the wholesale market, these concentration ratios for the retail market are calculated on the basis of the sample of 30 retailers who provided data, not the population of 47 retailers. Therefore, these measures of concentration are overstated to the extent that the sample was smaller than the population. To assess whether market concentration in any of the retail market spheres would have been substantially different if data for the population of retailers had been available, the study simulated the market concentration ratios for the population. Best estimates of quantities purchased for the remaining 17 retailers were obtained by matching each one with a retailer who had provided data and with whom they shared characteristics such as location and store size.

This exercise resulted in an increase in the number of retailers in all of the market spheres except market sphere one and market sphere two, and therefore, the market concentration ratios remained the same for these two market spheres. For market sphere five, the level of concentration for the population approximated that for the sample. However, for market sphere three and market sphere four, the concentration ratios dropped to levels that are not indicative of high market concentration. In market sphere three, the CR_2 for the population (13 percent) was much lower that the CR_2 for the sample (63 percent). Similarly, in market sphere four, the CR_2 for the population (54 percent) was lower that the CR_2 for the sample (87 percent).

Based on the results of the analysis, this study concludes that the retail market in 1999 was not characterized by high market concentration. The markets spheres that exhibit high market concentration are comprised of a small number (relatively) of farmers whose needs can be met by one or two small number of retailers. Therefore, the market concentration is a function of the small market size rather than other barriers to entry such as economies of scale or access to credit. As demand in these market spheres grows either due to price reductions, an increase in population or both, there will likely be a corresponding increase in the number of retailers and concentration should diminish. This conclusion is supported by the result that the retail market spheres that serve larger populations have a larger number of retailers and are not characterized by market concentration. For example, market sphere three has 32 retailers and the two largest retailers account for 25 percent of the market. In summary, the study concludes that the retail market in 1999 was not highly concentrated. However, there were pockets of concentration whereby one or two retailers dominated a particular market sphere, but this was a function of the small market size rather than nonprice competitive behavior or high barriers to entry.

8.2.3. Entry Conditions

8.2.3.1. Economies of Scale

Table 19 presents the cost structure for the largest retailer and the smallest retailer. These are costs per bag estimated by using the average number of bags purchased by each retailer in 1999. As was the case for wholesalers, some of the costs are the same for large and small retailers, namely handling costs and rebagging costs. With respect to storage costs, the largest and the smallest retailer stored all their fertilizer on their premises so this cost is included in their overhead and administration costs, i.e. rent. The study did not find scale economies at the retail level. Total costs per bag for the largest retailer were only four percent lower than those for the smallest retailer. Unlike importers and wholesalers, the main source of this cost difference was marketing costs, not purchasing costs.

Table 19. Cost Structure for DAP, Retail, Large and Small Retailers (Population) Fertilizer Trade Survey, Kenya, 1999(All figures in Ksh unless otherwise specified)

	Largest Retailer #40	Smallest Retailer #4
Total Purchases (all types of fertilizer, 50 kg	9,262	1,200
Cost Item (per 50kg bag)	Ksh	Ksh
Weighted Average Buying Price	1,306	1,348
Handling costs	4	4
Rebagging Costs	10	10
Weighted transportation charges	38	50
Storage costs	0	0
Weighted transit losses	16	14
Overhead and Administration	7	9
Total Marketing Costs	75	87
Total Costs	1,381	1,435

Whereas total marketing costs for the largest retailer were 16 percent higher than those for the smallest retailer, purchasing costs for the largest retailer were only 3 percent higher than those for its small counterpart. The largest retailer had higher costs for transit losses (14 percent higher). The small retailer had higher costs per bag for purchasing costs (3 percent), transport costs (32 percent), and overhead and administration costs (28 percent).

Overhead and administration costs of the largest retailer were not substantially lower than those of the smallest retailer because the largest retailer had more costs than its smaller counterparts; it hired some salaried employees, and it paid for security and electricity.

With regards to barriers to entry, access to information did not pose a barrier to entry to the retail market. Only a small number of the retailers in the population had telephones on their premises and/or access to email and fax machines on their premises or nearby. Nevertheless, retailers used their own means to obtain market information, for example from their suppliers during business trips to buy fertilizer and other via other informal channels, such as fellow retailers and customers. Hence, how well-informed a retailer was and the reliability of her/his information depended largely on how mobile she or he was willing and/or able to be, and on the quality of her or his professional and informal relationships with other market participants.

Capital requirements also did not pose a financial barrier at the retail level, as demonstrated by the high rate of entry and exit. At the time they entered the fertilizer trade, the majority of retailers interviewed were already established local traders selling general merchandise. Therefore, the initial investment needed to enter the fertilizer trade was the capital to purchase the fertilizer. The average size of a consignment for a small retailer in the population was 20 bags, and for a large retailer it was 200 bags. Therefore, the initial investment requirement ranged between Kshs 30,720 (US$400) for 20 50 kg bags to Kshs 307,200 (US$4,151) for 200 50 kg bags. Given this relatively modest minimum capital requirement, the financial constraint did not pose a barrier to entry to the retail market.

In summary, although there is evidence of market concentration at the retail level, barriers to entry are low to nonexistent and hence it is hypothesized that the threat of entry made this market competitive

8.3. Conduct

This section examines the following elements of coordination to describe retail market conduct: sources of information and the process of price discovery; financing of fertilizer transactions; and intra- and inter-stage cooperation and conflict.

8.3.1. Price discovery

Retailers were asked a series of questions regarding how they set their buying and selling prices in order to obtain some insights as to the price discovery techniques they employed in 1999. By and large retailers accepted the buying price set by suppliers; retailers reported that buying prices were set according to the prevailing market price and market supply and demand conditions. Buying prices tended to be fixed during the period of peak demand and negotiable during the off-peak period.

Similarly, the majority of retailers claimed that they were price-takers. Only 13 of the 47 retailers in the population used cost-mark-up pricing to set their selling price. Hence, unlike wholesalers, retailers lacked the flexibility to set their prices at a level that would always allow them to make a normal return on their trading activities and reinvest in their operations. For example, a wholesaler who purchased a torn bag of fertilizer and chose to repair the bag and resell it at a discount may have been able to adjust the margin on the non-defective bags to compensate for this loss. However, a retailer in a similar situation would have had to absorb the loss.

8.3.2. Non-Price Competitive Strategies

8.3.2.1. Selling Fertilizer on Credit

Selling fertilizer on credit was a competitive strategy employed by 17 of the 47 retailers in the population. The number of recipients per retailer varied from two to 10 over the trading season. The amount of fertilizer sold on credit varied from 20 to 30 50 kg bags per trader, which is small when compared with the average number of bags purchased by these traders over the season (2,480 bags). The duration of the loans varied from one to three months. All of the retailers required a down payment equal to 50 percent of the value of the loan. At the time of the interviews, ten of the retailers had been repaid in full and four had been partially repaid. These results imply that the criteria these traders applied to gauge the credit risk of a customer were effective. These criteria included job security of the customer, such as teaching or government employment; frequency of patronization at their store for fertilizer and other items; and whether the person was known to them personally, was a neighbor, or whether the trader knew where they lived. Retailers' reasons for selling fertilizer on credit included to attract and retain customers and hence counter competition, to assist customers who really need credit, and to maintain good trading relationships with customers. Two retailers said they sold fertilizer on credit because it improved relationships with farmers, thus increasing the likelihood that the farmer would sell their grain to them at harvest time.[75]

8.3.3. Inter-stage Cooperation and Conflict

Purchasing behavior in the retail market was characterized by a high number and frequency of small transactions. The data illustrate that the quantities purchased per consignment by retailers were small relative to total quantities purchased over a season, so there was a high number of transactions per trading season. For example, whereas the consignment size for a large-retailer ranged from 1 to 200 bags, this trader purchased 2,000 bags over the whole trading season. Similarly, a small retailer's consignments ranged in size from 1 to 20 bags, whereas the average of number of bags purchased by this trader over a season was 1,200.

This purchasing behavior was a reflection of both the efficient transportation system which enable retailers to rely on transportation rather than the storage function to ensure supplies, and the low use of credit at the retail level. There were numerous transporters constantly operating between the towns in Western Kenya, and there was a variety of modes of transport (small truck or canter, pick-up, matatu). This regular availability of transport and variety of modes enabled retailers to rely on local sources of supply as well as

[75]The majority of retailers did not sell fertilizer on credit. The main reason cited was that it was too risky; if they needed the money to restock their inventory and their debtor did not honor their agreement to repay them on time, they would face a stockout and lose sales. Some retailers also did not extend credit because they said it amounted to "chasing customers away" since if a farmer had an outstanding debt with a retailer, they would avoid them until they could pay off the debt. Eighteen of the 30 retailers who did not sell fertilizer on credit in 1999 said it was because they had extended credit in previous years and the customer had defaulted.

supplies from other towns, and the gave retailers more flexibility regarding timely availability of fertilizer. This ease of obtaining supplies at short notice meant there was no need to expand storage capacity at the retail level and retailers could shift the storage function and the associated risk further up the supply chain.

The high frequency of small consignments at the retail level was also due to the low level of credit available to finance their purchases. Only fifteen of the 47 retailers used a combination of cash and credit to purchase fertilizer in 1999. Five obtained a bank overdraft from the Kenya Commercial Bank, seven obtained credit in kind from their supplier, and three paid with a postdated check with a seven day grace period. None of them was required to make a down payment or charged interest.[76] Regarding the reasons given for not using credit to finance their fertilizer purchases in 1999, 10 of the 32 retailers who did not use credit said it was because they tried but were unsuccessful, and 12 said it was because credit was too expensive. The remainder gave a variety of responses including because they did not need to borrow, they did not want to borrow, and they could not borrow because they already had outstanding debts with their supplier.

Therefore, the majority of retailers did not use credit because it was unavailable or too expensive. Retailers responded by using the same set of capital to make their fertilizer purchases throughout the season which reduced the size of their consignments and increased the frequency. Initially, a trader would buy the quantity of fertilizer that her or his cash on hand will allow. This was normally cash (s)he had generated from other

[76] Data on quantity of fertilizer purchased on credit by each trader during the 1999 trading season were unavailable.

business activities. The retailer would deplete this inventory before returning to purchase another consignment, since this was often the only source of finance (s)he had for fertilizer purchases. As a result, the typical purchasing frequency for retailers in the population was one to three times a day during the peak season and two to three times a week off-peak.[77] Thus retailers used this purchasing strategy to accelerate the movement of fertilizer to the farm-gate and hence add to place and time utility. Given retailers preference for transportation over storage, it is possible that increased access to credit would not reduce the number of transactions but instead increase consignment size and possibly reduce unit costs which could result in savings for farmers.

There was evidence of inter-stage contractual arrangements that improved coordination and reduced transaction costs in the retail market. All of the retailers in the population had a main supplier they preferred to purchase from throughout the trading season for reasons that were similar to those given for wholesalers (convenience; it enabled them to benefit from interest-free credit in kind which became available on the strength of their business partnership; it reduced the likelihood of missed sales due to stockouts; and it reduced the transactions costs arising from search costs and uncertainty regarding quantity). However, unlike the wholesale market, it is unlikely that these trader relationships formed a barrier to entry since the amount of capital required to enter the retail market was small. However, it may have reduced the number of large retailers.

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[77]For wholesalers in the population, the purchasing frequency was two to three times a week during the peak season, and every week during the off-peak season.

However, in some instances these exclusive supplier-retailer relationships reduced the possibilities for preference articulation by consumers. Retailers reported that sometimes their supplier would call and offer to deliver fertilizer since their truck was making a trip that way anyway. Even if the retailer's inventory was not low, and without assessing whether the type of fertilizer the supplier was sending was the fastest moving fertilizer at the time or even whether they could locate sufficient extra storage, the retailers would agree because they didn't want to risk losing their supplier who offered credit terms, discounts and delivery, by refusing to accept the fertilizer consignment. This trader conduct contradicts one of the assumptions of the subsector analytical approach, that is, that the subsector is demand-driven. Instead, this is a case of supply driving demand. This conduct can have both negative and positive consequences. If it happens regularly enough that retailers become overstocked or become stuck with a slow-moving brand or fertilizer type, they may be compelled to sell the fertilizer at a lower price to move the product and lose money. On the other hand, the unplanned deliveries will boost local supplies, thereby lowering price and raising real incomes to farmers. The outcome depends on which effect prevails.

As was the case with wholesalers, large retailers used forward buying contracts to purchase their fertilizer. In all cases, the final price paid under the forward buying contracts was the same as the one originally agreed upon, meaning that suppliers honored the verbal or written contracts. In contrast, small retailers said the buying price was set according to the prevailing market price, and they set the price, took possession of the good and paid for the fertilizer at the same time. Therefore, there was evidence in the retail market of institutional arrangements that reduced the transaction costs associated with moving the commodity to the farmgate and added time utility.

A potential source of conflict between retailers and their suppliers was information asymmetry. Although access to market information was not a barrier to entry, once a trader had entered the retail market they may have been at a disadvantage vis-a-vis their suppliers.

In the absence of a formal market information system, telephones become an indispensable and fast medium by which to obtain market information, particularly about conditions in distant markets. All the wholesalers and importers had telephones on their premises, and access to email and fax machines on their premises or nearby. Moreover, not only did they have the means by which to contact people, importers and wholesalers also had agents and/or contacts in distant markets who provided them with information about fertilizer prices and demand conditions. They could also send employees to pose as customers and collect prices.

In contrast, retailers did not have the same level of resources at their disposal. They usually operated their stores themselves with one or two permanent employees plus casual laborers during the peak season, and the opportunity cost of using their permanent employees to collect market information was too high. Secondly, either they did not have telephones to obtain information about conditions in distant markets (only 43 percent of the retailers in the population had telephones on their premises), or if they did have telephones, they may not have had the contacts in distant markets who would be willing and able to give them reliable information. As a result, retailers made purchasing decisions based on, among other factors, their guesses of current supply and demand conditions. These guesses were in turn partly a function of past experience and partly of what they may have heard from other traders and farmers as opposed to actual market conditions. This resulted in high transaction costs due to purchases in an environment of poor (in quality and quantity) information about availability and prices which raised the possibility for opportunistic behavior by suppliers.

However, although the evidence supports the conclusion that retailers had less information than wholesalers and importers about market conditions, the study could not find evidence that this unequal access to information was really detrimental to retailers' operations. For example, the study did not find evidence that retailers with no telephones bought fertilizer at higher buying prices than their counterparts who had telephones.

8.4. Performance

8.4.1. Efficiency: Profit and Loss Accounts

8.4.1.1. Retailers: Marketing Margins and Percent Net Returns: Large and Small Retailers.

The profit and loss account for the large retailer firms in the population for which data were available are presented in Table 20. All of the profitability measures for large retailers are positive indicating that these trading enterprises were profitable in 1999. The results indicate that gross profit per bag ranged from Kshs 54 for large retailer number 37 to Kshs 307 for large retailer number 22, and net profit per bag ranged from Kshs 21 for large retailer number 6 to Kshs 253 for large retailer number 22. The annualized rates of return (which are a return to capital, risk and entrepreneurship) ranged from 5 percent to 288 percent.

Table 20. Profit and Loss Accounts for Large Retailers (Population) Fertilizer Trader Survey, Kenya 1999 (All figures in Ksh unless otherwise noted)

	TRADER I			
	#2	#3	#5	#6
Total Purchases (50 kg bags)	20,740	830	1,300	840
Sales Revenue	26,953,000	1,195,700	1,673,000	994,000
Total Purchasing Costs	22,142,000	1,074,200	1,581,000	915,600
Gross Profit Margin	4,811,000	121,500	92,000	78,400
Less Marketing Costs				
Transportation Costs	900,000	49,800	0	33,600
Handling costs	82,960	3,320	5,200	3,360
Rebagging Costs	200,000	8,300	12,000	8,400
Storage costs	0	0	0	0
Transit Losses	269,530	11,957	16,730	9,940
Administration	145,180	5,810	9,100	5,880
Total Marketing Costs	1,597,670	79,187	43,030	61,180
Total Costs	23,739,670	1,153,387	1,624,030	976,780
Costs/bag	1,145	1,390	1,249	1,163
Net Profit	3,213,330	42,313	48,970	17,220
Performance Measures				
Gross Profit/bag	232	146	71	93
Net Profit/bag	155	51	38	21
Working Capital (Kshs)*	12,668,670	437,254	570,030	671,580
Rate of Return (%)	28	13	8	3
Rate of Return (Kshs)	3547228	56843	45602	20147
Annualized Rate of Return (%)	53	23	14	5
Annualized Rate of Return (Kshs)	6,714,395	100,568	79,804	33,579

*Working capital for each trader is calculated as the final total purchasing cost plus total marketing costs. The final total purchasing cost for an individual trader depends on whether the trader used capital simultaneously or sequentially to purchase their fertilizer throughout the trading season. If a trader used more than one set of capital simultaneously (from different suppliers) to purchase their consignments, this trader was operating with a larger capital base. To take this into account, the final total purchasing cost for this trader is total purchasing cost divided by the number of consignments times the number of suppliers. If a trader only used one set of capital at any given time during the trading season to purchase her or his consignments, this trader was operating with a smaller capital base. Hence, the final total purchasing cost for this trader is total purchasing costs divided by the number of consignments.
Source: 1999 Fertilizer Trader Survey

Table 20. Profit and Loss Accounts for Large Retailer (Population), Fertilizer Trader Survey, Kenya 1999 (cont.d) (All figures in Ksh unless otherwise noted)

	TRADER ID			
	#19	**#20**	**#21**	**#22**
Total Purchases (50 kg bags)	550	403	4,400	1,500
Sales Revenue	687,500	348,380	5,390,000	2,146,515
Total Purchasing Costs	644,000	315,160	4,962,000	1,685,925
Gross Profit Margin	43,500	33,220	428,000	460,590
Less Marketing Costs				
Transportation Costs	11,000	8,060	88,000	30,000
Handling costs	2,200	1,612	17,600	6,000
Rebagging Costs	4,500	3,120	34,000	13,100
Storage costs	0	0	0	0
Transit Losses	6,875	3,448	53,300	21,465
Administration	3,850	2,821	30,800	10,500
Total Marketing Costs	28,425	19,061	223,700	81,065
Total Costs	672,425	334,221	5,185,700	1,766,990
Costs/bag	1,223	829	1,179	1,178
Net Profit	15,075	14,159	204,300	379,525
Performance Measures				
Gross Profit/bag	79	82	97	307
Net Profit/bag	27	35	46	253
Working Capital (Kshs)*	157,225	43,304	1,464,200	344,491
Rate of Return (%)	13	63	17	146
Rate of Return (Kshs)	20439	27282	248914	502957
Annualized Rate of Return (%)	23	131	31	366
Annualized Rate of Return (Kshs)	36,162	56,728	453,902	1,260,836

***Working capital for each trader is calculated as the final total purchasing cost plus total marketing costs. The final total purchasing cost for an individual trader depends on whether the trader used capital simultaneously or sequentially to purchase their fertilizer throughout the trading season. If a trader used more than one set of capital simultaneously (from different suppliers) to purchase their consignments, this trader was operating with a larger capital base. To take this into account, the final total purchasing cost for this trader is total purchasing cost divided by the number of consignments times the number of suppliers. If a trader only used one set of capital at any given time during the trading season to purchase her or his consignments, this trader was operating with a smaller capital base. Hence, the final total purchasing cost for this trader is total purchasing costs divided by the number of consignments.**
Source: 1999 Fertilizer Trader Survey

Table 20. Profit and Loss Accounts for Large Retailers (Population), Fertilizer Trader Survey, Kenya 1999 (cont.d) (All figures in Ksh unless otherwise noted)

	TRADER ID			
	#23	**#27**	**#28**	**#29**
Total Purchases (50 kg bags)	300	7,470	1,000	520
Sales Revenue	403,820	9,278,470	1,180,000	631,450
Total Purchasing Costs	343,160	8,212,990	1,050,000	558,550
Gross Margin	60,660	1,065,480	130,000	72,900
Less Marketing Costs				
Transportation Costs	0	373,500	50,000	26,000
Handling costs	1,200	29,880	4,000	2,080
Rebagging Costs	2,740	73,290	10,000	4,350
Storage costs	0	0	0	0
Transit Losses	4,038	92,785	11,800	6,315
Adminstration	2,100	52,290	7,000	3,640
Total Marketing Costs	10,078	621,745	82,800	42,385
Total Costs	353,238	8,834,735	1,132,800	600,935
Costs/bag	1,177	1,183	1,133	1,156
Net Margin	50,582	443,735	47,200	30,515
Performance Measures				
Gross Profit/bag	202	143	130	140
Net Profit/bag	169	59	47	59
Working Capital (Kshs)*	46,845	2,264,343	1,132,800	93,162
Rate of Return (%)	121	28	5	64
Rate of Return (Kshs)	56,683	634,016	56,640	59,624
Annualized Rate of Return (%)	288	53	9	133
Annualized Rate of Return (Kshs)	134,914	1,200,102	101,952	123,905

*Working capital for each trader is calculated as the final total purchasing cost plus total marketing costs. The final total purchasing cost for an individual trader depends on whether the trader used capital simultaneously or sequentially to purchase their fertilizer throughout the trading season. If a trader used more than one set of capital simultaneously (from different suppliers) to purchase their consignments, this trader was operating with a larger capital base. To take this into account, the final total purchasing cost for this trader is total purchasing cost divided by the number of consignments times the number of suppliers. If a trader only used one set of capital at any given time during the trading season to purchase her or his consignments, this trader was operating with a smaller capital base. Hence, the final total purchasing cost for this trader is total purchasing costs divided by the number of consignments.
Source: 1999 Fertilizer Trader Survey

Table 20. Profit and Loss Accounts for Large Retailers (Population), Fertilizer Trader Survey, Kenya 1999 (cont.d) (All figures in Ksh unless otherwise noted)

	TRADER I			
	#35	**#37**	**#40**	**#59**
Total Purchases (50 kg bags)	3,100	3,623	1,992	24,000
Sales Revenue	3,859,000	3,201,430	2,396,620	32,090,000
Total Purchasing Costs	3,577,000	3,006,420	2,150,700	27,830,000
Gross Margin	282,000	195,010	245,920	4,260,000
Less Marketing Costs				
Transportation Costs	0	0	44,540	1,440,000
Handling costs	12,400	14,492	7,968	96,000
Rebagging Costs	25,000	23,370	18,920	240,000
Storage costs	0	0	0	0
Transit Losses	37,990	31,567	23,583	320,900
Adminstration	21,700	25,361	13,944	168,000
Total Marketing Costs	97,090	94,790	108,955	2,264,900
Total Costs	3,674,090	3,101,210	2,259,655	30,094,900
Costs/bag	1,185	856	1,134	1,254
Net Margin	184,910	100,220	136,965	1,995,100
Performance Measures				
Gross Profit/bag	91	54	123	178
Net Profit/bag	60	28	69	83
Working Capital (Kshs)*	991,340	595,860	367,039	13,396,900
Rate of Return (%)	16	14	69	19
Rate of Return (Kshs)	158,614	83,420	253,257	2,545,411
Annualized Rate of Return (%)	29	25	145	35
Annualized Rate of Return (Kshs)	287,489	148,965	532,207	4,688,915

*Working capital for each trader is calculated as the final total purchasing cost plus total marketing costs. The final total purchasing cost for an individual trader depends on whether the trader used capital simultaneously or sequentially to purchase their fertilizer throughout the trading season. If a trader used more than one set of capital simultaneously (from different suppliers) to purchase their consignments, this trader was operating with a larger capital base. To take this into account, the final total purchasing cost for this trader is total purchasing cost divided by the number of consignments times the number of suppliers. If a trader only used one set of capital at any given time during the trading season to purchase her or his consignments, this trader was operating with a smaller capital base. Hence, the final total purchasing cost for this trader is total purchasing costs divided by the number of consignments.

Source: 1999 Fertilizer Trader Survey

The profit and loss account for the small retailer firms in the population for which data were available are presented in Table 21. The results indicate that gross profit per bag ranged from Kshs 58 for small retailer number 60 to Kshs 151 for number four, and net profit per bag ranged from - Kshs 8 for retailer number 13 to + Kshs 99 for number 43. The net profit per bag for all but two of the small retailers in the population were positive in 1999. The annualized rates of return -10 percent to 811 percent.

Table 21. Profit and Loss Accounts for Small Retailers (Population), Fertilizer Trader Survey, Kenya 1999. (All figures in Ksh unless otherwise noted)

	TRADER I #4	#7	#13	#24	#25
Total Purchases (50 kg bags)	1,200	625	200	400	893
Sales Revenue	1,534,000	687,840	250,050	525,000	1,133,900
Total Purchasing Costs	1,353,000	642,930	235,750	495,000	1,063,015
Gross Margin	181,000	44,910	14,300	30,000	70,885
Less Marketing Costs					
Transportation Costs	60,000	9,375	9,000	16,000	35,720
Handling costs	4,800	2,500	800	1,600	3,572
Rebagging Costs	12,000	6,250	2,000	4,000	7,930
Storage costs	0	0	0	0	0
Transit Losses	15,340	6,712	2,258	5,250	11,304
Administration	10,800	5,625	1,800	3,600	8,037
Total Marketing Costs	102,940	30,462	15,858	30,450	66,563
Total Costs	1,455,940	673,392	251,608	525,450	1,129,578
Costs/bag	1,213	1,077	1,258	1,314	1,265
Net Margin	78,060	14,448	(1,558)	(450)	4,322
Performance Measures					
Gross Profit/bag	151	72	72	75	79
Net Profit/bag	65	23	(8)	(1)	5
Working Capital (Kshs)*	328,440	45,074	45,327	154,200	148,333
Rate of Return (%)	34	61	(6)	(1)	3
Rate of Return (Kshs)	111,670	27,495	(2,720)	(1,542)	4,450
Annualized Rate of Return (%)	65	123	(10)	(2)	5
Annualized Rate of Return (Ks	213,486	55,441	(4,533)	(3,084)	7,417

*Working capital for each trader is calculated as the final total purchasing cost plus total marketing costs. The final total purchasing cost for an individual trader depends on whether the trader used capital simultaneously or sequentially to purchase their fertilizer throughout the trading season. If a trader used more than one set of capital simultaneously (from different suppliers) to purchase their consignments, this trader was operating with a larger capital base. To take this into account, the final total purchasing cost for this trader is total purchasing cost divided by the number of consignments times the number of suppliers. If a trader only used one set of capital at any given time during the trading season to purchase her or his consignments, this trader was operating with a smaller capital base. Hence, the final total purchasing cost for this trader is total purchasing costs divided by the number of consignments.
Source: 1999 Fertilizer Trader Survey

Table 21. Profit and Loss Accounts for Small Retailers (Population), Fertilizer Trader Survey, Kenya 1999 (cont.d).(All figures in Ksh unless otherwise noted)

	TRADER I				
	#30	**#43**	**#49**	**#50**	**#53**
Total Purchases (50 kg bags)	175	170	1,166	650	2,480
Sales Revenue	205,440	192,690	1,271,950	832,000	2,912,800
Total Purchasing Costs	186,450	170,750	1,186,460	780,000	2,679,600
Gross Profit Margin	18,990	21,940	85,490	52,000	233,200
Less Marketing Costs					
Transportation Costs		0	23,320	19,500	49,600
Handling costs	3,500	680	4,664	2,600	9,920
Rebagging Costs	700	980	6,460	6,000	18,800
Storage costs	1,750	0	0	0	0
Transit Losses	0	1,925	12,602	8,320	26,052
Administration	2,054	1,530	10,494	5,850	22,320
Total Marketing Costs	1,575	5,115	57,540	42,270	126,692
Total Costs	9,579	175,865	1,244,000	822,270	2,806,292
Costs/bag	196,029	1,035	1,067	1,265	1,132
Net Profit	1,120	16,825	27,950	9,730	106,508
	9,411				
Performance Measures					
Gross Profit/bag		129	73	80	94
Net Profit/bag	109	99	24	15	43
Working Capital (Kshs)*	54	8,996	114,038	302,270	662,612
Rate of Return (%)	28,224	264	34	4	17
Rate of Return (Kshs)	14	23,749	38,773	12,091	112,644
Annualized Rate of Return (%)	3,951	811	65	7	31
Annualized Rate of Return (Ks	25	72,955	74,125	21,159	205,410

*Working capital for each trader is calculated as the final total purchasing cost plus total marketing costs. The final total purchasing cost for an individual trader depends on whether the trader used capital simultaneously or sequentially to purchase their fertilizer throughout the trading season. If a trader used more than one set of capital simultaneously (from different suppliers) to purchase their consignments, this trader was operating with a larger capital base. To take this into account, the final total purchasing cost for this trader is total purchasing cost divided by the number of consignments times the number of suppliers. If a trader only used one set of capital at any given time during the trading season to purchase her or his consignments, this trader was operating with a smaller capital base. Hence, the final total purchasing cost for this trader is total purchasing costs divided by the number of consignments.
Source: 1999 Fertilizer Trader Survey

Table 21. Profit and Loss Accounts for Small Retailers (Population), Fertilizer Trader Survey, Kenya 1999 (cont.d).(All figures in Ksh unless otherwise noted)

	TRADER I			
	#55	#56	#60	#61
Total Purchases (50 kg bags)	1,900	595	1,000	538
Sales Revenue	2,229,000	632,350	1,402,000	579,440
Total Purchasing Costs	2,096,000	582,750	1,344,000	543,860
Gross Profit Margin	133,000	49,600	58,000	35,580
Less Marketing Costs				
Transportation Costs	38,000	17,850	10,000	10,760
Handling costs	7,600	2,380	4,000	2,152
Rebagging Costs	15,000	2,900	10,000	1,500
Storage costs	0	0	0	0
Transit Losses	22,290	6,303	14,000	5,794
Administration	17,100	5,355	9,000	4,842
Total Marketing Costs	99,990	34,788	47,000	25,048
Total Costs	2,195,990	617,538	1,391,000	568,908
Costs/bag	1,156	1,038	1,391	1,057
Net Profit	33,010	14,812	11,000	10,532
Performance Measures				
Gross Profit/bag	70	83	58	66
Net Profit/bag	17	25	11	20
Working Capital (Kshs)*	449,323	73,638	495,000	70,370
Rate of Return (%)	9	31	1	14
Rate of Return (Kshs)	40,439	170,104	4,950	9,852
Annualized Rate of Return (%)	16	59	2	25
Annualized Rate of Return (Kshs)	71,892	43,446	9,900	17,592

*Working capital for each trader is calculated as the final total purchasing cost plus total marketing costs. The final total purchasing cost for an individual trader depends on whether the trader used capital simultaneously or sequentially to purchase their fertilizer throughout the trading season. If a trader used more than one set of capital simultaneously (from different suppliers) to purchase their consignments, this trader was operating with a larger capital base. To take this into account, the final total purchasing cost for this trader is total purchasing cost divided by the number of consignments times the number of suppliers. If a trader only used one set of capital at any given time during the trading season to purchase her or his consignments, this trader was operating with a smaller capital base. Hence, the final total purchasing cost for this trader is total purchasing costs divided by the number of consignments.
Source: 1999 Fertilizer Trader Survey

To assess whether the annualized returns to retailers could be considered to be high, they were compared to the return retailers would have been able to make from their next best alternative, being employed by someone else. Based on the interviews, a large retailer in the population would have to be paid a monthly salary of at 10,000 (US$143) to close their business and be employed elsewhere. Therefore, these traders could have made an annual salary of approximately Kshs 120,000 (US$ 1,700) by being employed elsewhere. On this basis, fertilizer trading was a worthwhile investment for 9 of the 16 large retailers who made annualized returns of more than Ksh120,000 in 1999. Of the remaining 3 large retailers, 3 made approximately or close to Kshs 100,000 (US$ 1,429) and the remaining 3 earned between Kshs 30,000 (US$ 429) and Ksh 60,000 (US$ 857).

For example, large retailer #23 located in Eldoret made a total investment of Kshs 56,683 (US$ 809) which translated into an annualized earning of Kshs 134,914 (US$ 1927), or a return of 26 percent on his initial investment (after taking into account the opportunity cost of entrepreneurship). Therefore, the results for large retailers indicate that in general fertilizer trading was a worthwhile investment in that it gave them a higher return than they would have earned from their next best alternative.

In the case of small retailers, a small retailer in the population would have to be paid a monthly salary of at 5,000 (US$ 71) to close their business and be employed elsewhere. This is not an unrealistic amount considering that the monthly salary for a shop assistant in Kitale/Eldoret in 1999 was Kshs 2,000 to Kshs 3,000. Therefore, these traders could have made an annual salary of approximately Kshs 60,000 (US$ 857) by being employed elsewhere. On this basis, fertilizer trading was a worthwhile investment for 5 of the 14 small retailers who made annualized returns of more than Ksh60,000 in 1999. Of the remaining 9 retailers, 2 made losses and 3 earned less than Kshs 10,000 (Us$) in 1999. For example, small retailer #43 located in Nangili made an initial investment of Kshs 8,966 (US$) which translated into an annualized earning of Kshs 72,955 (US$), or a return of 70 percent on his initial investment (after taking into account the opportunity cost of entrepreneurship). This return is based on the assumption that small retailer number 43 used a new set of working capital each time he purchased a consignment. Consequently although the total amount of the annual investment was relatively small the rate of turnover was high (44).

Therefore, in contrast to their large counterparts, the results for small retailers indicate that in general fertilizer trading was not a more profitable investment in monetary terms than their next best alternative. However, these retailers do not specialize in fertilizer year round and it is likely that for them fertilizer is a loss leader so that they make up the loss from this good by higher margins on other goods. Moreover, retailing is a family-run business for many of these traders and may provide other benefits such as a short-term source of cash and employment in a country where off-farm employment opportunities are few and many have to self-created.

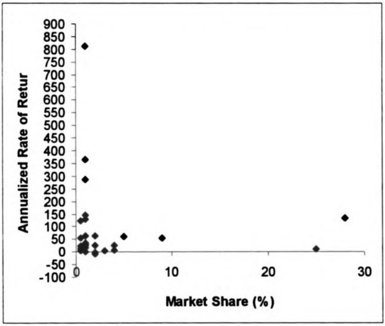
An important caveat to keep in mind with respect to these results is that the calculation of the annualized rates of return assumes the operations of these traders ran smoothly throughout the year with no interruptions (illness, weddings, funerals, other personal matters) which could hinder the rapid turnover of capital. However, this is unrealistic since small traders in Africa do not tend to distinguish between business and personal monetary resources, and therefore, it is likely that the annualized rates of return for these traders are overestimated.

Nevertheless, the results for retailers are more accurately estimated than those of importers and wholesalers for two reasons because the evidence suggests that lack of data on hidden costs for retailers was not an important omission. First, none of the large retailers and only three of the 14 small retailers had negative returns on any of their consignments. This implies retailers did not need to include a risk premia in their margins to account for price risk. Second, retailers did not invest in fixed capital such as storage or transportation and therefore, the returns were not overestimated to the extent that fixed costs were not accounted for.

Third, the variability in percent net returns for retailers in the population was low. To assess the relative variability of the returns to retailers the coefficients of variation for each retailer were calculated. Seven of the thirty retailers in the population had coefficients of variation that ranged from zero percent to 20 percent. The remaining 23 retailers had coefficients of variation that ranged from 21 percent to 240 percent. This means that, in general, the amount of variation in the net returns of the individual retailers ranged from 21 percent of the mean to over twice the size of the mean. However, the mean percent net returns for all the retailers were low, ranging from -.01 percent to 13 percent with a mean of 3 percent. As a result, these large coefficients of variation did not always translate into huge variations in the net returns of the individual retailers. For example, the coefficient of variation for large retailer number 23 was 42 percent. If the net returns were normally distributed, 2/3 of them would vary between 13 percent +/5 percent, that is, between + 8 percent and +18 percent. However, retailer number 60 had a coefficient of variation of 240 percent and a mean of 0.1; if the net returns were normally distributed, 2/3 of them would vary between -.14 percent and .34 percent. Therefore, although the coefficients of variation for the majority of these traders was large, the actual variability in their net returns per consignment (in percentage terms) was moderate.

In summary, the retail market was competitive and fertilizer retailing was a worthwhile investment for the majority of the large retailers and 5 of the 14 small retailers, that is, it earned them more than they would have been able to make from their next best alternative. This conclusion appears to be supported by the data; there is no discernible correlation between the annualized rates of return for retailers and their market shares. (Figure 11). To assess whether this conclusion is supported by the data, the next section uses regression analysis to explain retailer gross margins.

Figure 11. Percent Annualized Rate of Returns and Market Shares in the Retailer Market, (Population), Fertilizer Trader Survey, Kenya 1999



8.4.2. Regression Analysis of Retailer-Farmer Marketing Margins

So far the findings of this chapter are that the retail market was competitive in 1999. However, since this was bivariate analysis, it is possible that some other explanatory factors could be confounding this result. Therefore, using the approach adopted to examine wholesaler margins in Chapter Seven, this section uses multivariate regression analysis to test the hypothesis of market power in the retail market. .[78] In generalized form, the model reads as follows:

$$GM_{itm} = \beta_0 + \beta_1 HI_{tm} + \beta_2 TOTOPCOS_t + \beta_{3\text{-}8} MONTH_{it} + \beta_{9\text{-}13} FERTTYPE_{itm} + \alpha_t + \varepsilon_{itm} \qquad (8)$$

where:

i indexes individual consignments (i is a subset of [1,....,370]);

t indexes individual traders who purchased the consignments (t is a subset of [1,...,30]) since 30 of the 47 retailers in the population provided data;

m indexes month the consignment was purchased (m = January to July, with March excluded as the base month). If the variable does not have a m subscript, it represents the whole trading season;

The description of the variables is given below:

GM_{itm}	= the gross margin of the i^{th} consignment purchased by the t^{th} trader in the m^{th} month;

[78] For a discussion of the rationale for regression analysis, a description of the variables, specification of the model, hypotheses, and econometric considerations and estimation procedures, see Chapter Seven, pages 164 - 173.

HI_{tm}	= market concentration as measured by the Herfindahl index, for trader t in month m;
$TOTOPCOS_t$	= the total marketing costs of trader t over the fertilizer trading season;
$MONTH_{it}$	= is a dummy variable indexing the month consignment i was purchased by trader t. The fertilizer trading season lasted from January to July. It will be used to clean up potential trending taking March as the base;
$FERTTYPE_{itm}$	= is a dummy variable indexing fertilizer type of consignment i purchased by trader t in month m. Traders in the population purchased six types of fertilizer. This variable will be used to clean up potential trending taking the DAP fertilizer as the base;
α_t	= is trader specific error;
ε_{itm}	= is standard regression error;
β	= the weights associated with the explanatory variables.

Anticipated relationships between gross margins and the explanatory variables were established a priori. The linear model with gross margins per consignment as the dependent variable was estimated using the fixed effects estimator. Table 22 presents the estimation results. The F-statistic is 10.57 which indicates that the null hypothesis that none of the explanatory variables has an effect on the dependent variable can be rejected very strongly. The thirteen explanatory variables in the model do explain some of the variation in retailer gross margins in 1999 although the amount explained is not large: only 29 percent.

Table 22. Estimation Results of the Fixed Effects Linear Model of Gross Margins, Population of Retailers, Fertilizer Trader Survey, Kenya 1999

Dependent Variable: Gross Margins	Coefficient	t-statistic
Independent Variables		
Intercept	17.25	1.20
TOTOPCOS	2.11	4.83*
HI	-12.50	-1.42
MONTH1	-29.33	-2.58
MONTH2	-7.49	.32
MONTH4	-6.21	-1.18
MONTH5	1.50	.24
MONTH6	-15.19	-2.18
MONTH7	-9.83	-.98
F-test for Joint Significance of MONTH	H0: equality of MONTH coefficient)	$F(6, 334) = 1.91$ Prob > F= 0.08
FERT2	.39	.04
FERT3	-14.16	1.44
FERT4	12.25	1.86
FERT5	.63	.10
FERT7	-13.28	-2.12
F-test for Joint Significance of FERTTYPE	H0: equality of FERTTYPE coefficient	$F(5, 334) = 3.18$ Prob > F= .0081
No. of Observations = 377	Number of groups = 30	$F(13, 334) = 10.57$ Prob > F = 0.0000 R^2 within = .29

[1] The null hypothesis is that the coefficient on TOTOPCOS is *not* significantly different from 1.0. The absolute value of the observed t statistic (4.83) is larger than the critical t (2.58) at the one percent level of significance. Therefore, the model rejects the null; that is, if costs increase by one unit, retailers inflate their selling price by more than one unit.* Significant at the one percent significance level

With respect to the overall hypothesis of competitive retail markets, the market concentration coefficient (HI) is not statistically significant, which supports the hypothesis. However, the coefficient on TOTOPCOS is positive (2.11) and significantly different from one at the 1 percent level of significance. This result indicates that if retailers' marketing costs increased by Kshs 10, retailers increased their margins by more than Kshs 10, by Kshs 21. This result implies that retailers were able to influence their selling price to inflate their margins and pass on more than the full cost of marketing to their customers. Given the competitive nature of the retail market and the elasticity of the demand for fertilizer, this is unlikely. It is more likely that the model was unable to capture some of the marketing costs incurred by retailers and as a result this variable is being underestimated. For example, overhead and administration costs per bag for some of the large retailers may have been underestimated since the modal values for retailers in the population who provided cost data were used.

The variables for seasonality (MONTH) were jointly significant (statistically) at the ten percent level and the variables for fertilizer type (FERTTYPE) were jointly significant at the one percent level. These results indicate that seasonality did not have a significant influence on retailer gross margins although fertilizer type did.

8.4.3. Dynamic Performance Criteria

This section evaluates the retail market using the following performance measures: product suitability, progressiveness, and the extent to which the retail market generated information to help consumers make more informed market decisions.

8.4.3.1. Product Suitability

In 1999, rebagging was a common feature of fertilizer trading at the retail level. Retailers purchased the fertilizer already packaged from the wholesalers in standardized quantities of 50 kg, 25 kg and 10 kg bags. Thereafter, 35 of the 47 retailers in the sample (74 percent) rebagged their fertilizer purchases into even smaller quantities to meet customer demand. This activity was mainly carried out by small retailers. Over 90 percent of the rebagged fertilizer was sold in two kg tins or "gorogoros", whereby, at a customer's request, fertilizer was scooped out of a 50 kg bag that had been opened for this purpose, and measured using a gorogoro, before being bagged into a polythene bag and sold to the customer. The high percentage of retailers in the sample who rebagged their fertilizer indicates that it is an important component of retailers' marketing mix.[79] Two retailers said they provided this service only if the bags were already torn by mishandling and one said it was a profit making venture since selling in smaller bags was more profitable.[80] That is, according to this retailer, the cost of rebagging 25 two kg bags which consists of the cost of labor plus the cost of the plastic bags (the bags are not resealed using resealing equipment at the retail level - they are tied by hand) was less than Ksh 32.

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[79]However, this does not imply that the 12 retailers who did not rebag their fertilizer were not competitive, simply that they chose to focus on different market niches.

[80]The data indicate that on average rebagging increased the returns to small retailers but large retailers either made a loss or broke even by selling fertilizer in smaller units. Specifically, the average retail selling price for a 50 kg bag of DAP in 1999 was Kshs 1532 for large retailers and Kshs 1447 for small retailers. In comparison, a two kg bag of fertilizer cost, on average, Kshs 60 which when extrapolated to 50 kg would have a selling price of Kshs 1500. This finding also indicates that farmers purchasing from small retailers were willing to pay more in return for a product that better served their needs.

8.4.3.2. Delivery

Delivery was another innovation adopted by retailers to better meet the needs of their clients, specifically, the need for timely delivery. Twenty-four of the 47 retailers delivered fertilizer to their customers using their own transportation and/or arranging transportation with small transporters. Nineteen did so to attract and maintain customers, four delivered fertilizer because it provided an addition source of income, and one, a small retailer, said it had an arrangement with farmers to pick up maize at the same time that the fertilizer was delivered. Nine of retailers did not charge for the service, nine said they charged half of the going matatu rate, and six said they charged for fuel only.

Economic theory suggests that a farmer will only be willing to pay a retailer for transportation to the farm-gate if the retailer will do so at a lower costs than farmers would incur using their own means or public transportation. Therefore, it is hypothesized that retailers who delivered fertilizer charged full price (buying price plus transport cost) and delivered for 'free' normally within a certain radius, at a total cost that was lower than the farmer would incur using their own means of transportation. It follows that retailers who did not deliver sold their fertilizer at a discount that made it worth it to the farmer to pay the transport cost. Therefore, retailers either provided 'free' transport at a higher fertilizer price or sold at a lower price and did not deliver. Based on these assumptions, retailers who did not deliver fertilizer for their customers are expected to have smaller gross margins than their counterparts (due to their lower selling price). Conversely, retailers who did deliver are hypothesized to have larger gross margins than their counterparts to compensate them for absorbing the cost of the 'free' delivery. This hypothesis will be tested in Chapter Nine.

The finding that some retailers in the population offered delivery services while others did not implies that these retailers catered to different market niches. That is, some farmers had their own means of transport to the farm-gate so they preferred the lower price, whereas some did not have transport and so were willing to pay the higher price which included "free" transport. Alternatively some farmers were too busy - working on their farms, running their other businesses, or working off-farm - to arrange transportation for their fertilizer and preferred the convenience of having their fertilizer delivered for them. In other words, farmer demand for transport depended on their opportunity cost of time and transport options.

Retailers who delivered fertilizer to the farm-gate experienced competition from maize traders. On their way to pick up maize from farmers, some maize traders purchased fertilizer for the farmers and delivered it at the same time as they picked up the maize. This development was costly for retailers in two ways: first, the loss of income from providing delivery service, and second, the lost opportunity to build customer loyalty. However, it was a beneficial arrangement from the farmers' perspective as (s)he saved transport costs and the opportunity cost of time of going to pick up the fertilizer themselves.

The arrangement also indicates an opportunity to introduce an innovation that could lower transaction costs and spread risks for fertilizer retailers. Fertilizer retailers could expand into the maize trade, taking regular orders for fertilizer delivery and assure farmers a market for maize output at harvest time. This could lower the risks and reduce the transaction and transport costs to the benefit of both parties. However, only two retailers in the population engaged in maize trading in 1999. One reason could have been that the risk of advancing fertilizer on credit for repayment in kind (maize) at harvest time was too high given the volatility of maize prices.

All of the retailers in the population said they visually inspected their fertilizer purchases on a random basis for quality before payment. As a result of the lack of enforcement of the KBS inspection policy, 61 percent of retailers reported quality problems in 1999. The most common quality problem experienced by retailers was torn bags due to mishandling and adulteration.

Retailers also attempted to generate market information to help farmers improve their buying decisions. Thirty-eight of the 47 retailers in the survey said they provided information to farmers on correct fertilizer use (correct application rates and which fertilizer to use for planting versus top-dressing) and all of them said they would be willing to receive and disseminate such information on an regular basis. However, they only provided verbal information, they did not provide illustrative materials or carry out field demonstrations. Moreover, the quality of the information provided was questionable; only six of the retailers had any formal training in agronomy or a related field. As a result, the majority of these advisory services and promotional activities are typically provided by the government extension services and government experimental stations, and the provision of these services by the private-sector-led fertilizer marketing system in 1999 were minimal.

8.4.3.3. Progressiveness

In 1999, retailers in the population had adopted organizational arrangements to reduce marketing costs. Thirteen of the 47 retailers (27 percent) carried out joint marketing functions in 1999. Transportation was the main marketing function combined, although some firms combined storage and financing. Traders said they combined these marketing functions because it enabled them to operate at or near full capacity, thus reducing costs per unit. One retailer combined purchasing and transportation with an incumbent retailer as a way to enter the fertilizer retail market as a new entrant but do so competitively by obtaining price and quantity discounts which widened gross profit margins.

However, there were disadvantages to combining activities to take advantage of scale economies and as a result, the majority of retailers (34) did not combine their activities with other traders in 1999. As was the case for wholesalers, the main reason retailers did not combine activities in 1999 was fear of exploitation and dishonesty on the part of business partners. Some retailers also preferred to be self-reliant rather than collaborate with another trader, thus foregoing an opportunity to reduce unit marketing costs. Therefore, a stronger legal framework will be required before traders will be willing to increase their participation in such costs saving arrangements.

8.5. Summary of Main Findings

This chapter described and analyzed the fertilizer retail market in order to assess performance and constraints to improved performance. Of particular interest was whether the retail market was competitive or whether larger retailers were able to exert their market power to make above normal returns.

The results of the profitability analysis indicate that fertilizer retailing was a worthwhile investment for the majority of the large retailers and 5 of the 14 small retailers, that is, it earned them more than they would have been able to make from their next best alternative.

However, the structural characteristics of the retail market, and trader conduct support the conclusion retailers did not earn economic rents in 1999.

First, the retail market in 1999 was not highly concentrated. However, there were pockets of concentration whereby one or two retailers dominated a particular market sphere, but this was a function of the small market size rather than nonprice competitive behavior or high barriers to entry. Second, the substantial number of retailers who entered the retail market on a speculative basis in 1999 are indicative of the low barriers to entry to the retail market. Licensing was required but it was cheap and routine and the amount of capital was not large, though for many potential entrants it may still have been difficult to raise even small amounts. Third, the results of the multivariate regression analysis to test the hypothesis of market power in the retail market support the hypothesis of competitive markets since the coefficient on the market concentration variable is not statistically significant.

With respect to dynamic performance measures, retailers have taken a number of steps to improve the performance of the retail market vis-a-vis farmers. Retailers in the population delivered fertilizer to farmers or arranged delivery, inspected their fertilizer for quality, sold fertilizer on credit (even though, compared to wholesalers, a smaller number of retailers purchased fertilizer on credit), and provided farmers with limited information regarding the correct types of fertilizer to use and methods of application.

Therefore the study concludes that the retail market in 1999 was competitive. Nevertheless, there is room for market and institutional support of retailers' efforts. Only a few of the retailers had adopted innovations (combined transportation and purchasing) and organizational arrangements (purchasing directly from importers in order to shorten the supply chain) that could reduce unit costs and increase efficiency. Rather, the retail market was characterized by cash-and-carry transactions, and the typical retailer used the same set of capital to purchase his or her consignments throughout the trading season. One reason for this behavior was the cash constraint faced by these traders; in general retailers did not have large amounts of cash available at one time to purchase a substantial number of bags of fertilizer. Therefore, they purchased the amount of fertilizer that her or his cash on hand will allow. As a result, retailers purchased small consignments at a high frequency. However, it is likely that this procurement pattern may have prevented retailers from taking advantage of price and quantity discounts as well as lost sales due to stockouts and absence. Therefore, retailers may benefit from a credit facility that enables them to purchase larger quantities of fertilizer each trip and reduce the number of trips they make to suppliers.

AN ECONOMIC ANALYSIS OF THE PERFORMANCE OF THE FERTILIZER SUBSECTOR IN THE MAIZE BELT OF WESTERN KENYA

Volume II

By

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CHAPTER NINE
IMPROVING THE EFFICIENCY OF THE MARKETING SYSTEM: IMPLICATION FOR FARM-LEVEL PROFITABILITY OF FERTILIZER USE

9.1. Introduction

The profitability of fertilizer use is a function of the input/output price ratio, which is determined by input and output markets, and the crop response to fertilizer application, which is a function of agroecological factors, the genetic make-up of the cultivar, and farmer knowledge and skills. This chapter focuses on the input market dimension of the profitability of fertilizer use for maize production and assesses the potential for cost reductions in the supply chain to improve the returns to farmers. This question is particularly important in this era of trade liberalization, as the Kenyan government needs to consider avenues for improving the competitiveness of maize other than protectionist trade policies. Reducing the cost of maize production presents one such avenue. Maize is the major staple crop in Kenya. It is grown in almost all the agro-ecological zones and on two out of every three farms. Maize constitutes three percent of Kenya's Gross Domestic Product (GDP) and 12 percent of total agricultural production. Maize occupies a central position in Kenyan's diets and farm production activities, as well as its national economy through economic activities related to processing and distribution. Moreover, maize consumes approximately 38 percent of the fertilizer consumed in Kenya (Jayne et al., 1997).

Since the beginning of the 1990's, maize production (total output) has been on a downward trend, partly reflecting weather-induced shortages, but mainly due to a decline in fertilizer use on maize. Recent data indicate that average maize yields and area have stagnated at below two tons per hectare and about 1.5 million hectares, respectively. However, population has been growing at a rate of three percent per annum, outstripping production (Kimenye, 1997). Following the implementation of maize market reforms in the 1990's, the government of Kenya has met the shortfall with imports from the United States, South America, and in recent years, Southern Africa and Uganda. World prices and costs of production in these countries are below those in Kenya due to more efficient production and marketing practices, technologies and inputs as well as various forms of government subsidies (Arwings-Kodhek, 1999; Awuor, 2001).

Imports have increased the quantity of maize available in the domestic market, which has resulted in lower market prices. Although consumers have benefitted, domestic producers have been negatively affected. In fact, one study estimated (real) maize prices in the post-reform period to be 15 percent lower than in the pre-reform period (Karanja et al., 1999). In response to policy pressure from producer groups, the government has imposed import tariffs. The rationale for the tariffs is to keep domestic producers competitive, thus ensuring that the price at which imports reach domestic markets is not below the prevailing market price.

However, in this era of trade liberalization, Kenya has to look for alternatives to using protectionist trade policies to keep maize producers competitive. Firstly, Kenya signed the World Trade Organization Agreement (WTO) in 1996 and thus bound itself to tarrification of trade barriers, whereby all non-tariff barriers to trade, including import and export bans, are to be replaced with tariffs of given percentages and these percentages are to be reduced over time. Member countries are allowed to impose anti-dumping duties if they can make a case that subsidized imports will destroy a domestic industry. Kenya has been able to apply these duties to protect a number of agricultural commodity sectors, including maize. However, more competition must be expected from cheaper imports in the coming years, and if maize producers cannot become more competitive, the government may be forced to push for higher and higher duties, which are unlikely to be acceptable to the WTO and may jeopardize Kenya's membership[81] (Arwings-Kodhek, 1999).

Secondly, Kenya has joined the Common Market for Southern Africa (COMESA) and the East African Community (EAC), both of which call for the lowering of regional import barriers. For example, the common market agreement with Uganda and Tanzania under the EAC treaty demands that members eliminate all tariff and non-tariff barriers to importation of goods originating in other partner states. Hence, both treaties limit the governments' abilities to protect domestic producers from cheaper regional imports from producers, some of whom, as in the case of Uganda, seem to have gone into production with the sole aim of earning an income by supplying the Kenyan maize market. Thirdly, in a country where over 90 percent of the population are maize consumers, the majority of whom live below the poverty line, and where 67 percent of maize producers buy more maize in a year than they sell (Arwings-Kodhek, 1999), using trade policy to raise maize

[81]The WTO discourages the use of trade policy (duties, quotas, and phytosanitary restrictions) to cover up the inadequacies of domestic industries to the detriment of partner countries who sign binding agreements in anticipation of being allowed access to the markets of member countries (in this case the Kenyan market).

prices is not likely to improve food security. Kenya needs to find an alternative to using tariffs to protect local producers and make them competitive.

One alternative is policies that will increase maize productivity by reducing the unit costs of production. Such a change in maize policy can yield a number of benefits. First, lower production costs can allow producers to increase their incomes without taxing consumers through higher prices. Thus, policy goals can be achieved without making some parts of the society gain at the expense of other members of society, typically the rural and urban poor. Secondly, in the long run, the resultant lower maize prices will go further in helping to alleviate poverty (an important policy objective of the Kenyan government) than the traditional emphasis on raising agricultural incomes through high food prices because the majority of farmers in Kenya are net buyers and not net sellers of maize (Arwings-Kodhek, 1999, Jayne et al., 1999).[82]

Maize production involves the use of a number of inputs such as seed, labor, farm machinery, and fertilizer. Although reducing the cost of any of these inputs, ceteris paribus, will enhance maize productivity fertilizer is the focus of this study.[83] Small-scale maize producers currently use, on average, one 50 kg bag of planting fertilizer and one 50

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[82]However, the fact that this policy prescription has not yet been explored suggests that it is not pareto optimal. That is, if these costs savings to producers and consumers were costless, they would already have been achieved. Rather, there are some other stakeholders who are either benefitting from the status quo and stand to lose from a change in policy (for example, government officials who benefit from bribes to waive or reduce tariffs), or who would incur some costs if such a policy change were implemented. For example, one way to reduce costs of production is through government investment in rural feeder roads. However, funding such an initiative would require financial resources the government may be unable or unwilling to mobilize. Consequently, some stakeholders may have resisted such a change in policy.

[83]The other element that comes into play is the yield response to fertilizer, which varies with factors such as varietal selection, timeliness of fertilizer application, and water availability.

kg bag of top-dressing fertilizer per acre, to obtain an average yield of 15 bags of maize (Arwings-Kodhek, 1999; Awuor, 2001). At these rates of fertilizer use per acre, fertilizer is the highest component of the costs of production (22 percent), followed by ploughing (20 percent) and transportation of maize (11 percent). Therefore, if the farm-gate price of fertilizer can be reduced, the positive repercussions at the farm-level are hypothesized to be twofold (holding the price of maize and agronomic response to fertilizer use constant). First, at current levels of use a reduction in the farm-gate price can increase returns to fertilizer use by reducing the per-unit costs of maize production. In the long-run, a reduction in the price of this input can enable farmers to increase their fertilizer use per acre, and hence increase yields and returns per acre, ceteris paribus.

This chapter investigates the first hypothesis by analyzing the impact of a reduction in the farm-gate price on fertilizer via cost reductions in the supply chain on farmer incomes. The chapter is organized as follows. Section 9.2 summarizes the findings of previous studies on the profitability of fertilizer use for maize production. Section 9.3 introduces and describes fertilizer supply chains studied in the 1999 survey. Section 9.4 describes the supply chains in terms of their costs, prices and margins and identifies the cost bottlenecks. Section 9.5 focuses on the determinants of a major cost bottleneck, transport costs. Section 9.6 estimates the impact of feasible policy-induced cost-reductions on the profitability of maize production in Western Kenya using sensitivity analysis. Section 9.7 derives implications for government policy and makes suggestions for future research.

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9.2. Previous Studies of Profitability of Fertilizer Use in Kenya

This section briefly summarizes the findings of previous studies of the profitability of fertilizer use for maize production. Karanja et al. (1999), using econometric analysis of household survey data, showed that for maize, the crop response rate to fertilizer was clearly profitable in most agricultural areas of Kenya, and especially in conjunction with the use of hybrid seeds. They state "after considering mean fertilizer and maize prices prevailing during 1997, the year of the survey, the mean value-cost ratio for DAP fertilizer use is calculated at 5.86. This means that for every Kshs spent on DAP fertilizer, the farmer gets Kshs 5.86 back in value of maize output." There were regional differences in this value, but except for the drier agricultural zones, DAP use was clearly profitable given 1997 price ratios.

Similarly, Nyambane (2001) showed, using survey data from a number of maize-producing districts in Kenya, that the returns to land and labor were typically higher for maize when fertilizer was applied, yet this analysis was not able to net out the effect of hybrid seed use independently from fertilizer use. Awuor (2001) compiled farm-level financial budgets for medium-scale farm households in three districts in Western Kenya (the maize belt) to assess the profitability of maize production using fertilizer: Trans Nzoia, Kakamega/Lugari and Bungoma districts. The results indicated that the gross margins for maize were reasonably high when fertilizer was applied. However, the estimated maize costs of production per bag were slightly higher than in other recent assessments (Argwings-Kodhek 1999; Mutunga 2001), mainly because the study includes land rental, representing the opportunity cost of land, in the cost estimates (see Awuor for details on methodology).

The analysis in this chapter will use the farm budgets compiled by Awuor to simulate the impact on returns to fertilizer use on maize of a reduction in the price of fertilizer due to cost-reductions in the supply chain. In preparation for this analysis, Section 9.3 will: a) introduce and describe the supply chains that comprised the private-sector-led marketing system in 1999 in terms of their composition, channel route and quantity carried; and b) describe these supply chains in terms of their costs, prices and margins using the cost build-up technique.

9.3. Fertilizer Supply Chains

In 1999, farmers in Western Kenya obtained their fertilizer via the numerous supply chains first introduced in Chapter Five. Since there were no government restrictions, physical flows of fertilizer to the farm-gate via the supply chains were determined by price. Ten supply chains had small retailers as their penultimate stage. These supply chains are outlined in Table 23. Twelve supply chains had large retailers as their penultimate stage. They are described in Table 24. In contrast to the small retailers who purchased the majority of their fertilizer from intermediaries and specifically from large wholesalers, the majority of the fertilizer purchased by large retailers in 1999 was purchased directly from importers.

Table 23. Summary of DAP Supply Chains Small Retailer (Population), Fertilizer Trader Survey, Kenya 1999

Supply Chains	Composition of the Supply Chain	Channel Route	No. of bags purchased	
			DAP	Urea
Supply Chain 1 (SSC1)	Large Importer - Large Wholesaler - Small Retailer	Nairobi - Eldoret - Chepsiro	800	300
Supply Chain 2 (SSC2)	Large Importer - Large Wholesaler - Small Retailer	Nairobi - Eldoret - Nangili	1150	988
Supply Chain 3 (SSC3)	Large Importer - Large Wholesaler - Small Retailer	Nairobi - Eldoret - Kipkarren	130	30
Supply Chain 4 (SSC4)	Large Importer - Large Wholesaler - Small Retailer	Nairobi - Eldoret - Soy	113	333
Supply Chain 5 (SSC5)	Large Importer - Large Wholesaler - Small Retailer	Nairobi - Eldoret - Turbo	300	125
Supply Chain 6 (SSC6)	Vertically Integrated Importer - Small Retailer	Mombasa - Kitale - Kanjibora	580	355
Supply Chain 7 (SSC7)	Vertically Integrated Importer - Small Retailer	Mombasa - Kitale - Nangili	198	520
Supply Chain 8 (SSC8)	Vertically Integrated Importer - Small Wholesaler - Small Retailer	Mombasa- Kitale - Matunda	35	72
Supply Chain 9 (SSC9)	Vertically Integrated Importer - Small Retailer	Mombasa - Kitale - Kimilili	93	not app
Supply Chain 10 (SSC10)	Large Importer - Small Wholesaler - Small Retailer	Mombasa - Matunda - Nangili	1300	400

Table 24. Summary of DAP Supply Chains, Large Retailer (Population), Kenya 1999

Supply Chains	Composition of the Supply Chain	Channel Route	No. of bags purchased	
			DAP	Urea
Supply Chain 1 (LSC1)	Large Importer - Large Retailer	Mombasa - Nairobi - Eldoret	10,560	not app
Supply Chain 2 (LSC2)	Small Importer - Large Retailer	Mombasa - Nairobi - Eldoret	5,600	not app
Supply Chain 3 (LSC3)	Small Importer - Large Retailer	Mombasa - Nairobi - Kitale	150	60
Supply Chain 4 (LSC4)	Vertically Integrated Importer - Large Retailer	Mombasa - Kitale - Kimilili	3,692	226
Supply Chain 5 (LSC5)	Vertically Integrated Importer - Large Retailer	Mombasa - Kitale	250	1,886
Supply Chain 6 (LSC6)	Large Importer - Large Wholesaler - Large Retailer	Mombasa - Nairobi - Kitale - Moi's Bridge	2,000	not app
Supply Chain 7 (LSC7)	Large Importer - Large Wholesaler - Large Retailer	Mombasa - Nairobi - Kitale	550	not app
Supply Chain 8 (LSC8)	Large Importer - Large Wholesaler - Large Retailer	Mombasa - Nairobi - Eldoret	320	866
Supply Chain 9 (LSC9)	Vertically Imported Importer - Large Retailer	Mombasa - Kitale - Moi's Bridge	not app	91
Supply Chain 10 (LSC10)	Large Importer - Large Wholesaler - Large Retailer	Mombasa - Nairobi - Eldoret - Moi's Bridge	740	290
Supply Chain 11 (LSC11)	Large Importer - Small Wholesaler - Large Retailer	Mombasa - Matunda - Kitale	300	not app
Supply Chain 12 (LSC12)	Large Importer - Large Wholesaler - Small Wholesaler - Large Retailer	Mombasa - Nairobi - Kitale	60	40

9.3.1. Cost Build-Ups of the Fertilizer Supply Chains

Cost build-ups were constructed for each of the large retailer and small retailer supply chains. A cost-build up is an accounting technique which estimates the spatial and temporal gross margins at the various stages of a supply chain. Spatial margins refer to price margins between locations and include transport costs, storage costs, and other transfer costs such as transaction costs, plus a competitive return to capital and management. Since the gross margins include storage costs, they are not purely spatial margins as they also include price differences over time or a temporal dimension. The cost build-ups of the fertilizer supply chains are synthetic, meaning that they are not actual cost build-ups of the costs and margins incurred as each consignment traveled from the port to the farm-gate. This was not possible to do since the study was conducted after the main trading season had ended and the quality of record-keeping by traders (dates, buying prices, selling prices, quantities) made it impossible to match precisely the buying price and selling price for each consignment as it made its progression to the farm-gate. Consequently, the supply chains were constructed using data for consignments for specific months (March for DAP and June for urea) on the assumption that traders purchased and sold fertilizer in the same month. The weighted averages of the actual buying and selling prices reported by traders at each stage of the supply chains were used and where there was a discrepancy between the weighted buying price and weighted selling price, the prices were added and divided by two i.e. averaged. Table 25 presents the cost build-ups for large retailer supply chains for DAP and Table 26 presents the same for urea, Table 27 presents the cost build-up for small retailer supply chains for DAP and Table 28 presents the same for urea.

Table 25. Port-to-Farmgate Cost Build-ups, Large Retailer Supply Chains (Population) DAP 50 kg, June1999 (All figures in Ksh per bag unless otherwise noted)

	SC1	SC2	SC3	SC4	SC5
IMPORTER					
f.o.b. price in Oct/Nov 1998	637	721	721	930	930
Sea Freight	98	112	112	112	112
Insurance@1% landed cost	7	8	8	8	8
c.i.f. Mombasa	742	841	841	1,050	1,050
Port Charges	80	85	85	95	95
Total Transport Costs	148	148	148	175	175
Transit losses	12	14	14	13	16
Other Importer Costs	137	141	141	112	112
Importers total costs	1,119	1,229	1,229	1,445	1,448
Importers actual selling price	1,200	1,390	1,450	1,310	1,580
Gross Margin	563	669	729	380	650
Gross Margin % Farmgate Price	41	40	46	24	37
Importers net margin	81	161	221	(135)	132
Percent Net Return	13	22	31	(15)	14
Net Margin % Farmgate Price	6	10	14	(9)	7
LARGE WHOLESALER					
Actual buying price					
Transport Costs					
Transit losses					
Other Costs					
Total Wholesalers Costs					
Actual selling price					
Gross Margin					
Gross Margin % Farmgate Price					
Wholesalers' net margin					
Percent Net Return					
Net Margin % Farmgate Price					
SMALL WHOLESALER					
Actual buying price					
Transport Costs					
Transit losses					
Other Costs					
Total Wholesalers Costs					
Actual selling price					
Gross Margin					
Gross Margin % Farmgate Price					
Wholesalers' net margin					
Percent Net Return					
Net Margin % Farmgate Price					
RETAILER					
Actual buying price	1,200	1,390	1,450	1,310	1,580
Transport Costs	60	60	70	50	0
Transit losses	12	16	15	14	17
Other Costs	21	23	23	24	23
Total Retailers Costs	1,293	1,489	1,558	1,398	1,620
Actual selling price	1,300	1,600	1,520	1,480	1,700
Gross Margin	100	210	70	170	120
Gross Margin % Farmgate Price	7	13	4	11	7
Retailers net margin	7	111	(38)	82	80
Percent Net Return	1	8	(3)	6	5
Net Margin % Farmgate Price	1	7	(2)	5	4
Transport to Farm-gate	80	80	80	80	80
FARM-GATE PRICE	1,380	1,680	1,600	1,560	1,780

Table 25. Port-to-Farmgate Cost Build-ups, Large Retailer Supply Chains (Population) DAP 50 kg, June1999 (All figures in Ksh per bag unless otherwise noted)

	SC6	SC7	SC8	SC9	SC10	SC11	SC12
IMPORTER							
f.o.b. price in Oct/Nov 1998	637	637	637	637	637	930	637
Sea Freight	98	98	98	98	98	112	98
Insurance@1% landed cost	7	7	7	7	7	8	7
c.i.f. Mombasa	742	742	742	742	742	1,050	742
Port Charges	80	80	80	80	80	95	80
Total Transport Costs	148	148	148	148	148	175	148
Transit losses	13	13	13	13	13	12	12
Other Importer Costs	137	137	137	137	137	112	137
Importers total costs	1,120	1,120	1,120	1,120	1,120	1,444	1,119
Importers actual selling price	1,300	1,300	1,300	1,300	1,300	1,260	1,230
Gross Margin	663	663	663	663	663	330	593
Gross Margin % Farmgate Price	39	42	41	43	38	17	33
Importers net margin	180	180	180	180	180	(184)	111
Percent Net Return	28	28	28	28	28	(20)	17
Net Margin % Farmgate Price	11	11	11	12	10	(10)	6
LARGE WHOLESALER							
Actual buying price	1,300	1,300	1,300	1,300	1,300	1,260	1,230
Transport Costs	70	70	70	70	60	60	70
Transit losses	15	14	15	14	15	18	14
Other Costs	13	13	13	13	13	13	14
Total Wholesalers Costs	1,398	1,397	1,398	1,397	1,388	1,351	1,328
Actual selling price	1,500	1,400	1,500	1,400	1,500	1,800	1,460
Gross Margin	200	100	200	100	200	540	230
Gross Margin % Farmgate Price	12	6	12	7	12	28	13
Wholesalers' net margin	102	3	102	3	112	449	132
Percent Net Return	8	0	8	0	9	36	11
Net Margin % Farmgate Price	6	0	6	0	6	23	7
SMALL WHOLESALER							
Actual buying price							1,460
Transport Costs							0
Transit losses							16
Other Costs							13
Total Wholesalers Costs							1,489
Actual selling price							1,610
Gross Margin							150
Gross Margin % Farmgate Price							8
Wholesalers' net margin							121
Percent Net Return							8
Net Margin % Farmgate Price							7
RETAILER							
Actual buying price	1,500	1,400	1,500	1,400	1,500	1,800	1,610
Transport Costs	20	0	0	0	20	0	0
Transit losses	16	15	15	14	16	18	17
Other Costs	23	21	21	21	21	22	21
Total Retailers Costs	1,559	1,436	1,536	1,435	1,557	1,840	1,648
Actual selling price	1,600	1,500	1,550	1,450	1,655	1,850	1,700
Gross Margin	100	100	50	50	155	50	90
Gross Margin % Farmgate Price	6	6	3	3	9	3	5
Retailers net margin	41	64	14	15	98	10	52
Percent Net Return	3	5	1	1	7	1	3
Net Margin % Farmgate Price	2	4	1	1	6	1	3
Transport to Farm-gate	80	80	80	80	80	80	80
FARM-GATE PRICE	1,680	1,580	1,630	1,530	1,735	1,930	1,780

Table 26. Port-to-Farmgate Cost Build-ups, Large Retailer Supply Chains (Population) Urea 50 kg, June1999 (All figures in Ksh per bag unless otherwise noted)

	SC3	SC4	SC5	SC8	SC9	SC10	SC12
IMPORTER							
f.o.b. price in Oct/Nov 1998	402	402	402	392	402	392	392
Sea Freight	112	112	112	98	112	98	98
Insurance@1% landed cost	5	5	5	5	5	5	5
c.i.f. Mombasa	519	519	519	495	519	495	495
Port Charges	69	69	69	68	69	68	68
Total Transport Costs	148	175	175	148	175	148	148
Transit losses	8	8	8	8	8	8	8
Other Importer Costs	93	78	78	93	78	93	93
Importers total costs	837	849	849	812	849	812	812
Importers actual selling price	810	830	840	800	855	800	800
Gross Margin	408	428	438	408	453	408	408
Gross Margin % Farm-gate Price	41	42	45	40	46	42	40
Importers net margin	(27)	(19)	(9)	(12)	6	(12)	(12)
Percent Net Return	(7)	(5)	(2)	(3)	1	(3)	(3)
Net Margin % Farm-gate Price	0	0	0	0	0	0	0
WHOLESALER # 1							
Actual buying price				800		800	800
Transport Costs				70		60	70
Transit losses				8		8	8
Other Costs				14		13	14
Total Wholesalers Costs				899		888	899
Actual selling price				850		830	850
Gross Margin				50		30	50
Gross Margin % Farm-gate Price				5		3	5
Wholesalers' net margin				(49)		(58)	(49)
Percent Net Return				(5)		(6)	(5)
Net Margin % Farm-gate Price				0		0	0
WHOLESALER #2							
Actual buying price							850
Transport Costs							0
Transit losses							9
Other Costs							27
Total Wholesalers Costs							886
Actual selling price							880
Gross Margin							30
Gross Margin % Farm-gate Price							3
Wholesalers' net margin							(6)
Percent Net Return							(1)
Net Margin % Farm-gate Price							0
RETAILER							
Actual buying price	810	830	840	850	855	830	880
Transport Costs	70	50	0	0	20	20	0
Transit losses	9	9	9	9	9	9	9
Opportunity Cost of Capital	4	4	4	4	4	4	4
Other Costs	21	23	21	21	23	20	21
Total Retailers Costs	914	916	874	884	911	883	914
Actual selling price	920	950	900	950	900	900	930
Gross Margin	110	120	60	100	45	70	50
Gross Margin % Farm-gate Price	11	12	6	10	5	7	5
Retailers Net Margin	6	34	26	66	(11)	17	16
Percent Net Return	1	4	3	8	(1)	2	2
Net Margin % Farm-gate Price	1	3	3	6	0	2	2
FARM-GATE PRICE	1,000	1,030	980	1,030	980	980	1,010

Table 27. Port-to-Farmgate Cost Build-ups, Small Retailer Supply Chains, (Population) DAP 50 kg, March 1999 (All figures in Ksh per bag unless otherwise noted).

	SC1	SC6	SC7	SC8	SC10
IMPORTER					
Cost Build Up Items					
f.o.b. price in Oct/Nov 1998	637	930	930	930	637
Sea Freight	98	112	112	112	98
Insurance@1% landed cost	7	8	8	8	7
c.i.f. Mombasa	742	1,050	1,050	1,050	742
Port Charges	80	95	95	95	80
Total Transport Costs	148	175	175	175	148
Transit losses	13	15	13	16	13
Other Importer Costs	137	112	112	112	137
Importers total costs	1,120	1,447	1,445	1,448	1,120
Importers actual selling price	1,320	1,480	1,310	1,550	1,300
Gross Margin	683	550	380	620	663
Gross Margin % Farmgate Price	46	34	27	38	47
Importers net margin	200	33	(135)	102	180
Percent Net Return	31	4	(15)	11	28
Net Margin % Farm-gate Price	14	2	(10)	6	13
LARGE WHOLESALER					
Actual buying price	1,320				
Transport Costs	60				
Transit losses	13				
Other Costs	19				
Total Wholesalers Costs	1,412				
Actual selling price	1,380				
Gross Margin	60				
Gross Margin % Farmgate Price	4				
Wholesalers' net margin	(32)				
Percent Net Return	(2)				
Net Margin % Farm-gate Price	0				
SMALL WHOLESALER					
Actual buying price				1,550	1,300
Transport Costs				20	125
Transit losses				15	13
Other Costs				24	24
Total Wholesalers Costs				1,609	1,462
Actual selling price				1,583	1,340
Gross Margin				33	40
Gross Margin % Farmgate Price				2	3
Wholesalers' net margin				(26)	(122)
Percent Net Return				(2)	(9)
Net Margin % Farm-gate Price				0	0
RETAILER					
Actual buying price	1,380	1,480	1,310	1,583	1,340
Transport Costs	20	20	30	0	20
Transit losses	14	16	14	16	14
Other Costs	22	22	21	22	21
Total Retailers Costs	1,436	1,538	1,375	1,621	1,395
Actual selling price	1,450	1,600	1,390	1,615	1,400
Gross Margin	70	120	80	32	60
Gross Margin % Farmgate Price	5	7	6	2	4
Retailers net margin	14	62	15	(6)	5
Percent Net Return	1	4	1	(0)	0
Net Margin % Farm-gate Price	1	4	1	(0)	0
FARM-GATE PRICE	1,470	1,620	1,410	1,635	1,420

Table 28. Port-to-Farmgate Cost Build-ups, Small Retailer Supply Chains (Population), Urea 50 kg, June 1999, (All figures in Ksh per bag unless otherwise noted)

	SC1	SC2	SC3	SC5
IMPORTER				
f.o.b. price in Oct/Nov 1998	392	402	402	402
Sea Freight	98	112	112	112
Insurance@1% landed cost	4	5	5	5
c.i.f. Mombasa	494	519	519	519
Port Charges	68	69	69	69
Total Transport Costs	148	175	175	175
Transit losses	8	8	8	8
Other Importer Costs	93	78	78	78
Importers total costs	811	849	849	849
Importers actual selling price	870	880	872	850
Gross Margin	478	478	470	448
Gross Margin % Farm-Gate Price	48	50	48	48
Importers net margin	59	31	23	1
Percent Net Return	15	8	6	0
Net Return % Farm-Gate Price	6	3	2	0
LARGE WHOLESALER				
Actual buying price	870			850
Transport Costs	60			20
Transit losses	9			8
Other Costs	22			22
Total Wholesalers Costs	961			900
Actual selling price	900			845
Gross Margin	30			(5)
Gross Margin % Farm-Gate Price	3			0
Wholesalers' net margin	(61)			(55)
Percent Net Return	(7)			(6)
Net Return % Farm-Gate Price	(6)			(6)
SMALL WHOLESALER				
Actual buying price			872	
Transport Costs			20	
Transit losses			8	
Other Costs			29	
Total Wholesalers Costs			929	
Actual selling price			895	
Gross Margin			23	
Gross Margin % Farm-Gate Price			2	
Wholesalers' net margin			(34)	
Percent Net Return			(4)	
Net Return % Farm-Gate Price			0	
SMALL RETAILER				
Actual buying price	900	880	895	845
Transport Costs	30	20	0	20
Transit losses	9	9	9	9
Other Costs	24	24	24	23
Total Retailers Costs	963	933	928	897
Actual selling price	980	940	960	915
Gross Margin	80	60	65	70
Gross Margin % Farm-Gate Price	8	6	7	8
Retailers net margin	17	7	32	18
Percent Net Return	2	1	4	2
Net Return % Farm-Gate Price	0	0	0	0
FARM-GATE PRICE	1,000	960	980	925

For example, in Table 25, large retailer supply chain number six presents the cost build-up from Mombasa to Nairobi to Eldoret to Turbo for DAP fertilizer. The F.O.B. price in the US Gulf in November 1998 was US$196 per ton or Kshs 637. Adding freight charges of Kshs 98 per bag and insurance costs per bag (one percent of landed cost) to this gives a C.I.F. price of US$228 per ton or Kshs 742 per bag (using the prevailing exchange rate in April 1999 of US$1 = Kshs 65). Adding port taxes, transport costs, transit losses, and other importer costs brings importers' total costs to Kshs 1,120 per bag. Port taxes of Kshs 80 included: charges by the Kenya Port Authority (KPA) for unloading and loading the fertilizer and fees for the use of its facilities; fees paid for the Import Declaration Form (IDF) to the Central Bank, fees paid to Kenya Agricultural Research Institute (KARI) and fees paid to the Kenya Bureau of Standards (KBS). The IDF levy is paid to the Central Bank and covers the government document processing cost. The Kenya Agricultural Research Institute receives some money to conduct fertilizer demonstration trials on-site and on-farm, and the Kenya Bureau of Standards certifies that imports meet the required standards and receives a levy for this service.

Other importer costs include agency fees for clearing the fertilizer, bagging fees from private bagging companies, bank charges for the letter of credit, and labor, handling, storage and overhead and administration costs. These various costs, charges and levies add an extra Kshs 430 (or 58 percent) to the C.I.F. price. The importers' gross margin is positive and the percent net returns are also positive, indicating that the importers' selling price was higher than the total cost of importing, marketing and distributing to the wholesaler in Eldoret.

The wholesaler in Eldoret purchased the fertilizer at Kshs 1,300, transported it to Eldoret for Kshs 70, and stored it for a period of approximately seven days incurring storage costs per bag of bag of Kshs 10 and transit losses worth Kshs 15. When these costs were added to other wholesale costs, total wholesale costs (Kshs 1,398) were below the wholesale selling price (Kshs 1,500), resulting in a positive percent net return of eight percent. Similarly, the large retailer in Moi's Bridge who purchased the fertilizer from the wholesaler at Kshs 1,500 was still able to make a positive net return of three percent after paying transport costs of Kshs 20 per bag, transit losses of Kshs 16 per bag and other costs of Kshs 23 per bag.

It can be seen in each table that the percent net returns to trade at the same stage of the supply chains varied across supply chains between high profits and negative returns. This reflects the variability in prices - even within the same month fertilizer prices changed from day to day and week to week, and even within the same day. This price variability reflected changes in supply, that is, the quantity of product available on a particular day which is the result of many individual decisions by sellers. A change in demand may also have been a factor - demand could have changed due to changes in the market price of maize for example - although day-to-day variation in demand is usually less volatile than in supply. The variation in returns can also be explained by the fact that the cost build-ups depict a snapshot of a situation at a given moment in time, which is not necessarily an equilibrium situation. Therefore, it is possible that some traders, in a given point in time, were losing money.

9.3.2. Analysis of the Cost Build-Up Results

Analysis of the cost build-ups of the all of the supply chains for DAP and urea revealed that internal distribution costs comprised a significant proportion of the farm-gate price of fertilizer in 1999, and importers accrued the largest proportion of the farm-gate price. On average, for large retailer supply chains for DAP, 44 percent of the farm-gate price was accounted for by the F.O.B. price; and for urea, 40 percent of the farm-gate price was accounted for by the F.O.B. price. For small retailer supply chains, for DAP, on average 52 percent of the farm-gate price was accounted for by the F.O.B. price, and for urea the figure was 40 percent. The figures for DAP are slightly higher because DAP is imported in bulk and rebagged at the port while urea is imported in bags so its marketing costs do not include the costs of rebagging. On average, domestic marketing costs comprised 50 percent of the farm-gate price for DAP and 60 percent for urea.

The disaggregation of these internal costs by trader margin for both large and small retailer supply chains revealed that for DAP, on average, 33 percent of the farm-gate price was accounted for by importers gross margins, 12 percent was accounted for by wholesalers' margins, and five percent accrued to retailers. In the case of Urea, on average, 43 percent of the farm-gate price accrued to importers, eight percent to wholesalers and nine percent to retailers. The disaggregation of these internal distribution costs by trader margin for the small retailer supply chains revealed that for DAP, on average, 37 percent of the farm-gate price accrued to importers, eight percent to wholesalers, and five percent to retailers. In the case of Urea, on average, 46 percent of the farm-gate price accrued to importers, seven percent to wholesalers and seven percent to retailers. Therefore, the largest proportion of the farm-gate price accrued to importers for large and small retailer supply chains for both DAP and urea.

These findings are to be expected since relatively more services were added to the fertilizer at the importer level, as compared to the wholesale or retail level for these supply chains, and similarly, wholesalers added more value to fertilizer than retailers.

In the case of importers, since the analysis was dealing with an imported commodity, total market costs for importers were expected to be large relative to those incurred by wholesalers and retailers to reflect the higher costs of importation such as freight charges, port taxes, and storing the fertilizer for periodic release or sale over the trading season. The addition of this temporal dimension to fertilizer is important because fertilizer needs to be made available to farmers in a timely manner. The survey results indicated that the brunt of the storage costs in all the supply chain were borne by importers because importers typically stored fertilizer for approximately 120 days (compared to 14 days for wholesalers and two days for retailers). Importers also bore the brunt of the cost of adding form utility to the fertilizer, first, by sorting out the different types of fertilizer, assorting them into homogeneous lots, and then finally, bagging and labeling them.

In the case of wholesaler marketing costs, wholesalers and retailers performed essentially the same marketing functions (storage, transportation). However, wholesalers performed them at a larger scale or for longer periods, and therefore their total marketing costs per bag were larger since they incurred higher costs per bag for the same marketing functions. That is, wholesalers typically stored fertilizer for an average of 14 days compared to two days for retailers. They also tended to have separate storage facilities whereas retailers tended to store their fertilizer on their store premises. As a result, wholesalers incurred the higher storage costs per bag. Secondly, with the exception of the few large retailers who purchased fertilizer directly from importers, wholesalers transported fertilizer over longer distances than retailers so they had higher transport costs per bag. Wholesalers also performed some functions that retailers did not, such as sorting fertilizer into heterogenous groups on delivery and then assorting them into homogenous units for sale, according to the needs of their various types of customers. Therefore, the hypothesis is that more value was added higher up in the supply chains, and as the fertilizer approached the farm-gate traders invested less in value-adding activities.

9.3.3. Cost Bottlenecks

Table 29 illustrates the cost structure of the large retailer and small retailer supply chains for DAP and urea in 1999. For both large retailer supply chains and small retailer supply chains for both types of fertilizer, on average across all the supply chains, transport costs were the main cost component, followed by port charges and transit losses. Port taxes charges in the supply chains for urea are lower than those for DAP due to the lower C.I.F. price and zero bagging costs for urea supply chains since this fertilizer is imported bagged.

Therefore, port taxes, transit losses and transport costs were the main cost bottlenecks in fertilizer marketing in 1999. Whereas port taxes were only incurred at one stage of each supply chain by importers, transit losses and transport costs were incurred at each stage of the supply chains. There may be some scope to reduce these costs through policy interventions designed to improve efficiency.

Table 29. Cost Structure of Large Retailer Supply Chains and Small Retailer Supply Chains (Population of Traders) for DAP and Urea, Fertilizer Trader Survey, Kenya, 1999

Cost Component	Large	Retailer	Small	Retailer
	DAP	Urea	DAP	Urea
	%	%	%	%
Transport Costs	37	46	38	46
Port Taxes	15	14	15	17
Transit Losses	7	4	6	4
Other Costs	41	36	41	33
Total	100	100	100	100

Specifically, there is room for fertilizer cost reduction through government interventions to: a) reduce taxes and charges incurred at the port of Mombasa; b) reduce transit losses through more careful handling methods, using more direct channels of distribution, and improving security to reduce theft; c) reduce transport costs per bag in two ways: i) first, by upgrading rural roads from bad roads to good roads through investments in infrastructure; ii) second, by reducing the fuel tax.

The potential impact of these policy induced cost-reductions on farm income will be assessed using farm-budget simulations in Section 9.6. First, since transport costs comprised such a substantial proportion of the traders' marketing costs at all levels of the private-sector-led marketing system, Section 9.5 quantifies the cost savings that could be anticipated from investments in road infrastructure.

9.4. The Effect of Distance and Road Quality on Transport Costs

9.4.1. Transport Costs in Kenya

Road transport was the main mode of fertilizer distribution in Kenya in 1999. Two types of transporters catered to the fertilizer industry. The first category consisted of large transporters, operating trucks with a carrying capacity of between 28 and 32 tons. Transportation of fertilizer from the port of Mombasa to the various upcountry destinations of Nairobi, Nakuru, Eldoret and Kitale was dominated by these large transporters. Large transporters typically traveled long distances (on average 500 km) on good quality roads (good quality roads are wider, tarmac, all-weather roads which means they are accessible year round) and carried big loads of between 28 and 32 tons. These large tonnages and long distances resulted in low average unit costs, and allowed large transporters to benefit from scale economies in transportation whereby unit costs decreased with each additional kilometer traveled. Consequently, large transporters charged on a ton-per-km basis.

The second category of transporters were small transporters who dominated the distribution of fertilizer between wholesalers and retailers, and retailers and farmers in Western Kenya. Small transporters traveled short distances (on average 20km) on bad quality roads (bad quality roads are roads that may be tarmac but are narrow and pot-holed, or they are murram/dirt roads). These characteristics make them difficult to use, particularly during the rainy season. The loads carried by small transporters ranged in size from one bag to 400 bags. These transporters typically owned one or two vehicles, which varied in type from 1-16 ton canters or small trucks, pick-ups, matatus and bicycles or boda-bodas[84]. The canters and pick-ups were normally used to transport fertilizer from wholesalers to retailers, whereas the matatus normally transported the fertilizer from the retailer to drop-off points at varying distances from farms or homesteads. The remaining distances to the farmgate - ranging from a few hundred meters to several kilometers - were either covered on foot, or by boda-boda.[85]

The small loads and short distances meant that costs per unit had to be relatively high to cover running costs. Consequently, small transporters charged on a per bag basis and transport charges per bag increased with each additional kilometer traveled. For example, it cost between Ksh2 and Ksh5 to transport one 50kg bag within a 1km radius; Ksh10-Ksh15 per bag to transport one 50kg bag between 1km and 10km; and Ksh20 per bag to transport one 50kg bag between 10km and 20km. Moreover, small transporters took into account the variation in road quality and charged higher rates for the same or equivalent distance traveled on bad quality roads.

The different charging schemes employed by large and small transporters resulted in higher transport costs for distances traveled between towns and locations in Western Kenya than for distances traveled between Mombasa and/or Nairobi and towns in Western Kenya. For example, the cost of transporting a bag of fertilizer 40km from a wholesaler in Eldoret to a retailer in the town of Soy was Ksh50/bag which is almost one-quarter what it

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[84]"Boda-boda's" refer to people that offer transportation of people and goods via a bicycle. They can carry up to two 50 kg bags of fertilizer at one time. A matatu is a passenger van, typically able to seat between 12 and 15 people, with luggage loaded on roof-top carriers.

[85]The existence of the boda-boda trade can be attributed to the poor state of the interior roads which dissuades matatus from traveling on them. As a result, farmers, particularly those who live more than a few kilometers from the major roads, are forced to hire these 'boda-bodas' to carry their fertilizer to the farmgate.

cost to transport a bag of fertilizer the 788km from Mombasa to Eldoret (Ksh175/bag). Moreover, when the per bag transport charges were converted to ton-per-km, the average cost along the Mombasa-Eldoret route was Ksh 4 per ton/km compared to Ksh25 per ton/km for the Eldoret-Soy route (Table 30). Therefore, transport charges for fertilizer were influenced by a number of related factors: distance traveled, the different charging schemes used by large transporters and small transporters, number of bags carried, and road quality.

Table 30. A Comparison of Truck Transport Costs for fertilizer between Importers, Wholesalers and Retailers, (Population of Traders), Ksh/ton/km

Route	Most Common Transport Mode	Ksh per 50kg bag	Ksh per ton/km
Costs incurred by importers and wholesalers			
Mombasa - Eldoret	32 ton	175 (788km)	4
Mombasa - Kitale	32 ton	175 (867km)	4
Costs incurred by retailers			
Kitale/Eldoret to retailer in same city	Wholesalers' truck or pick-up, matatu, hired truck/pick-up	10 (1-10km)	40 (using average of 5 km)
Kitale/Eldoret to retailer hinterland location or town	Matatu only	50 (40km)	25
Retailer to Farmgate	Boda-boda	30 (10 - 30 km)	30 (using average of 20km)

9.4.2. The Transport Cost Model

The focus of the regression analysis in this section is to determine the effect of distance and road quality and other relevant explanatory variables, on transport costs. Minten and Kyle (1999) found that poor road infrastructure increases transport costs.

Similarly, Ahmed and Hossain (1990) concluded that improvements in road quality increases the use of fertilizer by decreasing transport costs. It follows that one way in which the government of Kenya could reduce transport costs would be by investments to improve road quality. To quantify these potential costs savings, this section will use regression analysis to assess the degree to which transport costs vary with road quality in Kenya.

In a reduced-form equation, transportation costs per ton/km (TCTONPKM) are expressed as follows (i subscript indicates consignment):

$$TCTONPKM_{it} = f\,(DISTGOOD_{it}, DISTGDSQ_{it}, DISTBAD_{it}, DISTBDSQ_{it}, NOTONS_{it}, SEASGOOD_{it}, SEASBAD_{it}) \qquad (9)$$

where i indicates the consignment, t indicates the trader who purchased the consignment. trader.

$TCTONKPM_{it}$	= transport costs per ton/km (in the local currency, Kenya Shilling) of consignment i purchased by trader t;
$DISTGOOD_{it}$	= distance traveled on good quality roads by consignment i purchased by trader t;
$DISTGDSQ_{it}$	= DISTGD squared;
$DISTBAD_{it}$	= distance traveled on bad quality roads by consignment i purchased by trader t;
$DISTBDSQ_{it}$	= DISTBDSQ squared;
$NOTONS_{it}$	= number of tons of consignment i purchased by trader t;

SEASBAD$_{it}$ = an interactive variable that takes on a value of 1 for distance traveled on bad roads during the rainy season (March through July inclusive); and 0 for the dry season (January and February).

SEASGOOD$_{it}$ = an interactive variable that takes on a value of 1 for distance traveled on good roads during the rainy season (March through July inclusive); and 0 for the dry season (January and February).

Table 31 presents the descriptive statistics for these variables.

Table 31. Descriptive Statistics for Variables in Transport Costs Regression Model, Fertilizer Trader Survey, Kenya 1999

Variable	Units	Mean	Standard deviation	Maximum	Minimum
TCTONPKM	Ksh per ton/km	20	6	33	4
DISTGOOD	Km	101	121	310	10
DISTGDSQ	Kmsq	24740	40314	96100	100
DISTBAD	Km	32	13	70	15
DISTBDSQ	Kmsq	1190	1115	4900	225
NOTONS	tons	84	486	5000	.05
SEASGOOD	Interactive variable	86	121	310	0
SEASBAD	Interactive variable	27	17	70	0

Road transporters are expected to charge higher rates per kilometer traveled on bad quality roads to compensate them for the higher costs of wear and tear on their vehicles. Therefore, the impact on transport costs of distance traveled on bad quality roads is expected to be larger than the impact on transport costs of distance traveled on good quality roads. Accordingly, this study tests the null hypothesis that the coefficient on DISTGOOD is equal to the coefficient on DISTBAD, and that the coefficient on

DISTGDSQ is equal to the coefficient on DISTBDSQ. The alternative hypothesis is that traveling an additional 10 km on a good quality road increases transport costs by less than traveling an additional 10 km on a bad quality road. However, even when distance has been accounted for, the number of bags in a consignment is anticipated to influence transport costs since unit costs decrease as the number of tons increases. The variable NOTONS is included in the model to capture this effect and the coefficient is hypothesized to be negative.

Transport costs are hypothesized to be higher during the rainy season because worsened road conditions increase the wear and tear on the vehicles and increase the difficulty of using certain routes. The effect of the rainy season on transport costs is hypothesized to be larger for distance traveled on bad roads than for distance traveled on good roads. To capture these differential effects, two interactive variables, SEASGOOD and SEASBAD are included in the model. SEASGOOD takes on a value of 1 for distance traveled on good roads during the rainy season, and 0 otherwise and the coefficient is hypothesized to be zero. SEASBAD takes on a value of 1 for distance traveled on bad roads during the rainy season, and 0 otherwise. The coefficient is hypothesized to be positive and statistically significant.

9.4.3. Results

Of the 14 wholesalers and 47 retailers interviewed, 10 of the wholesalers and 30 of the retailers provided data on consignments purchased and the corresponding transport costs. Since the dependent variable of interest, transport costs per ton/km, is not expected to vary depending on whether the trader was a retailer or wholesaler, the data sets were combined.

Observations with the supplier and trader in the same town were deleted. This yielded a data set of 416 observations. Since many of the transactions were purchased by the same trader over a period of seven months, there was a possibility of non-constant variance in the errors terms of observations for the same trader. Accordingly, the Breusch-Pagan test was performed, and on the basis of the results the study failed to reject the null hypothesis of homoskedasticity. Therefore, the study was able to use Ordinary Least Squares to obtain results with asymptotically consistent standard errors. Table 32 shows the results of the regression model with transport costs per ton/km (TCTONPKM) as the dependent variable. The R-squared statistic and F-statistic indicate that together, the seven regressors explain a considerable degree of the variability in transport costs per ton/km of fertilizer in Kenya in 1999.

Tests of joint significance were performed to test the null hypothesis that the coefficients on DISTGOOD and DISTBAD were equal and the coefficients on DISTGDSQ and DISTBDSQ were equal. In both cases the null hypothesis was rejected at the one percent level of significance, which indicates that the impact on transport costs of distance traveled on good roads is different than the impact of distance traveled on bad roads, and this difference is statistically significant.

Table 32. Pooled Least Square Regression of Transport Costs (ton-per-km) Fertilizer Trader Survey, Kenya 1999

Independent Variable	Coefficients (Standard Errors)
Intercept	22.47 (0.78)
DISTGOOD	-.17 (.02)*
DISTGDSQ	.0003 (.00004)*
DISTBAD	.003 (.05)
DISTBDSQ	.0008 (.0008)
NOTONS	-.002 (.0004)*
SEASBAD	.01 (.02)
SEASGOOD	.01 (.005)
F-test for Joint Significance	H0: DISTGOOD = DISTBAD
	F-statistic = 89.41 Significance (2, 408) = .0000
F-test for Joint Significance	H0: DISTGDSQ = DISTBDSQ
	F-statistic = 42.10 Significance (2, 408) = .0000
Number of observations = 416,	F (7, 408) =101.99 Adjusted R^2 = .63

*statistically significant at 1% level

With respect to economic significance, on average, transport costs were Ksh22 per ton/km. The coefficient on DISTGOOD was negative and statistically significant at the one percent level; specifically, for each additional 10 km traveled on a good quality road, transport costs decreased by Kshs 1.7 per ton/km relative to the average cost. The coefficient on DISTBAD was positive and not statistically significant, which indicates that per ton/km charges for distance traveled on bad quality roads were invariant with respect to distance. This is due to the short distances traveled on these bad quality roads; average distance traveled on bad quality roads was 32km compared to an average distance of 101km for good quality roads.

With respect to the impact of the rainy season on transport costs, the hypothesis was that since road conditions are considerably worse during the rainy season, the associated wear and tear would result in higher transport costs. The coefficients on SEASGOOD and SEASBAD are both positive but they are not statistically significant. A possible explanation for these unexpected results may be that there was not enough variation in the SEASON variable to allow precise estimation of the coefficients. There were only seven months included in the population (January to July) and January and February were the only dry season months.

9.5. Implications of Reductions in Transport Costs and Other Cost Bottlenecks for the Profitability of Maize Production

The previous section estimated the effect of distance traveled on good roads versus distance traveled on bad roads on transport costs (ton-per-km) in order to calculate the cost savings to be obtained by improvements in road infrastructure. The results indicate that on average transport costs were Ksh22 per ton/km, but transport costs decrease by Ksh2 per ton/km for each additional 10km traveled on a good quality road whereas the transport costs per ton/km do not vary for an additional 10km traveled on a bad road. Assuming this cost saving is fully passed on to the farmer in the form of a lower farm-gate price, the potential benefits of upgrading roads are two-fold. The first round effect is that, at current levels of consumption, returns to farmers of using fertilizer for maize production will increase. The second round effect is that since road improvement makes fertilizer use more profitable, farmers will purchase larger volumes. This will increase maize production per hectare and reduce costs of production per bag.

The next section will simulate the first round effect, that is, the effects of reductions or elimination of cost bottlenecks and marketing costs on the profitability of maize production. First, the impact of three possible scenarios for reductions in the farm-gate price of fertilizer will be simulated in the supply chains: a) elimination of the port taxes; b) reduction in transport costs; c) elimination of transit losses. Secondly, the reduced farmgate price will be inserted into farm-budgets to simulate the impact on the profitability of maize production using fertilizer. With regards to the reduced transport costs scenario, it is more realistic to think about the benefits to be accrued from reduced transport costs on both the input and the output side. Therefore, just as farmers will be assumed to benefit from the reduction in transport costs of fertilizer emanating from road improvement on the input side, they will also be assumed to benefit from a commensurate increase in the price of maize emanating from the same road improvement on the output side.

9.5.1. Farm-Budget Simulations

This section simulates the effects of reductions in marketing costs in general (including transport costs) on the profitability of maize production. The farm budgets are the farm-level financial budgets compiled by Awuor (2001) for medium-scale farm households in three major maize production districts in Western Kenya: Trans Nzoia, Kakamega/Lugari and Bungoma districts. (See Appendix 9.2 for the Farm Budgets compiled by Awuor, 2001). Though there is variation in fertilizer application rates between the three districts, for the sake of comparison, the budgets hold fertilizer dose rates and the yields that go with these dose rates constant. The results show that, with the fertilizer dose rate held constant, maize yields vary because of different levels of technology and farm husbandry techniques. Bungoma farmers use less-capital intensive technology and receive the lowest yields (14 bags/acre) and revenues (Kshs 13,500/acre), while the most mechanized system (representing relatively large small-scale farms in Trans Nzoia) provides the highest yields at 25 bags per acre and the highest revenues (Ksh 27,500/acre).

A number of important results emerged from the farm budgets. First, farmers using fertilizer on maize are realizing profits on maize production. The gross margins for maize were positive and reasonably high when fertilizer is applied.[86] However, fertilizer use on maize may be often unprofitable and very risky in the drier areas (Nyambane 2001). Secondly, the cost of fertilizer comprises a significant share of the costs of producing maize. It comprises the second highest share of the costs of production in Bungoma and Lugari districts (17 percent and 14 percent of the total production costs per acre respectively). The cost that comprises the largest share of cost of production in Bungoma is labor (20 percent) and in Lugari it is land preparation (22 percent). However, fertilizer is third in importance in Trans Nzoia district; it ranks after fixed costs (19 percent) and land preparation (14 percent), comprising 10 percent of the costs of producing one acre of maize. Clearly, among the larger smallholder farmers in Trans Nzoia, higher mechanization

[86] However, this does not prove that fertilizer use on maize is profitable. The profitability of fertilizer use is a function of the agronomic response of crop yields to the application of fertilizer, the cost of fertilizer to the farmer, and the price of the crop to which fertilizer is applied. Only if the incremental value of production from using fertilizer exceeds the cost of the fertilizer, then fertilizer use is profitable. Unfortunately, the budget data provided by Awuor are not detailed enough to do this sort of marginal analysis.

is substituting for labor as farmers move up to more capital-intensive technology. Therefore, although the costs of fertilizer remain a significant structural component for these farmers, profitability is these area is hypothesized to be less sensitive to reductions in fertilizer price. In contrast, in medium potential zones like Bungoma, where fertilizer comprises a higher percentage of the costs of production, the profitability of fertilizer use may be more sensitive to the price of fertilizer because it comprises a higher percentage of total production costs. To test these hypotheses, this section reports results of sensitivity analysis on the price of DAP and urea on the profitability of maize production, reflecting several scenarios that are envisioned to reduce farm-gate prices.

In 1999, although the Kenyan government had withdrawn from the marketing and distribution of fertilizer, there were still two policy areas that directly influenced the performance of the sub-sector: port fees and charges and the fuel tax. The cost build-ups indicated that port taxes, transit losses, and transportation costs were the cost bottlenecks in the private-sector-led marketing system in 1999 where feasible policy changes could be implemented to reduce the farm-gate price of fertilizer. Therefore, the scenarios are: (1) Elimination of government taxes and fees charged at the port of Mombasa; (2) A reduction in transport costs assumed to result from improvements in road infrastructure and the elimination of the fuel tax. Fifty percent of the cost of fuel is the fuel tax (Kenya Bureau of Standards, 1999). Since 14 percent of running costs are accounted for by fuel and oil, transport costs will be reduced by an additional seven percent to simulate the impact of the elimination of the fuel tax on the farm-gate price of fertilizer; (3) The elimination of transit losses at each stage of the supply chain; (4) the combined effects of all three of these scenarios of cost reduction.

The small retailer supply chain number six for DAP and small retailer supply chain two for urea are used as the base cases. The exposition as to how the cost build-ups and final farm-gate prices are affected by these scenarios is shown in Table 33. Scenario 1, the elimination of government taxes and fees at the port, is assumed to reduce the farm-gate price of DAP fertilizer by Kshs 58 per bag and Kshs 37 per bag for urea. Scenario 2, the reduction in transport costs due to upgrading of bad roads and elimination of the fuel tax is assumed to reduce farm-gate prices by Kshs 38 per bag for DAP and Kshs 31 per bag for urea. In Scenario 3, the elimination of transit losses is assumed to reduce farm-gate prices by Kshs 34 for DAP and Kshs 37 per bag for urea. The combined total cost reduction if all three of these scenarios were introduced simultaneously (Scenario 4) would be Kshs 128 per bag for DAP and Kshs 105 per bag for urea. These cost reductions would apply to all fertilizer transported through these supply chains, which include CAN, MAP and NPK.[87]

The effects of each of these scenarios on total costs of production per acre and profit per bag of maize produced are examined next. The simulations use the farm budgets compiled by Awuor (2001) as the base case scenario. The results are presented in Table 35. The calculations use the recommended rates of DAP and urea in Bungoma district which are 75 kg of DAP (basal) and 100 kg of Urea (top dressing) per acre and assume

[87]These sensitivity analyses assume that in each case the full cost-savings is passed onto the farmer. The author recognizes that this assumption may not be entirely consistent with the earlier findings of limited competition at the importer and wholesale level.

that fertilizer prices are uniform for farmers in each district. Under Scenario 1, which reflects the elimination of port taxes in Mombasa, the profit per bag of maize increases 13 percent in Bungoma, six percent in Lugari, and two percent in Trans Nzoia.

Table 33. Sensitivity Analysis for Small Retailer Supply Chain Six, DAP, Vertically Integrated Importer - Small Retailer, Channel Route: Mombasa - Kitale - Kanjibora, March 1999

No.	Vertically Integrated Importer	Base Case	Scenario 1: Eliminate Port Charges	Scenario 2 Reduction in Transport Cost	Scenario 3 Eliminate transit losses	Scenario 4: Combined of Scenarios
1	Importer buying price = US FOB price in November	930	930	930	930	930
2	Freight rates (from port of Florida November 1998)	112	112	112	112	112
3	Insurance (1% of landed cost of fertilizer)	8	8	8	8	8
4	CIF price (lines 1-3)	1,050	1,050	1,050	1,050	1,050
5	Total Port charges (lines 6-12)					
6	IDF (2.75% of CIF price)	29	0	29	29	0
7	KBS (.2% of CIF price)	2	0	2	2	0
8	KARI (1% of CIF price)	11	0	11	11	0
9	KPA Shore Handling	16	0	16	16	0
10	Misc.KPA charges	1	0	1	1	0
11	Stevedoring	28	28	28	28	28
12	Agency Fees (0.8% of CIF price)	8	8	8	8	8
13	Sub-total	95	36	95	95	36
14	Other costs incurred at the port (lines 15-18)					
15	Bagging	26	26	26	26	26
16	Bags	12	12	12	12	12
17	Local transport (to Mombasa warehouse)	0	0	0	0	0
18	Local handling charges	0	0	0	0	0
19						
20	Sub-total	38	38	38	38	38
21	Importers Costs ex-Mombasa (lines 4 + 13 + 20)	1,183	1,124	1,183	1,183	1,124
22	Other importer costs (lines 23 - 28)					
23	Transport Costs	175	175	158	175	158
24	Transit losses	16	15	16	0	0
25	Bank (LC) (3% of CIF price)	32	32	32	32	32
26	Handling Costs	10	10	10	10	10
27	Storage Costs	49	49	49	49	49
28	Overhead and administration	15	15	15	15	15
29	Sub-total	297	296	280	281	264
30	Importers total costs	1,480	1,420	1,480	1,464	1,388
31	Importers actual selling price	1,600	1,542	1,583	1,584	1,508
32	Gross Margin (line 31 - line 20)	670	612	653	654	578
33	Importers Net Margin (line31 - line 30)	120	122	103	120	120
34	Percent Net Return (line 33/line 20)*100	13	13	11	13	13
35						
36	Small Retailer (Kanjibora)					
37	Weighted actual buying price	1,600	1,542	1,583	1,584	1,509
38	Operating Costs					
39	Weighted actual transport costs	30	30	23	30	23
40	Handling Costs	4	4	4	4	4
41	Transit losses	18	17	17	0	0
42	Rebagging	10	10	10	10	10
43	Storage Costs	0	0	0	0	0
44	Overhead and Administration	7	7	7	7	7
45	Sub-total	69	68	61	51	44
46	Total Retailer Costs (line 37 + line 45)	1,669	1,610	1,644	1,635	1,553
47	Weighted actual selling price	1,750	1,692	1,726	1,716	1,635
48	Gross Margin (line 47 - line 37)	150	150	143	132	126
49	Retailers Net Margin (line 47 - line 46)	81	82	82	81	82
50	Percent Net Return (line 49/line 37)*100	5	5	5	5	5
51	Transport to farmgate	20	20	17	20	17
52	FARM-GATE PRICE	1,770	1,712	1,732	1,736	1,642

Table 34. Sensitivity Analysis for Small Retailer Supply Chain Two, Urea, Large Importer - Large Wholesaler - Small Retailer, Channel Route: Mombasa - Nairobi - Eldoret - Kipkarren, June 1999

No.	IMPORTER	Base Case	Scenario 1: Eliminate Port Charges	Scenario 2 Reduction in Transport Costs	Scenario 3 Eliminate transit losses	Scenario 4 Combined of Scenarios
1	Importer buying price	392	392	392	392	392
2	Freight rates	98	98	98	98	98
3	Insurance	4	4	4	4	4
4	CI.F.	494	494	494	494	494
5	Total port charges					
6	IDF (2.75% of c.i.f. price)	14	0	14	14	14
7	KBS (.2% of c.i.f. price)	1	0	1	1	1
8	KARI (1% of c.i.f. price)	5	0	5	5	5
9	KPA shore handling4	16	0	16	16	16
10	Misc.KPA charges	1	0	1	1	1
11	Stevedoring	28	28	28	28	28
12	Agency fees	4	4	4	4	4
13	Sub-total	68	32	68	68	68
14	Other costs incurred at the port					
15	Bagging	0	0	0	0	0
16	Bags	0	0	0	0	0
17	Transit losses	9	8	9	0	0
18	Local transport	23	23	21	23	21
19	Local handling charges	14	14	14	14	14
20	Sub-total	46	45	44	37	35
21	Importers costs ex-Mombasa	609	571	606	599	597
22	Other importer costs					
23	Transport costs	125	125	116	125	116
24	Transit losses	9	8	9	0	0
25	Bank (LC) (3% of c.i.f. price)	15	15	15	15	15
26	Handling costs	6	6	6	6	6
27	Storage costs	36	36	36	36	36
28	Overhead and administration	20	20	20	20	20
29	Sub-total	211	210	202	202	193
30	Importers total costs	820	781	808	801	790
31	Importers actual selling price	870	833	860	852	805
32	Gross margin	478	441	468	460	413
33	Importers net margin	50	52	52	51	15
34	Percent net return	13	13	13	13	4
35	WHOLESALER					
36	Weighted actual buying price	870	833	860	852	805
37	Operating costs					
38	Transport Costs	70	70	70	70	70
39	Handling costs	6	6	6	6	6
40	Overhead and administration	4	4	4	4	4
41	Transit losses	9	9	9	0	0
42	Storage costs	3	3	3	3	3
43	Sub-total	92	92	92	83	83
44	Total wholesalers costs	962	925	952	935	888
45	Actual selling price	900	863	890	873	826
46	Gross margin	30	30	30	21	21
47	Importers net margin	(62)	(62)	(62)	(62)	(62)
48	Percent net return	(7)	(7)	(7)	(7)	(8)
49	RETAILER					
50	Weighted actual buying price	900	863	890	873	826
51	Operating costs					
52	Weighted actual transport costs	30	30	21	30	21
53	Handling costs	4	4	4	4	4
54	Transit losses	10	9	10	0	0
55	Rebagging	10	10	10	10	10
56	Storage costs	0	0	0	0	0
57	Overhead and administration	7	7	7	7	7
58	Sub-total	61	60	51	51	42
59	Total retailer costs	961	923	941	924	868
60	Weighted actual selling price	980	943	960	943	867
61	Gross margin	80	80	70	70	61
62	Importers net margin	19	20	19	19	19
63	Percent net return	2	2	2	2	2
64	Transport to farmgate	20	20	17	20	17
65	FARM-GATE PRICE	1,000	963	977	963	904

Table 35. Simulated Changes in Maize Profitability from Illustrative Reductions in Fertilizer Marketing Costs, Bungoma, Lugari, and Trans Nzoia Districts, Kenya 1999.

Scenario	Profit Measure	Bungoma	Lugari	Trans Nzoia
Base Case (as shown in Appendix 9, Table A9.2.1):	Fertilizer Costs as percent of total production costs per acre:	36	32	22
	Cost per acre (Kshs):	12,813	14,472	20,925
	Profit per 90 kg bag maize (Kshs):	85	149	263
Scenario 1: Elimination of Mombasa Port taxes[1]	Cost per acre (Kshs):	12,652	14,310	20,764
	Profit per 90 kg bag maize (Kshs):	96	158	269
	Percent increase profit/bag maize (relative to Base Case):	13	6	2
Scenario 2: 27 percent reduction in transportation charges[2]	Cost per acre (Kshs):	12,694	14,353	20,806
	Profit per 90 kg bag maize (Kshs):	106	164	276
	Percent increase profit/bag maize (relative to Base Case):	25	10	5
Scenario 3: Elimination of Transit Losses [3]	Cost per acre (Kshs):	12,688	14,347	20,800
	Profit per 90 kg bag maize (Kshs):	94	156	268
	Percent increase profit/bag maize (relative to Base Case):	11	5	2
Scenario 3: Combined effects of scenarios 1 and 2.[4]	Cost per acre (Kshs):	12,411	14,069	20,523
	Profit per 90 kg bag maize (Kshs):	127	180	287
	Percent increase profit/bag maize (relative to Base Case):	49	21	9

[1] This will result in a reduction in the farm-gate price of Kshs 58 per 50kg bag of DAP and Kshs 37 per bag of Urea

[2] This will result in a cost reduction in the farm-gate price of Kshs 38 per 50kg bag of DAP and Ks31 per bag of Urea

[3] This will result in an accumulated reduction in the farm-gate price of Kshs 34 50kg bag of DAP and Kshs 37 per bag of Urea

[4] This will result in an accumulated reduction in the farm-gate price of Ks128 50kg bag of DAP and Kshs 105 per bag of Urea

Under Scenario Two, which reflects the reduction of transport charges, the profit per bag of maize increases by 25 percent in Bungoma, 10 percent in Lugari, and five percent in Trans Nzoia. Under Scenario Three, which reflects the elimination of transit losses the profit per bag of maize increases by 11 percent in Bungoma, five percent in Lugari, and two percent in Trans Nzoia. Therefore, the results indicate that, for each scenario, the resultant cost reductions would not appreciably affect maize profitability per bag in areas with high production costs and a high crop response rate to fertilizer application, such as Lugari and Trans Nzoia. However, each scenario appears to have a significant effect on the profitability of maize production in medium-potential areas such as Bungoma district, other factors remaining constant.

Over the long run it may be more possible to capture the combined benefits of these scenarios. The last row in Table 35 presents the combined effects of each of the three individual scenarios. The results show that in Bungoma, the profit per bag of maize produced could increase by 49 percent, while in Lugari profits per bag could increase by 21 percent. The increase in Trans Nzoia would be comparatively small, nine percent.

Therefore, these results support the hypothesis that the implications of reducing marketing costs in the supply chains are more important in medium potential zones like Bungoma, because fertilizer comprises a higher percentage of total production costs.[88]

[88]Fertilizer costs comprise a higher proportion of total costs in medium-potential zones because farmers in these zones are less mechanized than their counterparts in the high-potential zones, whose costs of mechanization relative to fertilizer inputs, are higher.

9.6. Summary of Findings

There are a number of findings from the analysis in this chapter. First, transit losses, transportation costs and port taxes were the cost bottlenecks in fertilizer marketing in 1999. Reducing or eliminating these costs via policy measures could result in an appreciable increase in the profitability of fertilizer use for maize production, which is of particular interest to policy makers as the Kenyan government needs to consider avenues for improving the competitiveness of maize other than protectionist trade policies. Therefore, the results of this study indicate that reducing the cost of maize production could present one such avenue.

However, a number of caveats are in order. This finding is only true in agroecological areas where soil fertility is still a major limiting factor to production and hence the cost of fertilizer makes up the biggest proportion of total costs of production. The increased return to such policies in high-potential areas is less impressive. A second caveat is the regards to the feasibility of these cost reductions. The results imply that the government could consider adopting policies to eliminate port taxes such as the IDF levy, KPA charges, and the fees paid to the KBS and KARI. However, in order to fully assess the feasibility of such policy changes, further research is needed. First, it will be necessary to compare the costs of reducing the farm-gate price of maize (by reducing or eliminating these port taxes) to the costs of the current policy of import tax on maize and price supports. Some of the costs of reducing the farm-gate price of maize are the loss of revenues to the government from the KPA charges, the IDF levy, and the loss of fees paid to the Kenya Bureau of Standards, the loss of funding for research by the Kenya

Agricultural Research Institute, and the loss of revenues from the fuel tax. Furthermore, in considering this policy recommendation (elimination of port taxes), it will be necessary to assess how reduced government revenues for KARI and KBS will affect the activities of these organization, or fund them using other sources of revenues.

A third caveat is with regards to the feasibility of a policy to reduce the farm-gate price of fertilizer by investments to improve road quality. This is of particular importance in developing countries where rural roads are often of poor quality and the potential savings that could accrue to farmers by improving roads to reduce the cost to farmers of using markets to purchase inputs and sell their output. Although the study found that the potential savings for farmers from road improvement could be impressive particularly in medium-potential areas like Bungoma, these savings have to be compared to the investment cost to society of upgrading rural roads. Moreover, it is unlikely that investment by society in road improvement could be justified on the basis of one commodity; it would have to be justified by taking numerous commodities and spillover benefits into other sectors into account. Nevertheless, the results are useful as they illustrate that improving the efficiency of fertilizer marketing, ceteris paribus, can improve the returns to farmers.

CHAPTER TEN
SUMMARY OF FINDINGS, POLICY RECOMMENDATIONS AND IMPLICATIONS FOR FURTHER RESEARCH

This chapter summarizes the main conclusions of the study, makes policy recommendations and suggests areas for further research. In doing so, it presents a snapshot of the structure, conduct and performance of the private-sector-led fertilizer marketing system in 1999. In reality, structure and conduct are in constant flux, adjusting to the continuous changes in the performance of the marketing system over time. The first section summarizes the research objectives and methodology. The second section presents the main conclusions of the research. The third section makes policy recommendations based on the findings of the study. The fourth section points out the limitations of the study. The final section suggests areas for further research.

10.1. Summary of the Research Objectives and Methodology

This dissertation carried out an economic analysis of the private-sector-led fertilizer marketing system in Kenya. The private-sector-led marketing system includes the private firms (importers, wholesalers and retailers) that sell to farmers, estates, cooperatives and to non-governmental organizations. These firms are distinct from the estates, parastatals, cooperatives and smallholder cash-crop schemes that import the bulk of their own fertilizer directly and also purchase fertilizer from the private firms. The study was driven by the following research questions. First, how is the reformed private-sector-led marketing system in Kenya performing in terms of efficiency and effectiveness in capturing unexploited opportunities to improve coordination? With respect to efficiency, do margins reflect competitive conditions, or are farmers paying price a price greater than long-run marginal cost because traders are making economic rents? Second, is there scope to reduce marketing costs and appreciably reduce the farm-gate price of fertilizer? Third, what will be the impact on the profitability of maize production of a reduction in the farm-gate price of fertilizer and what are the implications for fertilizer uptake? In terms of effectiveness, what are the opportunities for organizational changes and institutional arrangements that can that could add time, place and form utility.

To address these research questions, the industrial organization paradigm was used to analyze the structure, conduct and performance of the import market, wholesale market and retail market. Second, profit and loss accounts were compiled for each market to assess the profitability of fertilizer marketing at each level of the marketing system. Third, for the wholesale and retail markets, regression models using the fixed-effects technique were estimated to test the hypothesis of market power. Fourth, cost build-ups were constructed of each of the main fertilizer supply chains, and the main cost bottlenecks in fertilizer marketing were identified. Since transport costs were the main cost bottleneck in the supply chains, a regression model was estimated to examine whether the impact of distance on transport costs varied with road quality. Sixth, sensitivity analysis was carried out in the supply chains to simulate the impact on the farm-gate prices of fertilizer of policy-induced cost reductions. Seventh, the impact of reduced fertilizer prices and higher maize prices on the profitability of fertilizer use on maize was simulated by inserting these adjusted prices into farm budgets.

10.2. Main Conclusions

(1) *The competitiveness of fertilizer trading varied along the marketing chain. The import market was oligopolistic; the wholesale market was contestable; and the retail market was competitive.*

The main research question with respect to the profitability of fertilizer trading in Kenya that this study sought to address was whether the fertilizer markets at each level of the marketing system were competitive and thus provided farmers with fertilizer that was as cheap as possible, or whether the traders were in a position to exert their market power to inflate their margins and make above normal (zero economic profit) returns. However, on the basis of the profitability analysis alone, it was not possible to reach a firm conclusion as to whether the returns included some economic rents, particularly since in the case of importers and wholesalers, the returns were overestimated to the extent that they do not take into account the cost of fixed capital investments (mainly storage), the cost of credit and other hidden costs.

However, concluding that returns to a particular activity are "too high" implies that these returns would be different (lower) if the structure of the market was more competitive. It follows that if it is possible to make a judgement about whether a market can be characterized as noncompetitive it is possible to reach a conclusion about whether the possibility exists for the returns to include economic rents. Therefore, in addition to the profitability results, this study examined the structure of each market to reach a conclusion about the competitiveness of fertilizer trading at each level of the private-sector-led marketing system in 1999.

Import Market

The results of the analysis revealed that in 1999 the large importer made annualized rates of returns of 27 percent and the vertically integrated importer made annualized rates of returns of 18 percent. These annualized rates of return exceeded the annualized rate of return of 15 percent that the large importer considered an acceptable rate of return once risks and costs had been accounted for. Therefore, the profitability results indicated that importers may have made above -normal returns in 1999. The structural evidence supported this conclusion. While there were some competitive forces at play that may have put downward pressure on importers' returns, in general the importer market was oligopolistic with high barriers to entry, and there was strong evidence of the associated nonprice competitive behavior, both of which tend to result in lower volumes and higher prices than would have existed in a more competitive structure.

Wholesale Market

The profitability results indicated that in general, fertilizer trading was a very profitable investment for the population of wholesalers in that it gave them a higher return than they would have earned from their next best alternative. However, the structural evidence indicates that the wholesale market in 1999 was contestable. This implies that the high returns at the wholesale level may reflect something other than entrenched monopoly power. They may partially reflect the inability of the study to fully capture fixed costs and hidden costs such as risk and transaction costs at the wholesale level. Secondly, there were pockets of local oligopolies where some wholesalers may have been able to make above normal returns.

Retail Market

The results of the profitability analysis indicate that fertilizer retailing was a worthwhile investment for the majority of the large retailers and 5 of the 14 small retailers, that is, it earned them more than they would have been able to make from their next best alternative. However, the structural characteristics of the retail market in 1999, and trader conduct support the conclusion that these returns did not include economic rents in 1999. The retail market in 1999 was not highly concentrated and there were low barriers to entry.

(2) *An important structural feature of the fertilizer markets at each stage of the marketing system was scale economies in purchasing, but the absence of substantial scale economies in marketing.* Presumably this resulted in high total unit costs and therefore, higher prices in order for private firms to remain in the industry.

(3) *Transport costs, transit losses and port taxes were the major cost bottlenecks in the supply chains in 1999.* On average transport costs were Ksh22 per ton/km, but it cost Ksh2 per ton/km less for each additional 10 km traveled on a good quality road than on a bad quality road.

(4) *There are potential benefits to be gained at the farm-level from policy changes aimed at reducing or eliminating port taxes, transport costs, and transit losses.* The implications of reducing or eliminating these cost bottlenecks in the marketing chains were more important in medium-potential zones like Bungoma, because fertilizer comprises a

higher percentage of total production costs.[89] Over the long run it may be more possible to capture the combined benefits of these scenarios. However, additional research is required to study the potential costs of eliminating the fuel tax and upgrading rural roads, and compare them to the potential benefits. Similarly, research is needed to study the potential impact on farm-level costs of eliminating port taxes. If port taxes are used to maintain port infrastructure, eliminating them may, over the long run, lead to higher, not lower, farm-level costs.

(5) *In 1999, fertilizer traders had adopted some innovations and made some organizational changes to improve coordination of the marketing system. There are opportunities for the government to improve the performance of the marketing system by providing institutional support for these private-sector-led initiatives.*

In 1999, fertilizer traders at all levels of the marketing system had taken a number of steps to improve coordination of the private-sector-led marketing system such as combining activities, inspection for quality control, selling fertilizer on credit, and providing farmers with limited technical information. Although the institutions that facilitated and regulated fertilizer marketing such as private banks, Kenya Bureau of Standards, Kenya Port Authority and the Ministry of Agriculture were performing their responsibilities reasonably well in 1999, there was still room for improvements and changes that could improve the coordination and efficiency of fertilizer marketing. The

[89]Fertilizer costs comprise a higher proportion of total costs in medium-potential zones because farmers in these zones are less mechanized than their counterparts in the high-potential zones, whose costs of mechanization relative to fertilizer inputs, are higher.

following section identifies the areas of the marketing system that are in need of institutional support:

Importers Use the Most Expensive Mode of Procurement

C.I.F. liner out is the most popular mode of procurement for fertilizer importers because it requires the least effort on their part. However, C.I.F. liner out is also potentially the most expensive option since the importer has no flexibility to control costs, and the supplier has the opportunity to maximize its mark-up, subject to how well-informed the importer is about world market conditions. Therefore, there may be room for importers to reduce the landed price of fertilizer at the port of Mombasa by changing their mode of procurement to F.O.B. instead of C.I.F. F.O.B. is potentially the cheapest option since it provides importers with maximum flexibility to minimize the landed cost of fertilizer by seeking the most competitive bids for their fertilizer and freight rates. However, this option can be time consuming and tricky for the importer due to the high search costs; it depends on factors such as the tonnage of the ship, the season of the year, and how many ships are servicing a particular route at that time. The actual costs of these two options have to be compared, and the factors determining importers' preference for C.I.F. assessed, before any conclusions be reached and policy recommendations made regarding how public action could change importers' incentives to use, and preference for, one mode of procurement over another.

Lack of a Legal Framework to Guide Business Activities

Traders at all levels of the marketing chain combined activities such as procurement, transportation and storage in order to reduce unit costs (primarily transportation and storage). This implies that the potential existed for scale economies in fertilizer marketing. Nevertheless, the majority of traders did not combine their activities with other traders in order to benefit from these economies. The reasons included financial constraints, company policy, and lack of necessity since the firms had enough resources to run their business independently. However, the main reason more wholesalers did not combine activities in 1999 was lack of ability to enforce their agreements, which led to a lack of trust. One trader gave an example of his experience whereby his business partner claimed more of the combined shipment than he had originally ordered. Therefore, it appears that in the parlance of Williamson (1985), uncertainty due to the ex-post costs of monitoring performance, resolving disputes and enforcing contracts between business partners discouraged fertilizer traders from entering into the type of business partnership that could reduce marketing costs. This implies that a policy intervention that could result in the increased incidence of contractual arrangements to combine activities would have potentially high payoffs in the form of a lower farm-gate price of fertilizer and increased profitability of fertilizer use. One possibility is the establishment of business courts in Kitale and Eldoret to adjudicate business disputes and thus promote the use of contracts in fertilizer marketing.

Poorly Developed Capital Markets

The majority of -wholesalers and retailers either utilized their own financing and/or had strong single-supplier relationships that substituted for missing financial markets. Lack of access to working capital may have prevented traders from buying in large enough quantities to take advantage of economies in purchases and in marketing. This is particularly the case for retailers. The retail market was characterized by cash-and-carry transactions, and the typical retailer used the same set of capital to purchase his or her consignments throughout the trading season. As a result, retailers purchased small consignments at a high frequency. This procurement pattern may have prevented retailers from taking advantage of price and quantity discounts and resulted in lost sales due to stockouts and absence. Therefore, fertilizer retailers may benefit from a credit facility that enables them to purchase larger quantities of fertilizer each trip and reduce the number of trips they make to suppliers.

Poor Quality Control in the Wholesale and Retail Markets

Sixty-seven percent of the wholesalers and 61 percent of retailers reported quality problems in 1999, and quality control was the third most frequent suggestion for government intervention in 1999. The most common quality control problem experienced by wholesalers was underweight bags, while for retailers it was torn bags due to mishandling. Officially, testing for quality by the Kenya Bureau of Standard is supposed to take place at three points: the point of entry at Mombasa, the point of storage at the depots/godowns, and the point of sale at the retail and wholesale level. In reality, testing only takes place at port of entry and at the depots/godowns in Mombasa. The reason is that KBS has a limited number of staff available, making it impossible for them to be upcountry at the wholesale and retail points to ensure that quality standards are respected. Hence, KBS mainly relies on MOA agriculture field staff to send them samples of fertilizers they suspect are substandard, and test them for quality. However, since the MOA also has limited staff, this arrangement has not worked. In any case, KBS is not a law enforcement agent; in the event that its inspections uncover adulterated or otherwise substandard fertilizer, its only recourse is to report the offender to the relevant authorities who can take action. In the few cases this has happened, the penalty has been too low to act as a deterrent to repeat the offence; the penalty is Ksh10,000 (US$140 approximately).

In light of these findings, Section 10.3 makes recommendations for government action that could support the continued development and strengthening of Kenya's fertilizer subsector. In the short run, the government can implement a number of policies that will strengthen the private-sector-led fertilizer marketing system by improving the facilitation of marketing and distribution. In the long run, government fertilizer policy will have to take into account how the performance of output markets, and macroeconomic factors such as the exchange rate and interest rates, influence the continued development of the private-sector-led fertilizer marketing system. The policy recommendations in this regard are as follows.

10.3. Policy Recommendations

(1) Commission Policy-Relevant Research on How to Introduce Cost-Savings at the Importer Level

The study identified the importer level as having the largest potential payoffs to efforts to reduce marketing costs for two reasons. First, purchasing costs were the main source scale economies in fertilizer marketing in 1999. Since importers are the initial entry point for fertilizer into the domestic marketing system, taking advantage of scale economies in purchases will have to begin at this level. Second, gross margins at the importer level made the largest contribution to the farm-gate price of fertilizer. Hence the possibilities of achieving substantial reductions in the farm-gate price of fertilizer accruing from cost reductions at the wholesale and retail level are small compared with the possibilities at the importer level. Therefore, the study recommends that further research be carried out in the following areas.

- Investigate whether importers are exploiting all possible scale economies in the international acquisition of fertilizer;
- Identify whether there are changes importers could make in their business and procurement practices that would reduce the C.I.F. price of fertilizer. World market prices vary according to factors such as the season, number sellers and buyers at any one time, and costs of production in the exporting country. For example, are there cheaper sources of fertilizer? If so, what constraints to importers face in making use of them;
- Why are importers using the cheapest procurement option? There are three types of procurement practices typically used by importers: F.O.B., C.I.F. liner in and C.I.F. liner out.[90] If importers are not using the cheapest option, what constraints do they face to doing so? Since the C.I.F price in Mombasa

[90]These are: a) F.O.B. or free on board which means the importer pays for the cost of the fertilizer plus the cost of loading the fertilizer onto the ship. The importer has to arrange for the freight and pay for off-loading; b) C&F free out - this includes the cost of the fertilizer and the cost of freight, but it does not include the cost of offloading. The importer (via their clearing agent) pays for offloading; c) C&F liner out - this includes the cost of the fertilizer, the cost of freight, and the cost of offloading. C&F liner out is the most popular method used by importers, following by C&F free out.

accounts for approximately 50 percent of the farm-gate price of fertilizer, there are huge potential payoffs to Kenyan farmers if importers begin to source cheaper fertilize and/or use procurement practices that will allow fertilizer to land in Mombasa at the lowest possible price.

The study recommends that this research be carried out by Tegemeo Institute of Agricultural Policy and Development, the foremost agricultural research institution in Kenya. This institution carries out donor-funded policy-relevant research on various agricultural commodities and presents its findings to stakeholders. Researchers from Tegemeo also meet regularly with officials in the Ministry of Agriculture to make recommendations to the government on agricultural policy based on the findings of their research. Therefore, the study recommends that Tegemeo Institute draw on the findings of this research to meet with the relevant stakeholders and identify the opportunities for and obstacles to reaping the potentially efficiency-enhancing benefits at the importer level.

(2) Establish Business Courts in Kitale and/or Eldoret

A stronger legal framework could encourage the adoption of cost-reducing innovations such as combining procurement, transportation and storage. For example, the government could establish business courts in Kitale and Eldoret to carry out timely and fair adjudication of business disputes between traders. By providing means for the redress of disputes, these courts could promote the use of contracts in fertilizer marketing.

(3) Establish a Program to Meet the Financial and Credit Needs of Traders

There is the potential for substantial payoffs to a program that is aimed at providing credit to finance fertilizer purchases of existing retailers and wholesalers to promote the expansion of their operations. In this way they could take advantage of price and quantity discounts. Secondly, the large retailers, particularly those who already purchase directly from importers, could increase their purchases sufficiently to upgrade into wholesaling. An increase in the number of players in the wholesale market would reduce its market concentration and any associated non-competitive pricing behavior.

In the post market-reform era, the position of the government is that the responsibility of financing fertilizer marketing needs to be transferred to the banking sector. This may be suitable for large traders who are located in main distributing centers and who have experience with banks. It is not suitable for traders in the smaller towns and hinterlands, typically retailers who are in most need of credit, where the presence of commercial banks is weak and trader experience with banks is negligible. In light of this, the recommendation is that the government encourage private banks and micro-credit finance institutions to offer a menu of credit programs targeted to various levels of trader capitalization. Second, the Ministry of Agriculture should organize (in collaboration with donors, research institutions, and non-governmental organizations) short training workshops for wholesalers and retailers each year in the use of credit. These workshops could also be used to update traders on public marketing facilities they can avail themselves of, and regulations to improve understanding of and confidence in the marketing system.

10.4. Limitations of the Study

The data problems involved in a study such as this are considerable. These problems, together with the rather limited period within which data were collected mean that only tentative conclusions can be drawn from this study regarding the profitability of fertilizer marketing in Kenya.

Specifically, the study gathered data from 68 traders in 12 market centers. These traders consist of the population of traders in their respective cities at the time of the survey. Nevertheless, this population does not fully represent traders across the country. For example, traders who were not in the market year round were not included in the data collection or analysis. Therefore, general inferences about fertilizer traders in Kenya should not be drawn from this population. Rather, in addition to drawing some conclusions about this population of traders, the findings can be used to develop hypotheses about fertilizer trading to test with a different data set and/or in other parts of Kenya.

Second, the analyses were carried out using data from the population of traders who were active at the time the interviews commenced. However, a substantial number of wholesalers and retailers had already exited the industry by this time. Therefore, the analysis did not include data from fertilizer traders who only operated during the peak season. Moreover, only 10 of the 15 wholesalers and 30 of the 47 retailers interviewed provided data that were used for the analyses in this study. Therefore, the results are biased to the extent that these two groups of fertilizer traders that were not included in the data analysis - the short-term traders, and the firms that were included in the population of traders that were interviewed but did not provide data - differed from the traders that were.

Third, because the data used in the analysis were collected in one trading season, the findings reported in this dissertation are specific to the particular conditions that prevailed at the time the data were collected, such as the shortage of DAP fertilizer in 1999. Specifically, the profit and loss accounts represent the costs incurred and returns that accrued to traders during the 1999 trading season rather than a dynamic representation over a number of years.

Finally, the data collected for this study is recall data, which are typically associated with the concern for reliability.

10.5. Suggestions for Future Research

The results of the analysis of the fertilizer subsector helped conceptualize areas for further research that may contribute to greater understanding of the subsector and illuminate areas for policy intervention. The study identified three cost bottlenecks (port taxes, transport costs, and transit losses) that, if they were reduced or eliminated, could result in an appreciable increase in the profitability of maize production. However, before taking the next step to making a policy recommendation, it is necessary to evaluate not only the benefits of the proposed changes but also the costs. For example, what would be the likely impact of eliminating these port taxes on the operations of these organizations? If these monies represent a small percentage of their overall funds, then the overall payoffs to the policy change may be positive. Similarly, the research should study the potential costs of eliminating the fuel tax and upgrading rural roads, and compare them to the potential benefits. Although the study found that the potential benefits in the form of savings for farmers from road improvement could be impressive, particularly in medium-potential areas like Bungoma, these savings have to be compared to the investment cost to society of upgrading rural roads. Moreover, it is unlikely that investment by society in road improvement could be justified on the basis of one commodity; it would have to be justified by taking numerous commodities and spillover benefits into other sectors into account.

A second area that warrants further research is the determinants of transport costs in Kenya. The evidence shows that transport costs comprised a major element of gross margins for traders, and was one of the main cost bottlenecks identified in the fertilizer supply chains. There is near universal agreement on the importance of infrastructure for coordinating input and output markets and services. Improved transport stimulates markets by facilitating efficient price arbitrage between markets. Better communications infrastructure reduces costs, risks, and speculative gains and losses while improving market integration. Tarmac, all-weather roads increase options for traders in terms of fluid supply which improves supplier-client relations.

The results of the study are that road quality is an economically significant determinant of transport costs. However, before a policy for improved infrastructure development is implemented, it is recommended that further research be carried out to explore other factors that may also be important determinants of transport costs, but which may be confounding these results. For example, the availability of backhauls is a factor that influence transport costs, and there may be a higher incidence of backhauls on good quality than on bad quality roads. However, this variable is not included in the analysis, and to the extent that it influences transport costs, the marginal impact of distance traveled on good quality roads on transport costs is overestimated. Therefore, in order to obtain a more accurate measure of the marginal impact of road quality on transport costs, it would be necessary to collect data on other variables that may influence transport costs and include them in the analysis. Examples of such variables include running costs for the various modes of transport utilized by fertilizer traders (28-32 ton trucks; 1 - 16 ton canters; matatus; boda-bodas); and more clearly defined categorization of the different levels of road quality in Western Kenya.

A third area that emerges from the analysis for further research is whether there are scale economies in fertilizer marketing. The study revealed mixed results. On the one hand, the study found scale economies in purchasing at all levels of the marketing system. Secondly, some traders at all levels of the marketing system combined some marketing functions (most notably purchasing, transportation and storage) to reduce unit costs. However, the results of the analysis of the cost structure of the large and small traders at each stage of the marketing system did not indicate substantial economies of scale. However, the study did not collect cost data for individual traders. Rather, it collected it for a few traders who were willing to provide the data, and used the average cost for each group of traders. Therefore, a study that collects cost data on marketing functions for each trader may yield different results.

An important area of fertilizer research in the near future is the implication of policies that are adopted to maintain the economic incentives to grow maize. Maize is of central importance in Kenyan society, on a number of levels. It is the staple food crop, it employs (at least part time) over 80 percent of the population either directly via agricultural production or indirectly via related off-farm employment in marketing and processing of agricultural products, and it is grown by the majority of smallholders as well as large maize farmers (Arwings-Kodhek, 1997). Given the central importance of this crop in the diet of Kenyans and for the economy, the government uses protectionist trade policies to keep local production competitive in domestic markets. However, in this era of trade liberalization, the government will have to find other means of maintaining the profitability of maize production, and policy makers will need information on the implications of such measures for fertilizer policy.

With respect to implications for further research methodology, future studies of the fertilizer marketing system in Kenya (and in any developing country) should be carried out during the trading season. The payoffs to doing so in terms of obtaining a truer picture of the performance of the fertilizer subsector will be higher, since the data set is likely to be more accurate (less reliance on recall) and complete (fewer gaps). Secondly, although the enumerators attempted to capture as much information as possible on trader costs, capturing data on trader equity and fixed costs proved to be very difficult. The reasons included: a) lack of time since administering the trader survey already took at least one hour and few traders were able to go through the survey without constant breaks to attend to customers; b) even if traders were willing to provide data on equity, they did not have the pertinent records; c) traders were unwilling to provide such data. This was particularly true of larger traders who were suspicious of our motivations. Some of these hurdles can be overcome by better planning of the research whereby it is carried out in stages over a longer period of time (although the attendant increase in costs could present an obstacle).

It would also be advisable for researchers to collect information on more difficult types of data rather than enumerators since the larger firms in particular may respond more openly to someone in a position of authority.

APPENDICES

Appendix 1.1 Trends in World DAP Prices

Between 1990 and 1999, the F.O.B. price of DAP delivered at Mombasa increased by 200 percent, from about Kshs 200 per 50 kg bag to Kshs 600 per 50 kg bag; consequently, the nominal retail price of DAP in Nakuru rose by 220 percent (MOA, 1999).[91] This increase can be partially explained by the depreciation in the Kenya shilling against the US dollar by 168 percent between 1992 and 1999 and the upward trend in world DAP fertilizer prices during this same period. Figure A1.1.1. illustrates a steady fall in world DAP prices through 1987 (hitting record lows in 1987 of nearly US$ 100 per ton) reflecting acreage reduction programs in the US and Europe, excess supply as fertilizer producers could not cut back production fast enough, and lower production costs due to lower energy prices. After a sharp increase in 1987-1988, prices again exhibited a downward trend reflecting drastically reduced demand in the newly formed independent states of eastern Europe. By 1994, reduced supplies from the states of the former Soviet Union as well as an upsurge in demand (following the poor US harvests that reduced global food stocks after 1993) raised DAP prices to near record levels in 1995 and 1996 (Arwings-Kodhek, 1997).

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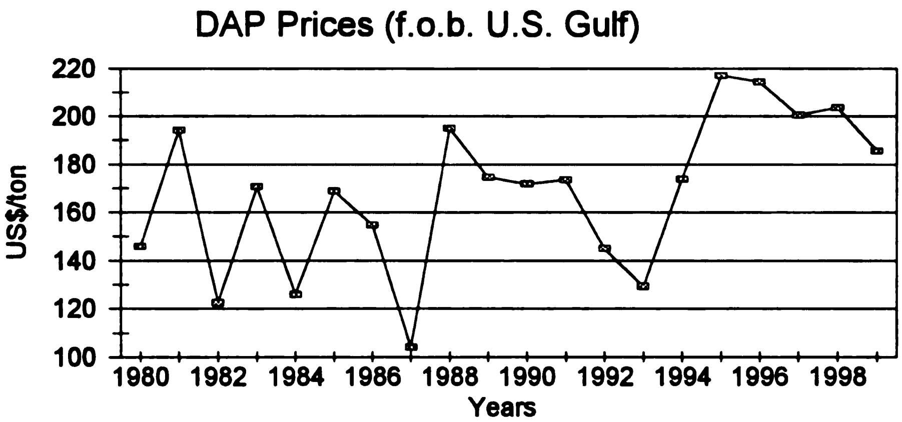
[91]Why Nakuru? Nakuru is a city in Western Kenya, approximately 400 km from the capital Nairobi, and 1000 km from the port of Mombasa. The MOA has found over the years that fertilizer prices in Nakuru are the most consistently representative of fertilizer prices prevailing in Kenya. It is also a central point that the majority of imported fertilizer passes through on its way upcountry.

Figure A1.1.1. World DAP Prices, US Gulf 1980 - 1999



Source: IFDC, 1999

Appendix 6.2. Explanation of Cost Calculations for Enterprise Budgets

A6.2.1. Storage Costs

Storage costs include rent, electricity, security, and labor costs of loading and unloading. If storage facilities are owned, rent is replaced by the cost of the store itself & amortization. Storage costs are minimized where the seasonal storage requirements are complementary so that overhead costs are reduced rather than if warehouses have been built exclusively for fertilizer and are used only a few months of the year. All traders reported they used storage facilities to store other commodities both during and after the fertilizer trading season. However, during the main fertilizer trading season, fertilizer typically accounted for 70-100 percent of the storage capacity.

Once the main trading season ended, traders still incurred storage costs for fertilizer. All of the traders had fertilizer in stock at the time of the interviews in July/August. It was being held for the short rainy season between October and December. For example, 80 percent of the large retailers interviewed still had fertilizer in stock after the main trading season had ended. However, 87 percent of had less than 100 bags, and 59 percent of these had less than 20 bags in stock, compared to the average purchases of over the trading season of 1200 bags Therefore, the quantities being held were low relative to the total quantities purchased throughout the year. Therefore, in calculating storage costs per bag of fertilizer, the percentage of the storage facilities used by fertilizer and the length of time the facilities were used by fertilizer, was taken into account.

Storage costs were calculated as follows: (the total costs per month x the proportion of storage devoted to fertilizer per month during the trading season x the number of months the fertilizer is in storage)/the average number of purchases over the trading season for that category of trader.

A6.2.2. Rebagging costs.

All retailers received fertilizer already bagged in 50 kg, 25 kg and 10 kg bags at the port of entry by private companies hired by importers, and a significant proportion of retailers rebagged this fertilizer into polythene bags in quantities as small as one kg and two kg. Rebagging was done manually by labor that has already been hired for other purposes such as loading and unloading of fertilizer and other goods, and they are paid to rebag on a per bag basis. Therefore, the costs generated are the costs of the plastic bags and the cost of labor. Retailers rebag both 50 kg and 25 kg bags. Therefore, this figure is calculated as an average of two costs. The cost of rebagging one 50 kg bag is one Kshs for a plastic bag, plus two Kshs per 50 kg bag for labor. Therefore, the cost to rebag one 50 kg bag into 50 one kg bags is Kshs 52; the cost to rebag one 50 kg bag into 25 two kg bags is Kshs 27. Since retailers rebag into both sizes depending on demand, we take the average which is Kshs 40 per bag. Sixty-seven percent of retailers said they rebagged their fertilizer. However, data was not obtained on what percentage of their purchases was rebagged. Based on field observations and personal knowledge, it was assumed 25 percent of total purchases by retailers was rebagged over a season. Therefore the cost of rebagging was calculated as follows:

= Kshs 40 per bag x average number of purchases over the season x 25 percent.

A6.2.3. Transit Losses

These refer to bags that were lost or stolen during transportation. The were calculated as follows:

(the percent of bags lost or stolen over the trading season, valued at the buying price of fertilizer):

= buying price per 50 kg bag of DAP x percent of bags lost or stolen over the season x average number of purchases over the trading season.

A6.2.4. Overhead and Administration Costs:

Overhead costs taken into account were: shop rent, licences, salaries which do not include the owner's salary, telephone, and electricity. They were calculated as follows:

= total monthly overhead costs x percentage of total sales revenue generated by fertilizer sales x the number of months the trader is involved in fertilizer trading)/average number of purchases per trading season.

Appendix 7.1. Price Spread Model and Imperfect Competition

A7.1.1. The Price Spread Model

This appendix presents the theoretical framework for the empirical model estimated in Chapter Seven and Chapter Eight . The theoretical model is the price spread model developed by Gardner (1975) and modified to apply to imperfectly competitive conditions in the tradition of Kinnucan and Nelson (1993) and Azzam (1997).

The model consists of six equations describing a food processing sector that combines a farm-based input (factor F) with two factors of production and an input called 'marketing services' (factor M), to produce a retail food commodity (output R). Market equilibrium conditions are established from the six equations: a production function, a retail demand equation, two input supply equations, and two equations setting out the marginal conditions for profit maximization. The approach allows the derivation of comparative static predictions about how the marketing margin will adjust to changes in three exogenous forces affecting food system equilibria: shifts in retail demand; shifts in farm commodity supply; and shifts in marketing input supply.

In general, the marketing margin is the difference between the demand curve at the retail level (D) and the derived demand curve (DD). That is, demand at the retail level is consumer demand measured as changes in retail prices (P_R) and expressed as a movement along the demand schedule (D). Derived demand by marketing firms is demand by marketing firms for farm input. It is derived from the demand by consumers. It is measured as changes in the farm price (P_F) and expressed as a movement along the derived demand schedule (DD)

A marketing margin can also be defined as the price of marketing services where marketing services refer to storage and transportation among other services. That is, the spread between the demand curve at the retail level (D) and the derived demand curve (DD) is defined by the equilibrium between the supply of marketing services curve (SMS) and the demand for marketing services (DMS) curve. The resulting price is a function of the demand for and supply of all marketing services.

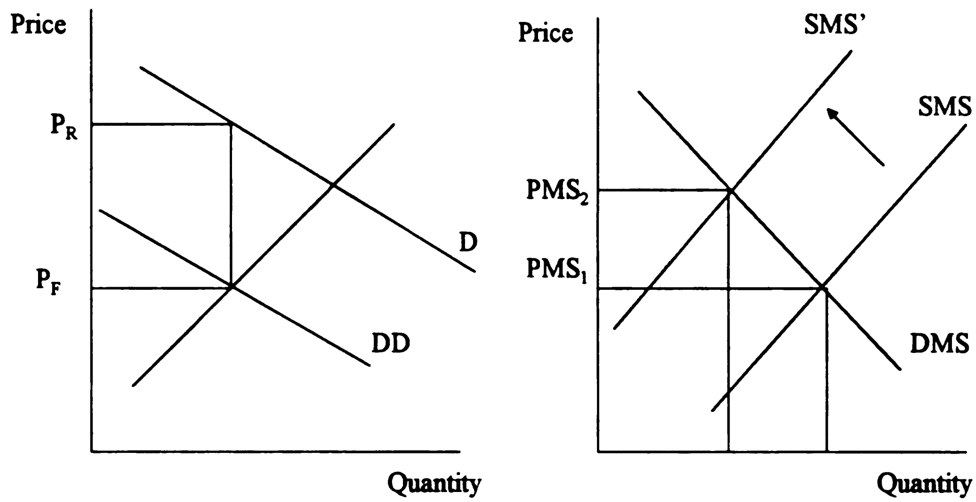
Assuming long-run competitive equilibrium, profit-maximizing behavior, and a fixed-proportions production function, the solution to the model is shown in Figure A7.1.1. Figure A7.1.1a indicates equilibria at the farm- and retail- level markets. Figure A7.1.1b indicates equilibrium in the market for marketing services. Note that prices at the farm and retail market levels are measured in equivalent units (for example, Kshs per 50 kg bag). In Figure A7.1.1a, the intersection of the farm supply curve (S) with the derived demand curve establishes the initial equilibrium farm price, P_F.

In the same diagram, the initial equilibrium retail price (P_R) is determined by the intersection of the retail demand curve (D) and supply curve (S). In Figure A7.1.1b SMS and DMS are defined as the supply and demand curves, respectively, for marketing services. The intersection of these curves determines the initial equilibrium price of marketing services, P_M.

Figure A7.1.1. Marketing Margin Analysis

Figure A7.1.1a Derived Demand Curves and Marketing Margins

Figure A7.1.1b Supply and Demand Functions and Marketing Services



Note: The illustrations depict marketing spreads per unit product.

An important point to note about Figure A7.1.1 is the direct linkage between quantities in Figure A7.1.1a at the farm-level and at the retail level, and between Figure A7.1.1a and Figure A7.1.1b. This linkage stems from the assumption of fixed proportions in the farm-retail production function. It is assumed that the production of output for retail consumption (to which value is added through marketing functions like storage, transportation, and handling that add form, time, and place utility) requires constant amounts of both the farm input and marketing services input per unit of output. The usefulness of this assumption is that the quantity of the farm input and the quantity of the final output that is supplied at the retail level are assumed to be equal, and accordingly, supply at both the farm-level and the retail level is depicted as S in Figure A7.1. Secondly, the model assumes that the elasticity of substitution between the purchased fertilizer and marketing services is zero.

The assumption of a fixed proportions production function is also the basis for the parallel derived demand curves and single supply curve. The implication is that the volume of product on the market has no effect on the marketing spread, and therefore the marketing margins remain constant even as the quantity of the commodity marketed changes. This is based on the assumption that the supply function for marketing services is perfectly elastic, so that the marketing margin remains constant as the demand for services (associated with the increasing volume) increases. Therefore, a marketing margin of the same magnitude is subtracted from the derived demand function at the retail level at all levels of quantity. Hence the derived demand function at the farm-level is parallel to the derived demand function at the retail level. Although this may usually be the case, it is possible that economies of scale in providing marketing services exist. That is, at higher volumes, marketing firms could realize scale economies which would reduce marketing costs. If so, this could result in a negatively shaped supply curve for marketing services, at least over some range. Then one would expect to find lower margins associated with a large volume of production. For example, a small consignment of the commodity may result in underutilization of marketing facilities, while a larger consignment may lead to increased efficiency and hence lower unit costs. This would lead to reduced marketing spreads and retail and derived demand curves would tend to move closer together at higher volumes. However, the model assumes perfectly competitive markets with no economies of scale.

Hence, the price spread model assumes that marketing firms produce the retail output, Q_R, from fixed proportions of the inputs, Q_F and MS, that is, one unit of Q_R is always obtained from one unit of imported fertilizer, Q_F and the marketing inputs, MS. That is,

$$Q_R = f\,(Q_F, MS) \tag{A7.1.1}$$

where:

Q_R = final output at the retail level

Q_F = farm input

MS = marketing inputs (e.g. labor, storage, transportation)

And

$$Q_R = \alpha Q_F \tag{A7.1.2}$$

And

$$Q_R = \alpha MS \tag{A7.1.3}$$

where $\alpha = 1$.[92]

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[92]If $\alpha < 1$, then as the fertilizer moves from the port to the retail level there is some loss due to the transformation process, and the retail price will have to be scaled down by α to make the units at the retail level comparable to the units at the port level. This is not the case for fertilizer because marketing firms cannot purchase less fertilizer and use more marketing inputs such as storage or transportation and still sell the same amount of fertilizer. Under this assumption the price spread will only reflect the cost of marketing services (MS) and will not include any loss due to the process of transformation in producing F_R.

Secondly, it is assumed that there is zero degree of substitution between Q_F and MS. That is,

$$Q_F = 6MS \tag{A7.1.4}$$

where $6 = 0$.

If markets are competitive, equilibrium prices in Figure 1a and Figure 1b are linked by the equation:

$$P_M = P_R - P_F \tag{A7.1.5}$$

Equation (1) says that in equilibrium, the difference between the retail price and the farm price equals the price of marketing services or the gross marketing margin. This equivalence is important because it permits ascribing observed changes in the marketing margin to changes in the price of marketing services induced by the structural characteristics of the marketing system such as market concentration, vertical integration and economies of scale. In general the margin per unit of marketed product is defined as the difference between the buying price and the selling price at each level of the marketing system. These prices are determined by derived demand and supply relations. Thus, a margin changes because of shifts in the supply and demand curves relative to others. A shift outward in the demand for marketing services or a shift backward in the supply of marketing services, all other things being equal, will both result in an increase in the price of marketing services, and an increase in the marketing margin. (Figure A7.1.1b)

A7.2. Modification of the Price Spread Model for Imperfect Competition: Application to the Private-Sector-Led Fertilizer Marketing System

All of the fertilizer marketed and distributed by the private-sector-led marketing system in Kenya in 1999 was imported. Wholesalers purchased the fertilizer from an oligopolistic importer industry and combined it with an input called marketing services, MS_W^1, to produce their output F_W which they sold to retailers or directly to farmers[93]. Since the wholesale level was itself oligopolistic, it may have been able to exert countervailing power in its dealings with importers. Therefore, the wholesale buying price approximated that which would prevail under competitive conditions. It sold the fertilizer to a competitive retail market and the hypothesis is that wholesalers exerted market power in their dealings with retailers. Therefore, the wholesale industry is modeled as a price taker in the input but not in the output market.

The retail industry consisted of a relatively large number of firms purchasing fertilizer from an oligopolistic wholesale industry (F_W), and combining it with an input called marketing services, MS_R^1, to produce their output F_R which they sold to farmers. However, there is also evidence of spatial oligopoly at the retail level. Therefore, assuming some retailers could exert countervailing power vis-a-vis their suppliers, the model assumes the retail buying price approximated the competitive market price. Therefore, the retail industry is also modeled as a price-taker in the input market but not in the output market.

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[93]Marketing services refers to marketing functions such as transport, storage, risk-bearing, and financing as well as retailing and wholesaling activities.

Based on the above description of the wholesale and retail industries, each industry can be depicted in the following manner for the purposes of building the theoretical model. Consider an input industry consisting of a small number (N) of firms (an oligopoly) combining a competitively purchased single material input (fertilizer) with other nonmaterial inputs (marketing services) which are purchased in competitive markets and used in variable proportions, to convert into a final output (fertilizer) that is sold noncompetitively. Each firm's production technology is characterized by fixed proportions between the input and the output and an elasticity of substitution equal to zero, that is, the model assumes zero substitution between marketing services and fertilizer.[94] Hence, each firm purchases the inputs in a competitive market but is not necessarily a price-taker in the output market. To model the impact of imperfect competition on the gross margins in the wholesale industry and the retail industry, this study adopts the methodology developed by Azzam and Schroeter (1995).

Let SP, BP and MC denote the firm's initial selling price, buying price and price of marketing services or marketing costs which include a competitive markup. Let V denote the oligopoly distortion, that is, it is defined as the proportional gap between the selling price net of the marketing costs and buying price:

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[94]This assumption is not representative of the reality in the marketing system since the study found evidence of transit losses in the marketing system. However, first, the costs associated with transit losses were insignificant relative to total costs. Therefore the model assumes that transit losses equaled zero (that is, the quantity of fertilizer bagged at the port was equal to the quantity sold to farmers at the retail level). Secondly, there was no evidence that traders attempted to use marketing services such as improved handling techniques to reduce transit losses. Therefore, the model assumes that the elasticity of substitution between the inputs was equal to zero.

$$V = \frac{SP - MC - BP}{BP} \qquad (A7.2.1)$$

When the (wholesale or retail) market is perfectly competitive, V = 0, and the selling price of the input equals the buying price plus marketing costs:

$$SP = \text{Total Costs} = BP + MC \qquad (A7.2.1)$$

When the input market is imperfectly competitive, V > 0, and the selling price of the input equals the buying price, plus marketing costs, plus the oligopoly distortion, V:

$$SP = BP\,(1 + V) + MC \qquad (A7.2.3)$$

and

$$BP = (1 + V)^{-1}(SP - MC) \qquad (A7.2.4)$$

Since the relationship between the input and the output is assumed to be one of fixed proportions, units can be defined so that both input and output quantities can be represented by the same variable, Q. For convenience, all the units of Q are normalized at Q = 100 and the selling price is set equal to 1. Then,

$$BP = (1 + V)^{-1}(1 - MC) \qquad (A7.2.5)$$

Following Azzam and Schroeter (1995), assume the demand and input supply functions take constant elasticity forms:

$$Q^D = ASP^{\eta} \qquad (A7.2.6)$$

$$Q^S = KBP^{\varepsilon} \qquad (A7.2.7)$$

When A and K are constants, $\eta < 0$ is the price elasticity of demand and $\varepsilon > 0$ is the price elasticity of input supply. Since when Q = 100, SP = 1 and $BP = (1 + V)^{-1}(1 - MC)$;

$$A = 100 \qquad (A7.2.8)$$

and $K = 100(1+V)^{-1}(1-MC)^{-\varepsilon}$ (A7.2.9)

Substituting for A and K in equations (11) and (12)

$Q^D = 100SP^{\eta}$ (A7.2.10)

$Q^S = 100(1+V)^{-1}(1-MC)^{-\varepsilon}BP^{\varepsilon}$ (A7.2.11)

And inverting the functions gives the inverse input demand and input supply functions under oligopoly:

$SP_{OLIG} = Q^{1/\eta}100^{-1/\eta}$ (A7.2.12)

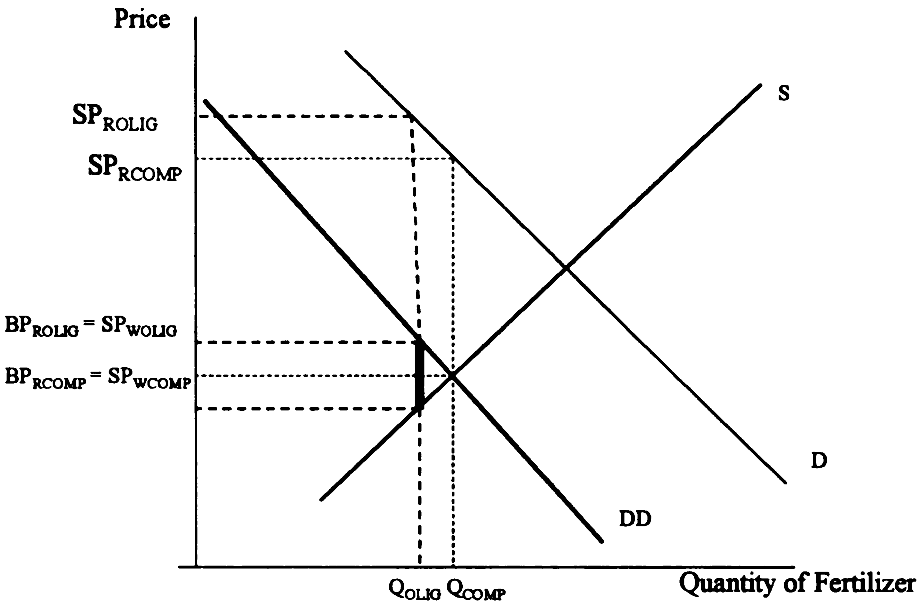
$BP_{OLIG} = Q^{1/\varepsilon}100^{-1/\varepsilon}(1+V)^{1/\varepsilon}(1-MC)$ (A7.2.13)

And the derived demand function for the input at a given quantity is derived by taking its price, SP (18) net of marketing costs, MC, and plugging it into the identify $BP \equiv SP - MC$ to obtain:

$BP = Q^{1/\eta}100^{1/\eta} - MC$ (A7.2.14)

Figure A7.2.1 contains graphs of equations (17), (18) and (19) and depicts the oligopolistic distortion in the gross margins in the wholesale and retail markets. The demand curve (D) is demand at the retail level by farmers for fertilizer, and the derived demand curve (DD) is the derived demand curve for retailers for fertilizer from wholesalers. The point where the derived demand curve intersect the input supply function or marginal cost curve (S) establishes the equilibrium selling price under perfect competition in the wholesale market, (SP_W), the price at which retailers purchase fertilizer from wholesalers which is equal to the price that wholesalers pay importers for the fertilizer (BP_W) plus a competitive mark-up.

Figure A7.2.1. Price Spread Model Under Imperfect Competition



In accordance with the assumption of fixed proportions, the point on the demand curve (D) directly above this intersection establishes the retail selling price to farmers (SP_R). Therefore, wholesalers purchase their fertilizer at BP_W add a competitive mark-up and sell it to retailers at (SP_W) so that the gross margin at the wholesale level is represented by (SP_w - BP_w). Similarly, retailers purchase their fertilizer at BP_R= SP_w, and add a competitive mark-up and sell it to farmers at SP_R, so that the retailer gross margin is represented by (SP_R - BP_R). Under perfect competition there is zero economic profit (or normal profit) at both the wholesale and retail level whereby the gross margin is equal to marketing costs plus a competitive mark-up.

The situation under oligopoly is as follows. The oligopolistic firms are able to collude to increase their selling price by an amount represented by V which is a measure of the extent of inefficiency caused by collusive behavior. This oligopolistic distortion is represented graphically by creating a wedge between the derived demand curve (DD) and the supply function.

Thus the wholesaler gross margin under oligopoly is the difference between the selling price under oligopoly and the price paid to importers, $(SP_{WOLIG} - BP_w)$ where $SP_{WOILG} = SP_W + V_W$. The gross margin under oligopoly is larger than the gross margin under perfect competition, $(SP_w - BP_w)$, by V_W. Again assuming fixed proportions, the point on the demand curve (D) directly above the intersection of the wedge and the derived demand curve establishes the retail selling price to farmers. If the retail market is competitive, and demand is elastic, the retail selling price will not change from SP_R and the retail margin will shrink. If demand is inelastic, the retail margin will increase but by a small amount. However, if the retail market is also oligopolistic, the selling price at the retail level will increase from SP_R to $SP_{ROLIG.}$ by an amount equal to V_R. The retail gross margin under oligopoly will be the difference between the selling price under oligopoly and the price paid to wholesalers, $(SP_{ROLIG} - SP_{WOLIG})$ which is larger than $(SP_R - BP_R)$ by V_R.

A7.2.1 Theoretical Model of the Private-Sector-Led Fertilizer Marketing System

Shifts in world market supply conditions and in demand (at the farm-level by the farmer and at the retail level by the consumer of the final output) can cause changes in the price and domestic supply of fertilizer. Therefore, a complete analysis of the determinants of marketing margins for fertilizer would require a model that explicitly links the marketing margin to various determinants of demand and supply of marketing services in the input market and in the output market, as well as determinants of demand and supply at the farm-level and consumer level. However, the estimation of such a multiple-market model requires more data than was available from the survey.

Instead this study models demand for the input (fertilizer) as demand for a separate factor of production into the firm's production process, instead of as derived from demand at the retail level. The analysis is limited to the wholesaler and retailer markets since data from importers was unavailable.

Consider an oligopolistic input industry consisting of N firms converting an input into a final output. Each firm's production technology is characterized by fixed proportions between the input and the output. Conversion of the input into output requires the performance of marketing functions such as transportation, bagging and storage which will be referred to as marketing services inputs. These inputs are purchased in competitive markets and used in variable proportions. Each firm purchases the input in a competitive market, but is not a price-taker in the output market. Profits for the ith firm (for i = 1,2,...,N) are:

$$\pi_i = (P(Q)q_i - w(VI_w)q_i - C_i\,(q_i, Z, VI_c) \qquad \text{(A7.2.1.1)}$$

where q denotes both the initial quantity purchased (the input) and the quantity sold (the final output) due to the assumption of fixed proportions; p is the output price; w is the price of the input. It is assumed that the input price depends on whether the supplier was vertically integrated or not, hence VI_w denotes whether the firm purchased the input from a vertically integrated firm or not; $Q = \Sigma_i^N q_i$ is the industry's total output; C_i (.) is the cost function. VI_c denotes whether the firm was vertically integrated or not. It is assumed that the quantity purchased and sold is not dependent on whether the supplier was vertically integrated or not; Z is a vector of prices of marketing services. Differentiating (1) with respect to q_i yields the first order condition:

$$\delta\pi/\delta q_i = p\,(Q) + q_i \frac{\delta p}{\delta Q} \cdot \frac{\delta Q}{\delta q_i} - w\,(.) - \frac{\delta C(.)}{\delta q_i} = 0 \qquad \text{(A7.2.1.2)}$$

$$\delta\pi/\delta q_i = p + q_i\left(\frac{\delta p}{\delta Q} \cdot \frac{\delta \Sigma^n_{j=1}\, q_j}{\delta q_i}\right) - w - \frac{\delta C}{\delta q_i} = 0 \qquad \text{(A7.2.1.3)}$$

Since:

$$\frac{\delta \Sigma^n_{j=1}\, q_j}{\delta q_i} = \frac{\delta q_i}{\delta q_i} + \frac{\delta \Sigma^n_{j\neq i}\, q_j}{\delta q_i} \qquad \text{(A7.2.1.4)}$$

And:

$$q_i \frac{\delta p}{\delta Q} = \frac{q_i}{Q} \frac{p}{\left(\frac{\delta Q}{\delta p}\right)\left(\frac{p}{Q}\right)} \qquad \text{(A7.2.1.5)}$$

then equation (.) can be written as:

$$p - w = \frac{q_i}{Q} \frac{p}{\varepsilon} (1 + \theta) + \frac{\delta C}{\delta q_i} \qquad \text{(A7.2.1.6)}$$

Assuming the ith firm's processing cost function takes the Transcendental Logarithmic (Christensen, Jorgensen, and Lau [1971, 1975]) function form,[95]

$$\begin{aligned}\ln C(w,q_i) &= \alpha_0 + \Sigma\alpha_i \ln w_i + 1/2\Sigma\Sigma\beta_{ij} \ln w_i \ln w_j + \alpha_q \ln q \\ &+ \Sigma\gamma_i \ln q \ln w_i + 1/2\alpha_{qq} (\ln q)^2 \\ &+ \Sigma t_i \ln T \ln w_i + tT + ½\, tt\, (T)^2 \qquad (A7.2.1.7)\end{aligned}$$

where w_i and w_j are factor prices, q_i is output level, T is time, and α_0, α_i, β_{ij}, α_q, α_{qq}, γ_i, t_i, t, and tt are parameters. The following constraints are implied by duality theory. First, in order to correspond to a well-behaved production function, a cost function must be linearly homogeneous in factor prices. Second, since the translog function is viewed as a second-order logarithmic approximation, the following symmetry constraint must hold: $\beta_{ij} = \beta_{ji}$, for all i and j. The symmetry condition is the consequence of the continuity assumption of the parent cost function and Young's Theorem from calculus. Combining

[95]The translog functional form is a generalization of the Cobb-Douglas (which is linear in logarithms) functional form. It places no *a priori* restrictions upon homotheticity returns to scale, or the elasticity of substitution between pair of inputs. A second advantage is that it is tractable with respect to the ease of computation, estimation and interpretation. The appropriateness of the translog functional form for this research is its flexibility which derives from no *a priori* restrictions with respect to returns to scale, hence it is capable of representing a wide range of technology. That is if all input prices increase by the same proportion, t, the total cost for producing any given output level will also increase by , but the cost-minimizing input and output choices remains the same. Increasing returns to scale or scale economies can be represented by the proportional increase in cost resulting from a proportional increase in level of output; if the proportional increase in cost is less than the proportional increase in output (that is, average cost curve is declining) then this indicates economies of scale. With respect to the ease of computation, in the translog cost function the first and second order partial derivatives can be obtained using Shepard's Lema $x_i = \delta C/\delta w_i$, and the second order partial derivatives can be employed to calculate Allen's partial elasticity of substitution (β_{ij}). If $\beta_{ij} > 0$, it indicates a substitution relationship between inputs i and j. When $\beta_{ij} < 0$, it is a complementary relationship. When $(\beta_{ij}) = 0$, this indicates zero elasticity of substitution between inputs i and j. This last case study assumes zero elasticity of substitution (β_{ij}) between marketing services (i) and the fertilizer input (j), that is, the two inputs are used in fixed proportions as complements to each others.

the symmetry and homogeneity constraints, the following relationships among the parameters must hold:

$$\sum_i \alpha_i = 1,\ \sum_i \beta_{ij} = \sum_j \beta_{ji} = \sum_i \sum_j \beta_{ij} = 0,\ \ \alpha_q = 1,\ \alpha_{qq} < 1,\ \sum_i \gamma_i = 0, \text{ and } \sum_i t_i = 0 \qquad \text{(A7.2.1.8)}$$

These restrictions imply that the cost function is homogeneous of degree 1. The β_{ij}, β_{ji}, α_{yy}, γ_i and t_i terms are forced to sum to zero in order to negate any effect they might have on total cost. This leaves α_i, α_q, and α_{qq} to exert the only impact on total cost. The restriction $\alpha_q = 1$ implies that as input prices rise by a fixed percentage, total cost rises by that same percentage. The restriction $\alpha_q = 1$ implies that at low levels of q, as output rises by a fixed proportion, total costs rise by the same fixed proportion. However, at higher levels of output, as output rises by a fixed proportion, costs rise by less than this amount such that $\alpha_{qq} < 1$. That is, the cost function exhibits economies of scale. The first order condition with respect to q_i, $\delta[\ln C(w,y)]/\delta[\ln q_i]$, is the factor share equation:

$$\frac{\delta \ln c}{\delta \ln q} = \frac{\alpha_q}{q} + \frac{\gamma_i}{q} \ln w_i + \alpha_{qq} \frac{\ln q}{q} \qquad \text{(A7.2.1.9)}$$

Therefore, α_q exerts the only impact on the margin as output changes. Hence, the final optimizing condition becomes:

$$\frac{p - w}{p} = \frac{H}{\varepsilon}(1 + \theta) + \alpha_q \frac{1}{q} + \alpha_{qq} \frac{\ln q}{q} \qquad \text{(A7.2.1.10)}$$

where (p - w)/p is the price mark-up on the selling price; q is the level of output; $H = q_i/Q$ is each firm's market share (the share of the total output sold by each firm), $\varepsilon = (\delta Q/\delta p)(P/Q) > 0$ is the price elasticity of input supply; $\theta_i = \Sigma^N_{j \neq i} (\delta q_j / \delta q_i)$, is the ith firm's conjecture as to its rivals' responses to a change in its sales of the input. That is, the price mark-up for each consignment is determined by the firm's market share, the input elasticity of supply (that is the sensitivity of the firm's input decision to the price of the input), the firm's conjecture or expectation about how other firms will react to its input purchasing decisions, and marketing costs per consignment.

A number of assumptions are made to operationalize the final model. First, the price elasticity of supply is an inverted elasticity. The assumption is that the elasticity of supply is approximately equal to one in the industry, that is, as long as a firm can pay for the fertilizer, supply is available. This is particularly the case for vertically integrated firms, that is, is one reason firms vertically integrate, is so that supply is available when it is needed.

A second assumption is with respect to firm's conjectural variations. If θ is equal to zero, this means that the firm believes other firms will make their output decisions independently of what output level the firm decides on. If θ is equal to 1 then the firm assumes that whatever it does will be exactly matched by its rival firms, that is, the firms engage in non-price competition. Since there is some evidence of non-price competition in the fertilizer marketing system, the model assumes that θ is equal to 1. Hence the final model has a measure of marketing margins as the dependent variable, and measures of market concentration and economies of scale as the explanatory variables.

Appendix 9.1. Calculation and Composition of Running Costs

Using data collected from transporters, car dealers, and the Automobile Association of Kenya, the running costs of 32 ton Mercedes Benz truck in 1999 was calculated to be Kshs 101 per km of tarmac road, assuming an economic life of 10 years. Table A9.1.1 shows the calculation of running costs for a 32 ton truck in 1999. As expected, transporters charged different rates per km for different routes. Transporters charged Kshs 139 per km for the Mombasa- Nairobi-Kitale route, so that total running costs accounted for 73 percent of the transport charges. Transport charges for a 32 ton truck traveling directly from Mombasa to Kitale were Kshs 124 per km, so total running costs accounted for 81 percent of the transport charges.[96]

Figure A9.1.1 shows the breakdown of the total running costs for a 32 ton truck. Forty-five percent accounts for fixed costs and includes loan repayments, administrative costs, depreciation, comprehensive insurance, annual inspection fee, interest on capital, and government licenses. The remaining 55 percent is variable costs. These are comprised of salaries and allowances (four percent), fuel and oil (16 percent), tubes and tires (28 percent), and services and repairs (seven percent). This presentation of the composition of

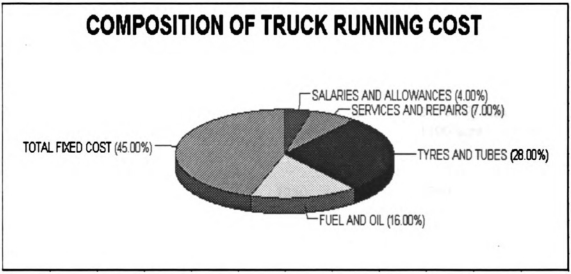
[96]Transport charges included costs of bribes to the police at road checkpoints and officials at weighbridges, and the transaction costs of finding return loads in order to spread transport costs over a larger number of units. These, however, are not captured in Table A 9.1.1. Interviews with both large and small transporters revealed that these charges are incurred and are included in the transport rates quoted to customers. However, they were unwilling to give us an idea of what these charges amounted to, although both groups said that they were not significant.

running costs provides a useful breakdown of the composition of running costs per bag of fertilizer.

Figure A9.1.1. Running Costs of a 32 Ton Truck

PARAMETERS	
INITIAL COST(PRIME MOVER &TRAILER)	10,000,000
ECONOMIC LIFE(YEARS)	10
TOTAL NUMBER OF KM IN ECONOMIC LIFE	720,000
AVERAGE DISTANCE PER MONTH	6,000
AVERAGE DISTANCE COVERED PER ANNUM	72,000
COMPREHENSINE INSURANCE RATE(10% INITIAL COST OF TR	1,000,000
TYRE SIZE(INCHES)	11
NUMBER OF WHEELS	28
COST PER TYRE	38,000
COST PER TUBE	0
CURRENT COST OF FUEL PER LITRE	40
CURRENT COST OF OIL PER LITRE	145
SERVICING COST AFTER 5000KM	31,350
DISTANCE COVERED BEFORE OVERHAUL	300,000
COST OF OVERHAUL	300,000
LOADERS SALARY PER MONTH	6,000
DRIVERS SALARY PER MONTH	15,000
OPPOTUNITY COST OF CAPITAL @ 40% INITIAL COST	5
WITHHOLDING TAX ON INTEREST OF PRINCIPAL	0
BANK FINANCE CHARGES ON 60% INITIAL COST	
AT 27% REDUCING BALANCE FOR 3 YEARS	
LOAN REPAYMENT	
AA SUBSCRIPTION PER ANNUM	1,000
ANNUAL INSPECTION FEE	1,000
DEPRECIATION	1
FUEL EFFICIENCY PER KM	3
RUNNING COSTS	
FIXED COSTS PER 12MONTHS	
GOVERNMENT ROAD LICENCES	13,500
COMPREHENSIVE INSURANCE	10,000,000
DEPRECIATION	700,000
OPPORTUNITY COST OF CAPITAL ON 40%	586,402
BANK FINANCE CHARGES ON 60%	324,000
LOAN REPAYMENT	600,000
ANNUAL INSPECTION FEE	1,000
AA SUBSCRIPTION	1,000
TOTAL FIXED COST	3,225,902
TOTAL FIXED COST PER KM	45
OPERATIONAL COSTS PER KM	
FUEL	16
OIL	0
TYRES AND TUBES	30
REPAIRS AND MAINTENANCE	1
SERVICING	6
SALARIES AND ALLOWANCES	4
TOTAL OPERATIONAL COSTS	56
TOTAL RUNNING COST PER KM	101

Figure A9.1.1 Composition of Truck Running Costs



Appendix 9.2. Sensitivity Analysis and Farm Budget Simulations

Figure A9.2.1. Farm Budgets in Kshs /acre (for a detailed breakdown of budget costs, see Awuor, 1999)

	Bungoma District	Lugari District	Trans Nzoia District
Yield per acre	14 bags/acre	17 bags	25 bags/acre
Revenue	14000@ Kshs 1000/acre	17000@ Kshs 1000/acre	27500 @ Kshs 1100/acre
Fixed Costs/acre	1125	1250	3750
Labor Inputs			
Planting	250	not applicable	not applicable
Weeding	1400	600	400
Top-dressing	50	90	60
Stooking	200	330	300
Maize dehusking	203	340	500
Transport to store	27	68	100
Transport to market	not applicable	not applicable	50
Shelling labor	203	34	125
Watchmen	not applicable	200	150
Total labor inputs	2333	1662	1685
Non-labor inputs			
1st plough	1500	1200	1200
Furrowing	250	1000	not applicable
1st harrow	not applicable	not applicable	800
2nd harrow	not applicable	not applicable	800
Planter Hire	not applicable	800	650

	Bungoma District	Lugari District	Trans Nzoia District
Hybrid seed	910	910	910
DAP fertilizer*	2655	2655	2655
Top-dressing fertilizer*	2000	2000	2000
Chemical weeding	not applicable	not applicable	1600
Weed spraying	not applicable	not applicable	500
Sheller hire	not applicable	425	500
Gunny bags	135	85	250
Transport to store	405	484.5	375
Transport to market	not applicable	not applicable	1250
Land rent per acre	1500	2000	2000
Total non-labor inputs	9355	11560	15490
Total costs	12813	14472	20925
Profit/acre	1187	2529	6575
Costs/bag	916	852	837
PROFIT/BAG	85	149	263

* Farmers in Bungoma, Lugari and Trans Nzoia districts use 75 kg of DAP/acre and 100 kg of CAN/acre

Source: Awuor (1999)

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