
FOOD SECURITY RESEARCH PROJECT

**DEVELOPMENTS IN FERTILIZER
MARKETING IN ZAMBIA:

COMMERCIAL TRADING,
GOVERNMENT PROGRAMS,
AND THE SMALLHOLDER FARMER**

**Ministry of Agriculture and Cooperatives
Agricultural Consultative Forum
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Comments and questions should be directed to the In-Country Coordinator, Food Security Research Project, 86 Provident Street, Fairview, Lusaka; tel: 234539; fax: 234559; email: fsrp1@msu.edu

Jan-Joost Nijhoff
In-Country Coordinator
Food Security Research Project - Zambia

FOOD SECURITY RESEARCH PROJECT TEAM MEMBERS

The Zambia FSRP field research team is comprised of Jones Govereh, Billy Mwiinga, Jan Nijhoff, Gelson Tembo and Ballard Zulu. MSU-based researchers in the Food Security Research Project are Antony Chapoto, Cynthia Donovan, Thom Jayne, Eric Knepper, Melody McNeil, David Tschirley, Michael Weber.

EXECUTIVE SUMMARY

I. Background and Objectives

The debate on fertilizer reform process in Zambia has two contrasting views. Some stakeholders continue to be convinced that the private sector is unable to adequately serve the needs of smallholder farmers, especially in the more remote parts of the country. Only 20 per cent of smallholder farmers used fertilizer in 1999/00. There are serious concerns over private traders' willingness to deliver inputs on credit for low-resource farmers. According to this view, government fertilizer and credit distribution are indispensable for promoting smallholder agricultural productivity growth.

Others believe that the fertilizer market should be restructured even more fully to remove the constraints on the private sector and reduce the drain on the public treasury. This latter line of argument is based on the premise that the continuation of government programs, while intended to meet the needs of remote and poor smallholder farmers, may actually undermine the market for private traders more generally and weaken the prospects for building a vibrant market-oriented fertilizer distribution system. Proponents of this view also contend that the private sector can indeed meet the needs of poor smallholder farmers in remote areas if the policy environment is conducive and if adequate investments in infrastructure are made to support a market economy.

This study was identified by the Advisory Board of the Food Security Research Project, composed of government and private sector stakeholders in Zambia's agricultural sector. The objectives of the study were to describe how the fertilizer industry has developed under the process of liberalization, to examine the effects of liberalization, to identify feasible opportunities to reduce farm-gate fertilizer prices and increase smallholder farmers' access to fertilizer. Particular attention was given to the impact of government programs on the objective of increasing the private sector's capacity and incentives to distribute fertilizer, and policy options for increasing fertilizer use in areas where it is profitable and contributes to agricultural productivity.

This summary provides the main results of the study and recommendations for consideration by government. First, the general trends in the importation of fertilizer into Zambia and the contributions of different players are shown. This is followed by a presentation of the alternative marketing channels prevalent in Zambia during 1999/2000 and their respective market shares and other characteristics. Thirdly, key suggestions on how to reduce the price farmers pay for fertilizer are presented. Finally, the recommendations emanating from these findings are provided.

II. Trends in Zambia's Fertilizer Marketing System

- The liberalization of fertilizer marketing has only been partial, making it difficult to fully assess the capacity of the private sector to market fertilizer to smallholder farmers.
- Donor support to government fertilizer programs and local fertilizer production have disappeared and led to a decrease of government stocks in the market but private sector involvement is increasing.

III. Performance of Government Fertilizer Programs

- Fertilizer distribution by government is cost-inefficient.
- Government fertilizer product range needs to be expanded to meet soil-specific agronomic demands.
- Fertilizer application on maize is not necessarily profitable in all areas, due to geographically varying response rates and market conditions.
- Government agents and non-agents face different business opportunities and risks in the fertilizer industry.
- Lack of information on government's short and long run intentions coupled with mutual mistrust between public and private sectors creates uncertainty in the market.
- A third of the farmers who used fertilizer in 1999/2000 received fertilizer from government and these farmers were better off, on average, than those farmers who did not receive the subsidized fertilizer.

IV. Strategies for Reducing Fertilizer Marketing Costs

- Reducing transaction costs in fertilizer marketing could improve farm profitability and productivity.
- Cost-saving routes and transport modes exist and could be explored.
- The small number of firms participating in the import and wholesale stages of distribution limit price competition.
- Eliminating double handling/ reshipment can lower fertilizer prices significantly.
- Reducing fuel taxes would further reduce farm gate price of fertilizer.

V. Performance of Commercial Fertilizer Traders

- The private sector has demonstrated potential to handle total import requirements provided the necessary macroeconomic conditions and finance are available.
- Private traders distribute fertilizer in areas with commercial agricultural activities.
- Private traders distribute fertilizer on credit to smallholder farmers producing industrial crops such as tobacco, paprika and coffee.
- A cash market for fertilizer by smallholder farmers exist but is not exploited fully by the private sector.
- Government operates in the same districts that the private sector operates.

VI. Recommendations to Improve Fertilizer Marketing for Smallholder Farmers

A key role of government is to identify cost-effective strategies to make fertilizer profitable for more of the 80 per cent of small-scale farmers who currently don't use fertilizer. "Cost-effective" strategies are those that, at a minimum, provide a greater value of output than the cost of the input. While promoting the profitable use of fertilizer for "resource poor" farmers is important, it must be borne in mind that fertilizer use is not appropriate in areas where the agro-ecology is unsuitable for it. But there appears to be great scope for government to raise the use of fertilizer in Zambia by taking steps to overcome some key constraints that currently limit its profitable use by small-scale farmers. These include:

1. Government should take direct steps to identify the most fertilizer responsive maize varieties for each agro-ecological region of Zambia and pro-actively support the distribution of these varieties to smallholder farmers.
2. Given that there is a blanket recommendation on fertilizer application levels throughout Zambia, government, in collaboration with the private sector, should develop fertilizer application recommendation domains that are more appropriate to local conditions, and then work with the extension service to publicize improved new recommendation rates to smallholder farmers in each area. Emphasis should also be given to publicizing the benefits of using lime and to provide incentives for the private traders to distribute it.
3. Given that fertilizer prices are sensitive to transportation costs, it is recommended that government should determine where the highest payoffs from increased road and transport investments would occur, and consider making these investments to make fertilizer use by small-scale farmers more profitable. Further investments in rural electrification and communication services are instrumental in the establishment and expansion of existing smallholder cash crop production schemes.
4. Recognizing that well-off and resource poor farmers live side by side, regional targeting might be inappropriate. Government should explore the possibility of having profiles of farmers and promote self-targeting mechanisms on fertilizer programs. To allow self-targeting mechanisms for conferring benefits to resource poor smallholder farmers, government should eliminate the need to administer a costly credit program by replacing it with a program where beneficiaries work for inputs. A "service for work" program may also help government extricate itself from spending resources to recover loans. Relevant experiences need to be studied closely to identify how a "fertilizer for work" program can be designed and implemented.
5. Creating a more level playing field between agents of government programs and non-agent private companies will lead to greater incentives for new entry by other firms and will discourage the potential for non-competitive practices. Government programs should complement and not compete with non-agent private sector.
6. To facilitate effective preparation and planning by the private sector, government should make clear statements backed by consistent action about its on-going and intended operations in the fertilizer market.
7. To facilitate the smooth exit of government from programs providing fertilizer on credit to smallholder farmers, government needs to specify a plan for phasing out the programs.

Clearly stating how long and under what conditions the government plans to continue in the fertilizer business, that is, the length of the transitional phase, could provide more long-term clarity for the sector and would facilitate long-term investment decisions on the part of the private sector.

8. Recognizing that the private sector is not fully exploiting the cash market for fertilizer due to inherent market risks, government should facilitate further reduction of these risks by dissemination of market information, establishing market centers, capacity building of farmer organizations, and by exploring co-financing and risk sharing opportunities with the private sector.
9. To facilitate the smooth passage of fertilizer at ports and borders, it is recommended that government should negotiate for favorable terms for handling Zambia's fertilizer cargo at shipping ports through Joint Permanent Commissions (JPCs) and regional bodies.

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DEVELOPMENTS IN FERTILIZER MARKETING IN ZAMBIA: COMMERCIAL TRADING, GOVERNMENT PROGRAMS, AND THE SMALLHOLDER FARMER

1. INTRODUCTION

1.1. Background to Fertilizer Marketing in Zambia

Since the 1980s, African governments have been working to reform their agricultural marketing systems. The impetus for the reforms have been largely externally driven, based on aid-conditionality. To a lesser extent, domestic motivations for the reforms have reflected concerns, for example, in Ministries of Finance, to reduce budget deficits associated with subsidized marketing board operations. In Zambia, the government initiated in the early 1990s a process of fertilizer market reform. However, some stakeholders continue to be unconvinced that the private sector will be able to adequately serve the needs of smallholder farmers, especially in the more remote parts of the country. Particular skepticism centers on the ability of private distributors to provide fertilizer on credit so that low-income farmers will be able to afford it. It is important that the future evolution of Zambia's fertilizer marketing system address these fundamental concerns.

Throughout the world, agricultural marketing policies are designed to fulfill political as well as social welfare objectives. Therefore, it should not be surprising to find that political objectives may also be important in the design of key agricultural markets in Zambia. Several studies contend that the reform of the fertilizer markets in Zambia has proven difficult because of the historical use of this strategic commodity for political patronage purposes (e.g, Pletcher 1999; Republic of Zambia 1996). While the marketing of fertilizer is increasingly being handled by the private sector, the government continues to determine how and to whom fertilizer is allocated on credit. Government programs are implemented using private fertilizer companies to handle the logistics. Moving toward a more financially sustainable and development-oriented fertilizer marketing system is likely to require explicit attention to a multiplicity of objectives that are embedded in agricultural policy.

Much debate has ensued over whether the objectives of improving rural productivity and incomes as well as reducing the drain on the public treasury could be achieved at the same time. Reform advocates envisioned that economic liberalization would lead to competitive private sector provision of key services to smallholder farmers, including fertilizer and financing for agricultural intensification. Reform skeptics have contended that the private sector would be reluctant to provide credit to smallholder farmers, and would not adequately service farmers in remote areas. There has been little basis for evaluating which of these views is correct in Zambia, for reasons that are discussed at length in this report. However, many insights emerge from this study of fertilizer marketing in Zambia with implications for future policy.

1.2. Objectives of This Study

The overall aim of this study is to present a set of options for agricultural policy makers for promoting smallholder productivity through a sustainable and cost-effective system of providing

fertilizer to small-scale farmers who can use it profitably, and through strategies to increase the proportion of small-scale farmers that can use fertilizer profitably.

To do this, we examine:

- how the fertilizer marketing system has evolved in the past decade, the motivations and concerns that led to particular government programs,
- why certain programs have been unable to perform effectively, how they led to newly configured programs, and
- how commercial fertilizer business has performed alongside government fertilizer programs.

Based on this review of past programs, the report identifies a range of policy options, with a focus on rural growth and productivity objectives. Explicit attention is devoted to the long standing concerns over how best to address the needs of smallholder farmers in areas considered remote and inaccessible, the importance of credit in increasing fertilizer use, and the impact of government programs on the objective of increasing the private sector's capacity and incentives to distribute fertilizer.

1.3. Data Sources and Methods

The conclusions of this report are based on the following analyses (corresponding data sources are presented in parentheses):

1. Trends in fertilizer supply disaggregated according to private/public and commercial vs. non-commercial channels between 1980 - 2000. (Data sources: Ministry of Agriculture, Food, and Fisheries (MAFF) data files, and annual importation data from private sector firms).
2. Smallholder farmers' fertilizer acquisition and use patterns, crop production and marketing patterns, and crop income levels. (Data sources: Post-Harvest Surveys (PHS), conducted annually by MAFF and the Central Statistical Office. The PHS surveys are considered nationally representative of small- and medium-scale farmers to the provincial-level; our analysis is drawn primarily from the PHS surveys implemented for the 1997/98; 1998/99 and 1999/00 production seasons, and the Supplemental Household Survey in 2001 which enumerates the same set of households as those in the 99/00 PHS).
3. Fertilizer marketing agents' market behavior and operations. (Data sources: Fertilizer Trader Surveys conducted jointly by MAFF and Food Security Research Project, during the period June through September 2000. These surveys were designed to identify all fertilizer importers, wholesalers and retailers operating in eight purposively-selected districts (of which a sub-set were identified for in-depth interviews, using structured questionnaires). The four districts of Choma, Mpongwe, Chipata and Katete were selected for being relatively high fertilizer use areas, while the four districts of Kaoma, Namwala, Nakonde and Mansa were selected for being relatively low fertilizer use areas. These eight districts can be categorized further as being near or far from the line of rail. Information obtained includes the number of firms at import, wholesale, and retail level in each area; the degree of concentration in the marketing of fertilizers; the degree of and motivations for vertical integration that occurs within the fertilizer supply chain; factors affecting the timeliness of fertilizer delivery to the farmer; traders' views of the policy environment, constraints on

fertilizer demand and supply, and strategies to improve fertilizer use in Zambia). Details of procedures used to identify traders are provided in the Appendix E.

4. Cost build-ups, to identify the costs of fertilizer at different stages of the supply chain, including the landed cost of fertilizer at Lusaka, at wholesale depots in district towns, and at retail shops in rural areas. (Data sources: Joint FSRP/MAFF fertilizer trader surveys). The cost-build up figures are then compared with actual prices observed in the respective areas during the survey period to compare costs and price levels.

1.4. Outline of the Report

Section 2 first describes government's policy objectives in fertilizer marketing and pricing before and after reforms initiated in 1991. The changes in the macro-economic environment especially exchange rate management are discussed briefly with regard to impacts on the fertilizer industry. This section further describes the trends in fertilizer importation and availability in Zambia, disaggregating between commercial and non-commercial purposes, and between government, donor, and private firm procurement. Local fertilizer production trends are also discussed. Smallholder farmers' response to these market changes is looked at in terms of farmer adoption rates and factors that distinguish fertilizer users from non-users. Finally this section gives a historical account of the nature of government involvement in the fertilizer industry since 1991 and a brief account of market reform experiences in other countries.

Section 3 describes the performance of the government program in 1999/2000. This study partly relies on an earlier review of the government fertilizer program commissioned by FAO and other donors (Smith et al 2000). The dimensions of performance evaluated include the costs of the program, loan recovery and government ability to sustain the program, the delivery of right fertilizer products at right time, the profitability of fertilizer use on maize, and the expected impact of the program on maize production. Fertilizer retailers' views on how government programs affect the development of their fertilizer business are also discussed including the potential effects of government fertilizer program on maize marketing.

Section 4 discusses the sources of potential cost reduction in handling fertilizer imports into Zambia. The importation of fertilizer involves use of several routes, and several modes of distribution. Cost build-up estimates are done for different marketing channels with varying degrees of vertical integration. Simulations are done to estimate the impact of cost reduction strategies on the price of fertilizer. Furthermore, the impact these price changes have on crop enterprise profitability is simulated.

Section 5 describes the performance of the commercial fertilizer sector. The structure of the market at all levels of the marketing chain is discussed. The distribution networks utilized by market participants to distribute fertilizer to smallholder farmers are described. This section highlights the main constraints at the importation stage of the market. The section discusses the timing of market entry for traders, the sources of fertilizer and finance, distribution mechanisms and stock management and the fertilizer distribution calendar. Fertilizer retailers' views on the sources of business risk are also discussed.

Section 6 summarizes the key findings and conclusions of the study. Alternative strategies for further development of fertilizer markets by government in partnership with the private sector are presented.

1.5. Limitations of the Study

This study analyses fertilizer importation operations and constraints experienced by the major importers, yet it identifies fertilizer marketing system issues that concern the smallholder farming sector. The unique needs of estates and large-scale commercial farmers are not addressed here. Also, specific fertilizer marketing challenges for horticultural and high value crops are also not included in this report. Finally, granular fertilizers especially Compound D and Urea are the most important fertilizers used by smallholder farmers, and this report focuses on these fertilizer types. Specific issues related to the marketing of relatively minor fertilizer products, such as foliar and liquid fertilizer products are not included in this report.

The rapid appraisal of fertilizer traders was conducted in selected districts in Zambia. The survey did not interview all the fertilizer traders in each district, neither was there an attempt to interview traders who had exited the market after 1999. The data from the rapid appraisal is a reflection of only those traders who were interviewed. Although standard procedures to enhance representativeness were followed, the number of traders interviewed in each district was small, and hence subject to potential representativeness issues. The trader survey results need to be interpreted accordingly.

2. TRENDS IN ZAMBIA'S FERTILIZER MARKETING SYSTEM

The economic reform program adopted by GRZ in 1991 has brought enough challenges and opportunities for the fertilizer sector. The specific objectives of fertilizer market reform program, its implementation and the aggregate impact on the industry and smallholder farmers are discussed next.

2.1. Government Objectives on Fertilizer Marketing and Pricing

In Zambia, the nature of fertilizer marketing and pricing policies have produced various market regimes over the last twenty years. These regimes vary from controlled marketing and pricing at all levels in the 1980s to market liberalization and price deregulation in the 1990s. The current fertilizer marketing and pricing policy in Zambia focuses on implementing the sectoral dictates of a market led economy whose characteristics include free entry of as many fertilizer traders as is feasible and availability of information on fertilizer prices and its availability (GRZ 1999, GRZ 2000). The overall objective of government's agricultural policy is to promote the development of a competitive, efficient and transparent private sector-driven marketing system for fertilizer in a way that contributes to rural development and income growth. In general terms, liberalization of fertilizer marketing is expected to remove previous market distortions, introduce new competition into the market and stimulate growth of new markets.

2.1.1. Pre-reform Policy Regime

Fertilizer prices and marketing in Zambia were controlled by the government in the 1980s with the express goal being to keep prices as low as possible to smallholder farmers. Prices were established based upon a uniform price policy and subsidized at the rate of 50% (MOF, 1989). The purpose of the uniform price policy was to promote equity in fertilizer use and food production among smallholder farmers. The subsidy was to make fertilizer available at a price that smallholder farmers could afford. This service was considered essential for the welfare of miners and other urban consumers and the government found it necessary to subsidize fertilizer in order to keep smallholder farmers producing surplus maize.

Fertilizer pricing formula did not reflect the relationship in market forces and associated costs. There was neither an incentive for market development nor market efficiency in the fertilizer marketing system. The price controls and uniform pricing policy, meant that smallholder farmers paid the same price for fertilizer, regardless of location and timing of purchase. This pricing policy stifled private sector interest in participating in fertilizer trading (Faber, 1993). In addition, the pricing policy did not seem to take into account the nutrient composition of different fertilizer formulations. The prices for Compound D (10-20-10) and X (20-10-5) were similar although the latter had higher nutrient content (Jha, 1993). If fertilizer prices are not rationalized based on real prices of nutrients, economic efficiency is lost. In the initial stages of market development, a uniform pricing policy may be desirable but when the market becomes large, such a pricing policy prevents flexible pricing that promotes competition and market efficiency (Bumb, 2001). Bumb argues that to help develop the fertilizer market further, priority should be given to infrastructure improvements rather than uniform pricing.

2.1.2. Post-reform Policy Regime

To achieve its objectives of reforming the fertilizer industry, the government of Zambia adopted several policy strategies. Government, through a repeal of the Namboard Act liberalized marketing of fertilizer. Prior to this repeal, fertilizer was a designated product implying that its handling or marketing was restricted to Namboard and subsequently Zambia Cooperative Federation (ZCF), Lima Bank and CUSA. The repeal of the Act freed entry of private firms into the industry at different levels of the marketing chain. Private firms were able to import fertilizer into or export out of Zambia. In addition to freeing up entry of private firms, government also liberalized pricing of fertilizer as these two policies operate in tandem. Private firms were able to charge a price to reflect the marketing costs and a mark up to cover the risks of trading. Among the key steps that government put in place were the discontinuation of direct fertilizer subsidies to farmers and removal of duty on fertilizer imports. However, there was a distortion introduced because fertilizer raw materials were not included among imports that qualified for an import duty waiver.

Between 1994 and 1997, government adopted a pricing policy to reduce subsidies and avoid budgetary allocations towards fertilizer marketing. Both government and donor fertilizer was supplied to farmers on the basis of market prices. The pricing formula included the landed cost (including inland handling, transportation, storage and insurance costs) and the distributor's margin. During this program, government continued to set the cash and credit prices including the mark-ups that distributors charged. This pricing formula achieved variation in fertilizer prices in various districts of the country and differences in product prices between top and basal dressing fertilizers (MAFF, 1996). Prices within the district were however made uniform which meant that farmers near the storage depot subsidized those farmers further from the storage depot.

The government of Zambia partially abandoned fertilizer price liberalization in 1997/98. Since 1997/98 season, government price setting for fertilizer does not differentiate between various market segments. The price has been fixed at the same level in all parts of Zambia. This price setting penalizes fertilizer users in Central and Southern Provinces by charging them a higher price than necessary in order to provide farmers in Northern and Eastern Provinces with subsidized fertilizer. This pricing policy reversal negates achievements of earlier measures to reduce or suppress subsidies on inputs. It would follow that this pricing policy reduced the incentives for private firms to engage in fertilizer trading in locations beyond the major transport routes as it meant that they had to pay for transport and handling costs to distribute to outlying areas where government fertilizer was distributed below full market cost.

In addition the price setting in 1999/00 did not take into account the different nutrient content of the products handled. The price for both urea and compound D was set at \$266 per tonne even though compound D was acquired at \$285 per tonne and Urea was acquired at \$260 per tonne. Even Calcium Ammonium Nitrate acquired at \$195 per tonne was distributed at \$266 per tonne. The pricing adopted failed to rationalize the different values of nutrients contained in each fertilizer product type.

The price setting of government fertilizer distorts competition. According to field observations in 2000, the difference between full market and government price was large enough to attract retailers in outlying districts to buy fertilizer from some government beneficiaries for further resale. This discrepancy is a clear financial disincentive to private distributors who are involved in fertilizer trading in outlying areas. Given such a market system, it will be difficult for private traders to cover actual costs of transport, storage, administration and overheads as well as the mark-up to return a reasonable profit and to compensate for the risks faced. The uniform pricing policy is a

form of cut-throat competition in areas outside the major transport routes. Given the degree of government involvement, the fertilizer industry is partially operating under a planned sub-economic system where government through FRA decides how much fertilizer to order, where it will be distributed and who will receive it. By this policy, government undertakes to replace the market functions and denies the advantage of the private enterprise. The often talked about minimal response by the private sector to fertilizer market liberalization is expected as traders remain cautious because of continued uncertainty about the seriousness of government in allowing free market pricing to prevail in the industry.

2.2. Macroeconomic Environment

Macroeconomic factors critically influence the growth and performance of the fertilizer industry in Zambia. Policies initiated since 1990 have changed the macroeconomics environment to become more conducive for private sector investment and growth especially for the productive sectors such as agriculture. Macroeconomic adjustments included interest rate liberalization, adoption of a flexible exchange rate, and changes in the legal capital reserves provision and liquidity requirements for commercial banks. Other features include strong fiscal performance and reduced inflationary expectations, addressing tax and tariff anomalies to attract private sector investment and the strengthening of financial institutions. In this study we focus more on the impact of exchange rate stability and import tariffs on fertilizer prices.

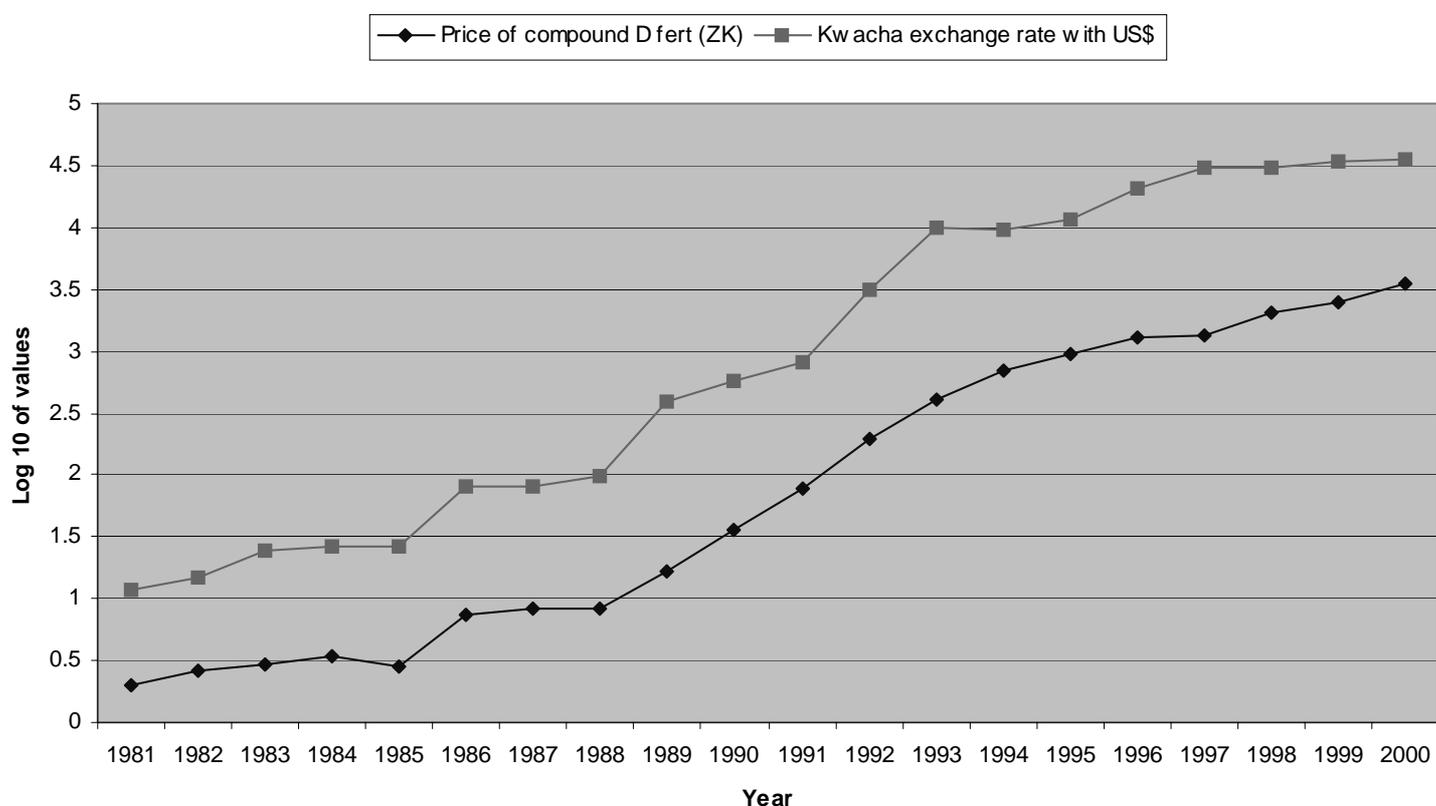
2.2.1. Exchange Rate Management

The exchange rate depreciated from ZK35 = US\$1 in 1990 to as high as ZK4000 = US\$1 in 2000. The increase in the domestic price of fertilizer in Zambia (Fig 2.1) does not necessarily reflect an increase in costs. Much of this increase is due to the depreciation of the local currency relative to major currencies. Figure 2.1 shows that the correlation between the two series is strong reflecting a strong link in the pattern of year-to-year changes. The world prices of fertilizer decreased continuously in the 1980s and have been stable throughout the 90s but Fig 2.1 shows that domestic prices in Zambia kept on increasing during the same period. This increase is largely due to depreciation of local currency rather than structural changes in fertilizer marketing. In the face of exchange rate instability, it is an enormous challenge for Zambia's fertilizer industry to link domestic prices with global prices. The instability of the exchange rate has a direct impact on the price of fertilizer. Fertilizer importers typically include a premium in their retail prices to reflect their expectation of the exchange rate when their sales revenues are converted to tradeable currency.

2.2.2. Other Macro-policy Changes

In an effort to take additional steps necessary to encourage private sector participation in fertilizer marketing the Government of the Republic of Zambia introduced a number of tax reforms intended to benefit the fertilizer industry in 1996. The 1996 budget made several reductions on import duties for agricultural inputs including agricultural chemicals, fertilizers, farm machinery and irrigation equipment.

Figure 2.1. Fluctuations in the Price of Compound D Fertilizer And Exchange Rate 1980 - 2000



Source: CSO and NCZ

Generally, those inputs that were previously subjected to a 10 percent or 20 percent import duty were imported tax free or at a nominal tariff rate of 5 percent. Other inputs that used to be taxed at 40 percent were subject to a 25 percent duty. Far more important than the tariff policies is that the Value Added Tax (VAT) rating for most agricultural outputs has been put at zero. This tax incentive was aimed at reducing the costs of production in the agricultural sector. The Zambia National Farmers Union estimates that these policies translate roughly into a 5 percent savings on the total costs of farm production (Westlake and Sergeant 1999).

2.3. Trends in Fertilizer Supplies and its Distribution among Users

Between 1981/82 and 1999/00, 19 per cent of the fertilizers used in Zambia were manufactured locally, 27 per cent were donated, 20 per cent were imported by private firms (mainly to meet the needs of large-scale farmers) and 34 per cent were imported through Government direct purchase or through a government agency. The roles of donors, government and the private sector in supplying fertilizer into Zambia are discussed next.

2.3.1. Donor Fertilizer Imports

With the GRZ facing increasingly acute foreign exchange shortages during the 1980s due to a decline in copper revenue, donor agencies stepped in to fund a greater volume of imports than government could afford to finance on its own (Table 2.1). Japan, Denmark, Finland, Norway and USAID were the major donors, and most of this fertilizer aid was distributed through public sector channels. Donor support of GRZ fertilizer importation was irregular as can be seen by the large year-to-year fluctuations in column 2 of Table 2.1. Notwithstanding the benefits accruing to donor country firms from fertilizer aid, it is clear that some donors derived satisfaction knowing that smallholder farmers were going to increase their productivity and others wanted to ease the difficulties GRZ faced in mobilizing foreign currency.

However, since 1993 donor fertilizer aid has contracted and has entirely ceased in the last three production seasons (Table 2.1). This could be because donors have become seemingly concerned about lack of transparency of direct government participation in markets, due to inefficiencies, lack of accountability, and the potential for patronage activities. As a result, some donors insisted that their donated fertilizer be channeled through private sector companies using tender procedures.

2.3.2. Government-Financed Imports

Fertilizer importation in Zambia had been a public-sector monopoly until deregulation of the sub-sector in 1991. Government committed itself to complete liberalization of the fertilizer market based on part of the conditions of structural adjustment program. With this commitment in place, the national budget did not have a line item for the importation of fertilizer between 1993 to 1999. However, fertilizer was still being imported by government agencies such as Nitrogen Chemicals of Zambia (NCZ) and the Food Reserve Agency (FRA), who negotiated commercial transactions on their own and obtained credit guarantees from the government. These agencies accessed short-term finance, provided collateral, and government provided a guarantee in case of loan default. The loss-making nature of government fertilizer distribution programs meant that government continued its treasury outlays for public sector fertilizer distribution, albeit in a non-direct manner. In so doing, government was able to continue importing fertilizer, but the quantities have gradually been falling since 1994 (Table 2.1, column 4).

Most recently as 2001, the government reintroduced a line item for fertilizer importation in the budget and set aside about ZK32 billion. This amount would cover the purchase and distribution of less than 30 000 tonnes considering a cost of \$400 per ton. This change reflects the stated conviction of government that it cannot exit the fertilizer market abruptly and that it will continue its involvement in a manner that is hopefully more transparent, with the longer-run objective of withdrawing once private sector capacity is adequately established. This money, however, went towards settling debts contracted previously.

Table 2.1. Total Fertilizer Supply in Zambia 1980 - 1999 (Tonnes of Product)

Agric Season	Local production by NCZ	Donor Imports	Private firm imports	Govt direct & NCZ imports	Product handled by govt and agents	Total Supply^a
	(1)	(2)	(3)	(4)	(5)=(1)+(2)+(4)	(6)=(3)+(5)
1981/82	24032	16000	0	141000	181032	181032
1982/83	56980	30000	0	80000	166980	166980
1983/84	90347	113000	0	9300	212647	212647
1984/85	74978	68861	0	126348	270187	270187
1985/86	16688	30456	0	0	47144	47144
1986/87	78980	87613	0	60975	227568	227568
1987/88	66194	96033	0	85164	247391	247391
1988/89	67449	141371	0	48145	256965	256965
1989/90	35972	28250	0	245410	309632	309632
1990/91	46614	53607	0	102850	203071	203071
1991/92	34372	18000	0	134304	186676	186676
1992/93	33376	34033	14500	74485	141894	156394
1993/94	27169	113743	88000	16105	157017	245017
1994/95	0	66000	92000	10919	76919	168919
1995/96	0	25380	69000	35761	61141	130141
1996/97	0	16577	108000	49000	65577	173577
1997/98	0	0	96900	0	15000 ^c	96900
1998/99	84	0	108800	43000	43000	151912
1999/00	10175	0	134359	23929 ^b	35000	144534 ^d
Averages:						
Average in 80s	55823.4	66519.1	0	89919.2	212261.7	212261.7
Average in 90s	11686.22	30414.78	79062.11	35622.44	77723.44	156785.6
Overall Average	34916.32	49417.05	37450.47	64199.68	148533.1	185983.5

^apart of the fertilizer imported into Zambia is re-exported to DRC and Malawi ^b after the private sector made their import decisions, government requested that this portion of their imported stock be used for government fertilizer programs, according to government allocation decision. ^c these were carryover stocks from previous year. ^d totals exclude what government purchased locally

Source: MAFF Statistical Bulletin 1998; Zambia Fertilizer Importers; and Faber 1993

Government also acknowledges that private sector investment in supplying fertilizer to farmers is increasing and government intends to exit the industry eventually (GRZ 2000). However, the time line for the transition period has not been spelt out because of uncertainties in the length of time required to nurture private sector capacity to a level considered satisfactory by government. Importantly, the government has been able to move the World Bank and IMF from their former position that continued financial assistance was dependent on the government's complete and immediate withdrawal from fertilizer markets to a new and much softer position in which continued financial assistance comes without any clear commitment for government withdrawal in the foreseeable future. Yet the capacity of private sector fertilizer importers in Zambia has clearly matured, at least to the degree that it is possible for government to award tenders to these firms to supply fertilizer to government-selected beneficiaries through public distribution programs. In the past three seasons since 1998/99, GRZ has procured fertilizer through a combination of local purchases from private firms that had already imported fertilizer into Zambia and direct imports. A major issue is whether government procurement of fertilizer locally reduces the amount of fertilizer available for commercial transactions and diverts commercial fertilizer towards semi-commercial

purposes or whether private firms are positioning their stocks in readiness for bidding for government fertilizer supply tenders. This issue is examined in detail in Section 3.6.

The volume of government imports took an upward trend during the same period when the number of private firms importing fertilizer and the volumes of imports they were bringing into Zambia was increasing as well. While the private firm services are highly concentrated in the large scale and estate farming sectors, their network in the smallholder sector is getting established and expanding through a crop swap program and direct cash sales. Unfortunately, this is the sector which government is targeting with fertilizer credit.

2.3.3. Commercial Imports

Prior to deregulation of fertilizer importation, private sector imports were absent. Over the last ten years, private firms have completely taken over the importation of fertilizer for large scale commercial and estate farmers. In addition to servicing needs of commercial farmers, fertilizer importers have established themselves in Zambia to offer fertilizers to wholesalers and retailers serving smallholder farming areas. In the last five years, the private sector has increased its imports of fertilizer for commercial distribution to smallholder farmers (Table 2.1, column 3). As mentioned earlier, private firms also compete for bids to supply government with fertilizer for government programs. Since 1995, the proportion of fertilizer imports by the private sector has surpassed that of government and donors combined. Overall, the role of the private sector in importing fertilizer into Zambia has grown immensely and continues to do so.

2.3.4. Local production

Nitrogen Chemicals of Zambia established in 1967 to produce explosive grade ammonium nitrate was in 1975 expanded to produce fertilizers. The fertilizer plant commissioned in 1981 was seen as a means to achieve security of fertilizer supplies in Zambia. Many developing countries promote local fertilizer production as a means to industrialization and to save foreign exchange through import substitution (FAO 1999). Given the risks of investment and the policy pursued by government in the 1980s, no private firm would have invested in fertilizer production facilities during that period. The fertilizer plants at NCZ have a total capacity of 140 000 tonnes of composite fertilizer and 55 000 tonnes of ammonium nitrate fertilizer. These plants were designed to produce most fertilizer types demanded by the domestic market excluding urea. While local production allowed specific fertilizer blends to be available, government involvement in NCZ was less than satisfactory. NCZ fertilizer plants never operated above 50 per cent. Reasons for poor performance of state operated enterprises in developing countries include: political interference; inadequate allocation of foreign exchange; insufficient autonomy and authority for decision making and implementation; and poor incentive structures, operation and management (Bumb 2001). With a competent management team, Bumb argues that ownership is not an issue. Despite the corporatization of NCZ, efficiency did not improve.

Prior to 1990/91, NCZ produced an annual average total of 55 000 tonnes which represented 27 per cent of total average annual fertilizer supplied during that period, Table 2.1. Since 1990/91, average annual production levels were around 11 000 tonnes representing only six per cent of average annual supplies. The viability of fertilizer production operations in the early 1990s was under threat and the performance was not satisfactory. According to its past performance, NCZ last made profit in 1993 (NCZ unpublished reports). Actual production of fertilizer ended in 1994 although 10 000 tonnes were produced in 1999. Since 1993, the performance has deteriorated. One option for NCZ was to have the company liquidated. This could have lead to a disastrous

impact on lost jobs, loss of value of assets and loss of value added to the products. The other option available to NCZ then was privatization.

Privatization of NCZ was adopted in 1992 but has not been implemented to date. The Zambia Privatization Agency has made concerted efforts to sell NCZ but have not succeed. Sasol in alliance with Norsk Hydro were interested and initiated negotiations in 1996. Sasol's interest on NCZ waned when it felt that it had a firmer deal to buy Kynoch in South Africa. Sasol had considered NCZ to have profit potential although there were constraints to be overcome. NCZ has outstanding payments to suppliers, statutory deductions, terminal benefits to ex-employers and loans and overdrafts.

Following the failure to privatize NCZ, interest is emerging to restructure the company and recapitalize it to produce saleable products that can compete on the market (Financial Mail, 11-17 September, 2001). The Ministry of Commerce, Trade and Industry recognize that with recapitalization, the firm can attract buyers. The inactivity of NCZ has been cited as a major reason why private firms have not shown effective interest in buying the plants. However, there is considerable investment required to recapitalize the key plants so that the company is saved from closure. Investments in fertilizer production plants pay after very long periods and manufacturing requires substantial economies of scale to provide fertilizer at competitive prices. To be successful, local production should be based on low cost domestic raw materials available in substantial quantities (FAO 1999).

The issue of how competitive NCZ can be at producing fertilizers in this region has not been fully assessed. Unverified reports indicate that NCZ can produce basal fertilizer at \$226 per tonne compared to landed price of \$270 per tonne (NCZ Management, Personal interview 2001). Tax incentives could be considered to make NCZ fertilizer products competitive. In the short to medium term, it would appear that Zambia's fertilizer requirements will be completely met through imports. Resuscitating fertilizer production at NCZ is not a small challenge for government and the only future is eventual privatization. Privatization should not be seen as an end in itself but the end is improved efficiency (Bumb 1999).

2.3.5. Smallholder farmer adoption rates

Results of Post Harvest Survey data collected by Central Statistical Office in the last three years reveal that fertilizer use by smallholder farmers has been increasing each year during the three year period 1997/98 to 1999/00, Table 2.2. In 1997/98, only 13 per cent of the smallholder farmers used fertilizer. This proportion rose to 16 per cent in 1998/99 and 22 per cent in 1999/00. In volume terms, smallholder farmers used 20 000 tonnes in 1997/98, the volume rose to 26 000 tonnes in 1998/99 and rose again to 35 000 tonnes in 1999/00. Table 2.2 shows that during the same period maize output by smallholder farmers increased as well.

Table 2.2. Trends in Fertilizer Use and Maize Production by Smallholder Farmers, Zambia, 1997/98 - 1999/00

Province	T o t a l households	Farmers who used fertilizer		Total fertilizer used (tonnes)	Total maize produced (tonnes)
		Number	Percentage (%)		
1997/98					
CENTRAL	70,974	17,819	25.11	3,723	113,212
COPPERBELT	31,521	5,469	17.35	1,105	33,378
EASTERN	177,838	30,790	17.31	6,278	198,257
LUAPULA	99,286	4,541	4.57	701	10,125
LUSAKA	13,574	3,703	27.28	593	24,493
NORTHERN	139,873	16,250	11.62	3,002	31,791
NORTH WESTERN	48,655	1,866	3.84	145	26,236
SOUTHERN	97,679	18,041	18.47	4,316	165,596
WESTERN	80,444	1,755	2.18	314	30,955
TOTAL	759,845	100,234	13.19	20,181	625,015
1998/99					
CENTRAL	71,180	25,391	35.67	6,652	126,000
COPPERBELT	28,227	8,353	29.59	1,250	33,263
EASTERN	173,289	29,551	17.05	6,478	271,000
LUAPULA	100,181	5,292	5.28	1,061	22,057
LUSAKA	15,482	4,423	28.57	718	14,792
NORTHERN	156,073	23,974	15.36	3,885	71,755
NORTH WESTERN	51,103	2,384	4.66	311	26,223
SOUTHERN	107,377	25,351	23.61	6,124	203,000
WESTERN	99,022	1,951	1.97	264	43,671
TOTAL	801,934	126,670	15.80	26,747	811,774
1999/00					
CENTRAL	63,897	20,398	31.92	5,366	117,000
COPPEBELT	32,622	10,180	31.20	2,823	58,454
EASTERN	182,333	49,715	27.27	10,265	280,000
LUAPULA	66,805	5,171	7.74	782	15,249
LUSAKA	16,795	6,150	36.62	1,374	20,176
NORTHERN	111,382	17,960	16.13	3,492	38,523
NORTH WESTERN	32,742	1,620	4.95	391	21,091
SOUTHERN	101,151	38,510	38.07	10,423	252,000
WESTERN	90,265	1,016	1.13	208	47,757
TOTAL	697,991	150,721	21.59	35,128	850,250

Source: PHS Data 1997/98;1998/99 and 1999/00. Central Statistical Office, Zambia

The increase in fertilizer use is, therefore, consistent with increases in maize production. Given that smallholder farmers apply most of their fertilizer on maize, this result is expected. The PHS figures of fertilizer used by smallholder farmers should be treated with caution as PHS sampling does not take into account the localized nature of fertilizer use in Zambia and potentially weights the data inappropriately. Overall, a small proportion of the smallholder farmers use fertilizer and are thus able to benefit directly from a program subsidizing fertilizer distribution.

The important fertilizer demand areas in Zambia are Central, Eastern, Northern and Southern provinces. All these provinces, except for Northern have experienced steady growth in the number of farmers and proportion of farmers using fertilizer. Copperbelt and Lusaka provinces have also shown tremendous growth in terms of the proportion of farmers using fertilizer. These figures indicate that provinces such as Luapula, Northwestern, and Western have very limited potential for fertilizer use. The range of the proportion of farmers using fertilizer in these provinces was 1 - 7% in the last three years. These low fertilizer use provinces are distant from major urban centers and the high cost of transport makes fertilizer use unattractive pushing demand down and making supply markets unsurprisingly thin. Using fertilizer on maize appears to be unprofitable and risky for farmers in these low fertilizer use provinces of Zambia. It is not surprising that private sector investment is limited in the provinces where the demand for fertilizer is low.

When compared with the 1980s, current fertilizer use levels by smallholder farmers are lower. While market liberalization has been followed by decline in fertilizer supplies, this study is unable to determine that this is a result of "liberalization". The decrease in fertilizer use appears to be related to supply constraints which are exacerbated rather than alleviated by government's involvement in the sector (Deininger et al 2000; Gordon 2000). Seshamani (1998) attributes this declining trend to the manner of implementation of the policies especially the pace, sequencing and politicization of the implementation.

2.3.6. Farm Production Characteristics of Fertilizer Users and Non-users

The decision by farmers on whether to use fertilizer and how much to use is a function of the following factors: the personal attributes of the farmer; farming systems and resource characteristics; institutions and infrastructure factors; and environmental factors (Jha and Hojjati, 1993). The characteristics of fertilizer users were compared to those of non-users to understand whether these factors have any relationship to the farmer's decision to use or not to use fertilizer (Table 2.3). Household level data from the 1999/00 Post Harvest Survey was used to compare these factors among the two groups of farmers.

The age of the farmer appeared to have no effect on fertilizer use. Often, older farmers are less likely to adopt new technologies such as fertilizers but the data in Table 2.3 show that the average age in each of the two groups is similar. Women headed households are generally perceived to be subsistence oriented and face more constraints in purchasing fertilizer than male-headed households. Table 2.3 shows that a higher proportion of female-headed households (87.6%) did not adopt fertilizers than male headed households (78%). Often, large families create more consumption pressure and a large supply of labor is likely to favor adoption of new technology such as fertilizers. As expected, households using fertilizer had an extra member in the household compared to households not using fertilizer.

The cropped area or value of crop production is an indicator of the household's economic status. Wealthier households are likely to adopt fertilizer use than poorer households. Fertilizer users had a larger area cropped and produced about three times the value of crops produced by non-fertilizer users. Fertilizer users also had more farm equipment than non-users. From Table 2.3, there were surprisingly more cattle owners (22%) among non-users than among users (8.8%). This is possible because animal owners substitute animal manure for fertilizer.

Table 2.3. Characteristics of Fertilizer Users and Non-users, Zambia, 1999/00

Farmer and Location Characteristics	% of HH in this category	Entire sample	Household use of fertilizer	
			No fertilizer used	Basal, top dressing, or both
Overall, total HH (%)	100.0%		80.3	19.7
Age head of household (mean years)	100.0%	42.8	42.7	43.3
<i>Gender</i>	0.0%			
male (%)	76.2%		78.0	22.0
female (%)	23.8%		87.6	12.4
HH size (mean number members)	100.0%	6.1	5.9	7.1
Cropped area (mean ha)	100.0%	1.4	1.3	2.0
Value of HH crop production (mean 1000s ZK)	100.0%	470.6	339.1	921.9
Value of HH farmland (plows, harrows, ox-carts) (1000s ZK)	14.2%	507.8	429.4	625.6
HH raises livestock (%)	31.3%		22.6	8.8
Dependency ratio (youth/adults)	100.0%	0.905	0.917	0.857
<i>Fertilizer depot in district (%)</i>				
no fertilizer depot (%)	66.4%		87.3	12.7
fertilizer depot present (%)	33.6%		65.0	35.0
Province				
Central	8.7%		68.2	31.8
Copperbelt	4.2%		67.8	32.2
Eastern	23.0%		71.8	28.2
Luapula	13.0%		95.1	4.9
Lusaka	2.1%		63.5	36.5
Northern	16.7%		86.0	14.0
Northwestern	6.1%		96.8	3.2
Southern	13.5%		63.2	36.8
Western	12.6%		98.9	1.1

Source: 1999/00 Post Harvest Survey, Central Statistical Office, Zambia

Apart from characteristics of the farmer or farm, there are other forces such as the status of the fertilizer distribution system and the physical response environment which govern the process of fertilizer diffusion. Maize producers are spread out throughout the provinces and these locations vary in terms of the ease with which maize can be produced. Access to input and output markets also vary. About a third of the sample population were in districts where a fertilizer marketing depot was present (Table 2.3). In these districts, 35 per cent of the farmers used fertilizer. On the other hand, districts which did not have a fertilizer marketing depot, had 13 per cent of the farmers who used fertilizer. Fertilizer depots have been established mainly in locations with effective demand for fertilizer. Smaller fertilizer outlets dominate those districts with relatively low effective demand for fertilizer. Provinces including Lusaka, Central, Copperbelt, Eastern and Southern have a relatively higher density of fertilizer users than other provinces such as Luapula, Northwestern, Western and Northern. The common characteristic among these two groups of locations is that the former has a favorable climate and soils and relatively good market infrastructure. The latter group of provinces are the furthest from major market centers and have poor soils which limit profitable fertilizer use.

2.4. Organizational Changes in Government Participation

The market liberalization policies initially advocated by government in 1991 were intended to reduce the direct involvement by government in maize and fertilizer marketing, thus providing opportunities to the farming and agricultural trading sector to react to market driven supply and demand conditions. Before 1991, fertilizer marketing was the preserve of Namboard and cooperatives. Yet Namboard accumulated enormous budget deficits in the form of subsidies. This eventually led to the demise of Namboard in 1989 ushering in a new system of fertilizer marketing in Zambia. The NCZ took over the role of fertilizer distribution on behalf of government. Fertilizer marketing was handled by ZCF, Lima Bank and CUSA.

The first phase, lasted from 1992/93 - 1993/94, featuring the ZCF, Lima Bank and CUSA. The second phase, lasting from 1994/95 to 1996/97, revolved around the Agricultural Credit Management Programme (ACMP), with its designated Credit Managers and credit coordinators. In the third phase, which lasted only one year, 1997/98, the Food Reserve Agency directly distributed fertilizer to designated agents and cooperatives. Lastly, since 1998/99 and up to the time of this writing this report in May 2002, private companies have again been designated by the government to distribute fertilizer under contract to designated beneficiaries on its behalf. Some of the participants were present through all four phases while others exited as the new institutions failed to accommodate their involvement.

It is noteworthy that throughout each of the four phases, the government has maintained control over the allocation of fertilizer on credit to designated beneficiaries. Evaluations of prevailing market organization led to new structures being put in place but the key element common to all phases of liberalization has been government control over the selection of which private firm handles the distribution and the beneficiaries to receive fertilizer. Targeting of beneficiaries has been and continue to be a problem for government fertilizer programs. These government programs co-exist with parallel private sector fertilizer marketing operations, with relatively free entry and exit of market participants.

2.4.1. Phase 1: Ag Inputs Credit Program 1992/93 and 1993/94

At the time that government committed itself to liberalizing fertilizer marketing, no private firm in Zambia had any experience handling and financing fertilizer distribution in smallholder areas. Government deemed that the most important issue was to find alternatives to the distribution efforts of NCZ (and Namboard, before NCZ). Government created three facilities, the Agricultural Inputs Credit Revolving Fund (AICRF), Fertilizer Supplier Loan Facility (FSLF) and Traders/Agency Training Facility. These facilities were created with the intention to expose domestic traders to importation, handling and financing of fertilizer. These efforts by government were being implemented at the same time the fertilizer market was being opened up to allow entry of foreign private firms into the local fertilizer industry. The AICRF was accessed by Zambia Cooperative Federation - Finance Services (ZCF-FS), Lima Bank and Credit Union and Savings Association (CUSA) to market fertilizer on government's behalf to smallholder farmers. The Program Against Malnutrition (PAM) was included in the team of selected agencies in the subsequent year. The FSLF was ZK1 billion for onward lending to locally- based manufacturers, importers and suppliers of fertilizer. This facility was accessed through Lima Bank by local companies including Sable Transport, NCZ, Zambia Cooperative Federation and Mazabuka Marketing and Development Company (MAFF 1994). The local companies had to negotiate with Lima Bank to access the fund on commercial terms. The agency training facility targeted 27 indigenous traders who were trained in chemical handling practices and later entered a contract with MAFF to be its fertilizer distributing agents. This deliberate attempt by government to underwrite these programs was

because the financial systems were facing difficulties at that time with interest rates above 45 per cent. The government also believed in building the capacity of the indigenous entrepreneurs to take over government functions in fertilizer marketing.

Government, through the Food Security Division of MAFF, selected, appointed and paid warehouse managers for receiving and storing the fertilizer. In addition, MAFF also issued release orders of where fertilizer was to be distributed and to which parties. The agencies who were selected to handle the fertilizer did not provide any bids but were selected and requested to distribute fertilizer at government stipulated terms. Out of the four lending institutions who distributed fertilizer in 1993/94, only CUSA signed the loan agreement with MAFF. There was, therefore, no legally binding agreement to guard against deviant behavior. The principal (MAFF) shouldered all the risk associated with the agent's operations.

The lending institutions distributed fertilizer on credit and cash terms that were set and monitored by government. A significant amount of the fertilizer was also issued to other institutions such as Nitrogen Chemicals of Zambia and the private agents for onward selling on cash terms. As foreign based and other local private firms entered the fertilizer marketing chain, they had to compete with government-supplied fertilizer which was being distributed at below full market price.

The Agricultural Credit Revolving Fund was accessed by smallholder farmers only while the Fertilizer Supplier Loan Facility benefitted both large scale and smallholder farmers. The recovery rates for the AICRF was 29% in 1993/94 but much lower in 1992/93 because of loan defaults and the drought conditions which prevailed in most parts of the country. The recovery rate for the FSLF was impressive as all the companies paid back in full. The recipients had pledged collateral with the bank and their small numbers made it easy for LIMA Bank to monitor repayments. Surprisingly, a number of the firms who participated in the FLSF were also operating as warehouse managers for the AICRF and also acquired some of the fertilizer for further resale. Unfortunately, the success recorded in the FSLF was not replicated under the AICRF.

2.4.2. Phase 2: Agricultural Credit Management Program - 1994/95 to 1996/97

Despite continued Government assistance, the appointed lending institutions and selected government agents continued experiencing unimpressive loan recovery rates. To improve recoveries, government sought to streamline the distribution system by improving credit management and record keeping as well as to change the perception that loanees are not obliged to repay government loans. In 1994/95, government started a pilot Agricultural Credit Management Program (ACMP).

The ACMP program was designed to enhance the capacity of the private sector in agricultural input marketing and credit delivery through a gradual process by increasing the levels of liability and ownership in the partnership. In particular, it was aimed at building the capacity of the private sector through providing inputs and giving firms an opportunity to gain experience in fertilizer marketing. It was envisaged that through this coordinated process, the private sector would eventually take over all the responsibility of agricultural input marketing (particularly fertilizer) as well as agricultural credit management. The ACMP was viewed as a gradual way of liberalizing agricultural inputs marketing.

In 1994/95 and 1995/96 seasons, Cavmont Merchant Bank and SGS Zambia Limited were appointed as Credit Managers. There were no tender procedures followed for these appointments (Personal Communication, 2000). The ACMP Credit Managers did not provide any security for the agricultural inputs advanced to them by the government. All the risk of the program was borne by

government. Credit Managers operated basically as a conduit for delivery of government agricultural inputs to small scale farmers. The Credit Managers were required to appoint a network of Credit Co-ordinators to provide inputs on credit and cash terms to farmers. The contract between credit managers and credit coordinators was purely a private arrangement and the principal (Government) was not supposed to intervene in the choice and nature of the coordinators the Agency (Credit Managers) appointed. Anecdotal reports indicate that government was involved in the selection of Credit Coordinators, although such claims are difficult to verify. Some of the private agents who participated in the AICRF program were appointed as credit coordinators but others were not. It is not clear whether the agents included were the ones with the best performance record in the AICRF program. Credit Coordinators were required to provide a 10% down payment before inputs were drawn. Credit Coordinators were also required to submit reports to Credit Managers on all their operations.

After the first two years in operation, it was observed that the two Credit Managers were unable to adequately cover the country. About 60 000 farmers were given fertilizer loans each year (MAFF, 1996). The number of Credit Managers were subsequently increased to eight with each manager assigned to a specific geographical region or province. The additional managers included PAM, Investrust Merchant Bank, Farmers Fair Trade, Sikatengwa Farms, Swarp Agricultural Development Company and Cornplus Ltd. The increase in the number of Credit Managers from two to eight was made with a view not only of widening coverage but the hope that this would enhance competition in terms of loan recoveries. Government pressured the Credit Managers to begin accepting some of the risk of participating in the fertilizer program by absorbing a portion of the credit recovery losses, as opposed to simply receiving a fixed management fee per tonne of fertilizer distributed regardless of credit recovery rates (which were averaging about 3 per cent). As was the case under the ACRF in 1993/4, none of these managers signed the contracts in 1996/97 and they continued to operate with the previous contracts.

The ACMP program was characterized by recovery rates averaging 3 per cent. Most Credit Coordinators failed to remit money they recovered from farmers to the respective credit managers. Some credit coordinators collected loan processing fees from farmers but failed to supply inputs. In addition, most Credit Coordinators failed to collect debts from farmers. Overall, the poor performance of the ACMP program is attributed to an absence of liability and accountability on Credit Managers and Credit Coordinators, and the absence of a government monitoring system to verify repayment claims, and misplaced agent incentives. Since the inception of the ACMP, fertilizer worth more than 70 billion kwacha was distributed but the low recovery rates meant that the fertilizer credit fund failed to revolve and government was forced to continue channeling in additional funding without much coming back. When the Credit Managers refused to agree to a risk-sharing approach, the government discontinued the program after the 1996/97 agricultural season. The lack of proper accounting procedures made it very difficult to establish which party owed the other and how much. Four years after the program was terminated, efforts to establish liabilities continue.

2.4.3. Phase 3: Food Reserve Agency and Credit Management Transition - 1997/98

In 1997, the government withdrew all carryover fertilizer stocks from Credit Managers and assigned the Food Reserve Agency (FRA) to distribute agricultural inputs (fertilizer) to small-scale farmers. The FRA was the only government marketing agency in existence after the demise of the Lima Bank, CUSA and ZCF-FS in 1994/95. Unlike the ACMP managers, FRA was easy to control as its records were readily accessible despite its officially semi-autonomous nature. Although the FRA Act explicitly circumscribes the design and role of the agency, the activity of handling

fertilizer was imposed on it (MOFED 1998). According to the Food Reserve Act of 1995, the main functions of the Food Reserve Agency are to:

- Establish and manage the national food security reserve
- Establish a marketing information system
- Promote grade and weight standards for the marketing of food commodities; and
- Manage and lease out government-owned storage facilities and equipment.

The activity of handling fertilizer was, therefore, adopted as an ad hoc arrangement. The semi-autonomous status of the agency enshrined in the Act, gives the Minister of Agriculture, Food and Fisheries the right to delegate to the Agency the implementation of any agricultural activity. It is through this provision in the Act that the FRA was tasked to import fertilizer, distribute it on credit to small-scale farmers, and receive repayments in the form of maize. Officially, the FRA was to disengage from fertilizer activities as soon as an appropriate alternative mechanism was in place or private sector capacity was seen to be sufficiently developed to take on commercial credit programs for small scale farmers.

These decisions were made late in the 1997/98 farming season. At that time, FRA was not in a position to import fertilizer into the country but it took over responsibility of the carryover stocks from the ACMP program, which amounted to 15,000 tonnes. Since the program started late, FRA did not have any mechanism to screen beneficiaries. Beneficiaries were screened by the Ministry of Agriculture, Food and Fisheries which processed all loan documents and issued release orders for collection of inputs (FRA, Personal Communication, 2000). In addition, the Food Reserve Agency insisted on a 10 per cent down payment on all fertilizer released and collateral from private companies appointed as agents. However, due to inadequate capacity to screen and value the title deeds offered by the private sector companies, the fertilizer loans were under-secured. The credit program was designed to benefit smallholder farmers but some of the traders who received the fertilizer reportedly exported the fertilizer to non-designated channels. The overall loan recovery of the 1997/98 program amounted to 25 per cent.

2.4.4. Phase 4: Agro-support Program under Fra - 1998/99 - 2000/01

Given its lean structure, the Food Reserve Agency had to issue contracts for handling, storage and transportation of fertilizer, monitoring utilization of fertilizer and recovering the loans. The contracts were issued to intermediaries which included Omnia Small Scale (Z) Limited, traders, farmers associations, cooperatives, out grower firms and individual farmers. These firms and associations were administratively selected as no bidding took place. With the exception of Omnia, the other agents were coopted from the previous ACMP program. During the first two seasons of this phase, FRA's fertilizer credit operations were financed by Nedbank of South Africa. The funds from Nedbank were provided on condition that all the fertilizer sourced through the fund will be handled and distributed by Omnia Small Scale. Nedbank had little confidence and trust on the performance of indigenous firms and therefore disregarded the tender evaluations that were done. Omnia Small Scale was appointed the sole warehouse manager in 1998/99. In 1999/00, FRA appointed an additional warehouse manager, Farmer's Friend, to handle and distribute locally manufactured fertilizer in Southern Province. Omnia Small Scale had the exclusive opportunity to handle distribution in all other provinces after Nedbank had insisted on it. In 2000/01, FRA sourced finance from ABSA and the conditions on appointment of warehouse managers were relaxed and followed the recommendations of the tender board. Two other companies, AMAKA in Central and Western Provinces and Sable Transport in Eastern Province were appointed as warehouse managers. Farmer's Friend remained in Southern Province and Omnia Small Scale handled distribution in Northern, Lusaka, Copperbelt, North Western and Luapula provinces.

The initial target group for this phase of the credit program were individual traders, individual emergent farmers and associations of smallholder farmers. The overall recovery rate for 1998/99 was 36 per cent. Farmer associations had higher repayment rates than the other groups. It was against this background that the Government decided to concentrate on giving fertilizer loans to farmer groups as opposed to individual farmers or traders in the following years (FRA 1999). With the enactment of the Cooperative Act No.20 of 1998 and the associated legislation, the government directed its efforts to support farmer groups mostly Agricultural Primary Cooperatives to access loans from the Food Reserve Agency. As a result of this change in focus, there was an associated increase in the registration of Cooperatives between the period of 1998 and the 2000 as compared to any other period. According to the figures with the Registrar of Cooperative Societies the number of registered cooperatives between this period exceeded 4 000. Over 90 000 farmers were given loans through cooperatives. The repayment rates in 1999/00 was expected to improve to about 46% (Smith et al 2000). The distribution of loans recovered by province is shown in Table 3.2.

2.5. Fertilizer Trends in Other Countries in the Region

As is the case in Zambia, many African countries have witnessed attempts to reform their input and output markets in the 1990s. Before 1990, the state directly controlled the fertilizer industry in most countries. Contrary to conventional perceptions, however, fertilizer use has actually increased in most other countries in the region since the reforms were initiated. Zambia and Tanzania are notable exceptions (Table 2.6).

Table 2.6. Total Fertilizer Nutrient Use (Thousands of Metric Tonnes), Selected Countries of Eastern and Southern Africa

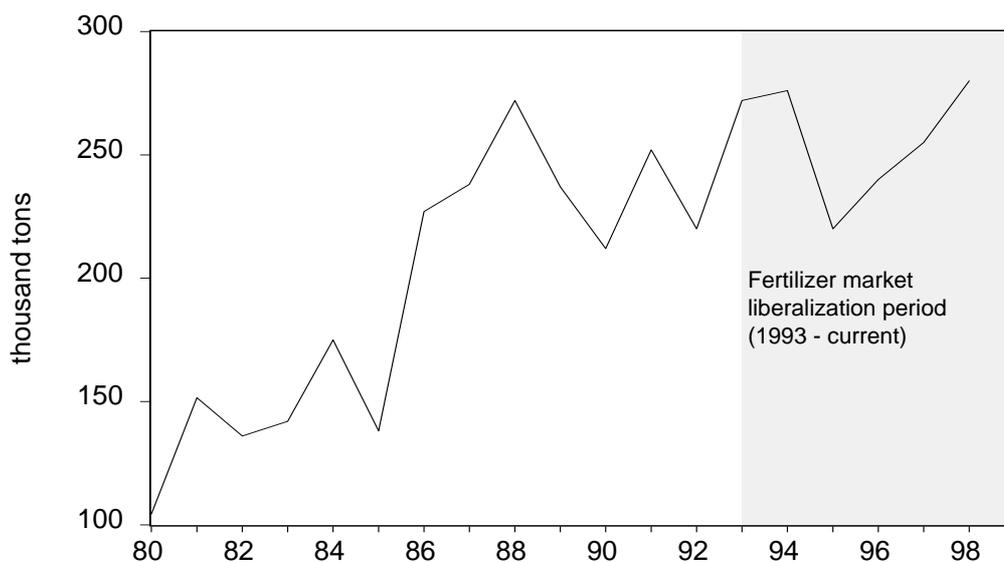
Year	Ethiopia	Kenya	Malawi	Tanzania	Zambia	Zimbabwe
1980-84	41.2	75.8	37.4	29.2	74.2	159.7
1985-89	71.6	115.0	45.2	44.5	83.3	156.4
1990-94	92.7	112.7	57.4	44.2	70.2	156.9
1995-00	156.0	126.5	52.2	31.0	50.9	165.9

note: Mozambique has consumed under 10,000 tonnes of total nutrient in each year since 1980; Uganda has consumed less than 3,000 tonnes of total nutrient in each year since 1980.

Source: FAO Agristat data files.

Of all the countries examined in Table 2.6, Kenya is perhaps the one with the most comprehensive record of input market reform, and therefore, it may be instructive to examine more closely the case of Kenya.¹ By 1993, the government had completely disengaged from the marketing and distribution of fertilizer.

Figure 2.2. Trends in Fertilizer Consumption in Kenya, 1980 - 1998



Source: Ministry of Agriculture data files

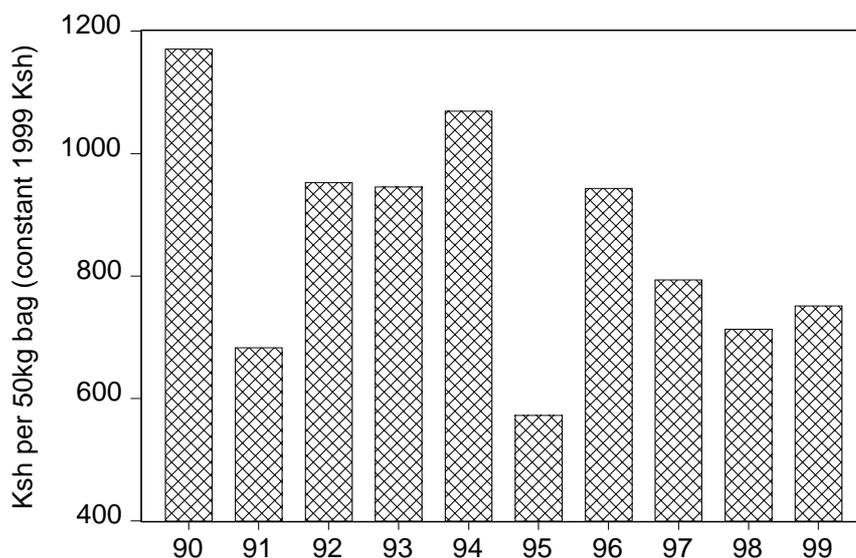
Prior to 1990, a parastatal, the Kenya Farmers Association (KFA), handled all marketing and distribution, the Ministry of Finance set prices, and import licenses and exchange rate controls were the norm. However, between 1990 and 1993, the Kenyan government removed price controls

¹This section draws from Wanzala et al 2001.

on fertilizer, abolished import quotas and import licenses, and eliminated foreign exchange controls. Today, once fertilizer lands at the port of Mombasa, the private sector handles its distribution and sale. The sole exception is approximately 5 per cent of the imported fertilizer that is donor-sourced via bilateral aid from the Japanese government (Wanzala et al 2001). Liberalization has had the desired effect of increasing private sector participation in fertilizer marketing. The number of players in the fertilizer marketing system has mushroomed. One estimate is that there are 10-12 importers, 500 wholesalers, and 5000 retailers of fertilizer countrywide (Allgood and Kilungu 1996). Fig 2.2 shows the basic upward trend in fertilizer consumption in Kenya during the 1980s and into the period of liberalization.

Fertilizer market liberalization in Kenya has actually resulted in a decline in the real farm gate price of fertilizer and in marketing margins. Therefore, liberalization has actually improved economic incentives to use fertilizer. Between 1990 and 1999, the nominal price of DAP in Nakuru rose by 220% (MOA, 1999).² However, a number of factors are at play.

Figure 2.3. Constant 1999 Marketing Margins for Dap Between F.o.b. Mombasa Price and Wholesale Nakuru Prices



Source: Green Markets

During this same period (between 1992 and 1999), the Kenya shilling depreciated against the US dollar by 168%. Secondly, the impact of the depreciation on domestic fertilizer prices was compounded by a steady upward trend in world fertilizer prices during this same period. Hence, these two factors alone caused the f.o.b. price of DAP delivered at Mombasa in 1999 to rise by

²Nakuru is a city in Western Kenya, approximately 400 km from the capital Nairobi, and 1000km from the port of Mombasa. The Ministry of Agriculture 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 much of the imported fertilizer passes through on its way upcountry, and therefore it is not a thin market.

200% from about 200 Ksh per 50kg bag to 600 ksh per 50 kg bag. However, this analysis of prices does not account for the general inflation that has occurred in Kenya during the 1990's. After adjusting import and retail prices of DAP for changes in the general level, both these prices have actually declined in real terms. Moreover, the marketing cost wedge between Mombasa and Nakuru actually declined in real terms during the 1990's. In real 1999 shillings, the average Mombasa-Nakuru marketing margin between 1990-1993 was 944 Ksh per 50kg bag; this margin declined by 14% to 820 Ksh per bag between 1994-1999 (Fig 2.3).

3. PERFORMANCE OF 1999/2000 GOVERNMENT PROGRAM IN REGARD TO GOVERNMENT'S OBJECTIVES

The resources used in the government fertilizer distribution programs have an opportunity cost. In addition, the presence of government in the fertilizer market has important influence on the ability of the private sector to operate it. The details surrounding these issues are discussed in this section.

3.1. Government Fertilizer Program Costs

The government of Zambia distributes fertilizer on loan to smallholder farmers. The stated program objective is to extend credit to smallholder farmers. This program is open in terms of areas of operation but it limits its package to a maximum of 2 hectares per farm household. The modalities of the program require that farmers pay back the loan in cash or in kind after six months. The program appears to be a round about way of conducting trading business. The modalities impose enormous transaction costs on government.

The purchase price of fertilizer offered to government (\$260/ton) was about the same as the landed price of commercial fertilizer in Lusaka (\$267/ton). However, the costs of handling, disbursing and recovering government fertilizer loans appeared excessive. In Zambia, there are out-grower firms who distribute fertilizer to farmers on loan to produce tobacco, cotton and paprika. The costs incurred by these out-grower firms in distributing fertilizer are much lower than costs incurred in conducting a similar operation under the government fertilizer loan program (see section 4.2).

A 1999/00 trading account statement for the government fertilizer distribution program shown in Table 3.1 reveals that it cost government US\$438 to distribute a tonne of fertilizer to smallholder farmers. Since the price of fertilizer was uniform through out all locations in Zambia, the cost of \$438 was an average cost for the program (the cost items which constituted this total cost estimation are shown in Table 3.1 and additional details are provided as notes to the table). As will be seen in Section 4, to commercially distribute fertilizer to a location in Macha, Choma District in Southern Province, it will cost an estimated \$356 per ton. This comparative analysis of commercial versus government distribution costs shows that government on average spend \$82 per tonne more distributing fertilizer than private sector channels.

The government fertilizer distribution channel is not as efficient as commercial channels. Unless inefficiencies are identified and avoided, continued operation is likely to lead to financial problems for government and generate additional inefficiencies in the channel. The commercial market price in central market locations and along the major transport routes is much lower, for example, the price was \$300/ton at Choma district center and \$320/ton at Chipata district center.

Table 3.1. Government Agro-support Program Income and Expenditure Analysis (Us\$/ton) 1999/2000, Zambia, 2000.

Costs/Gains	Value in US \$/ton
1. Purchases	260
2. Management fees (transport, storage)	57
3. FRA costs (3% of sub-total)	8
4. Debt recovery expenses	35
5. Interest charges (7.8% pa. For 8 months)	13
6. Bank fees	33
7. Agent commission	16
8. Grain bags (@ 32c per unit)	16
9. Total costs	438
Less gains	
10. Recoveries	116
11. Down payments	40
12. Total gains	156
13. Deficit	(282)
<u>Expected payments from farmers</u>	
Government fertilizer	
14. Loan repayment	267
15. Down payment	40
16. Total paid by farmers	307
Private fertilizer	
17. Commercial market price	356

Source: Smith, L.D. et al June 2000 & FRA 2000

Notes

1. Price FRA paid for Urea that was purchased from Omnia Zambia
2. Average fees for handling, storing and transporting a tonne of fertilizer to the farm
3. Overhead costs for FRA at 3% of fertilizer purchase price
4. A fee of 14/ton paid to the agent for each tonne of maize recovered
5. Interest charges at 7.8% p.a. for 8 months
6. Bank fees for securing and processing loan
7. Commission paid to agent for recoveries 4% of fertilizer purchase price (40 -50% recovery)
8. Value of 50 units of 50 kg bags at \$.32 per unit (50 bags required to collect 2.5 tonnes of maize)
9. This is what it cost government to distribute fertilizer to the farm gate
10. About 1.185 billion kwacha and 30645 tonnes of maize were recovered in 2000. These figures were reported by FRA. Using an exchange rate of K3000 = US\$, the cash recovered is equivalent to US\$395 000. The actual maize recovered when valued at \$120 per tonne yields a value of \$3,677,400. So the total value of recoveries is the sum of the cash and in-kind recoveries which is \$4,072,400. Given the volume of 35000tonnes of fertilizer delivered, the average amount recovered is \$116 per ton.
11. A payment of K5000/bag was made by farmers as part of their application for the loan in November 1999
12. Total value of what was realized from the program
13. This value was not recovered but was guaranteed by government
14. Cash payment is K40 000 per 50kg bag or K800 000/ton. Repayments began in June 2000 when exchange rate was at K3000/\$. Therefore, total expected cash payment is K800000/3000 = \$266.67.
15. A payment of K5000/bag was made by farmers as part of their application for the loan in November 1999
16. This is the total costs that farmers incurred to procure fertilizer through the government credit program
17. This is the farm gate price of fertilizer distributed through commercial channels

3.2. Cost Recovery and Sustainability

According to the government fertilizer credit terms in 1999/00, farmers were expected to pay only \$307 per tonne (Table 3.1). Assuming there was 100 per cent loan repayment, this would have implied an unrecovered value of \$131 (\$438 - \$307) per ton. This unrecovered amount is a loss to the program. The level of subsidy payment is the difference between the total cost of fertilizer and the total payments farmers are expected to make. It is no wonder then that government is forced to source fresh money to procure and distribute fertilizer every season. Even with 100 per cent recovery, government will still be required to source money elsewhere. Because the funds do not revolve, the government program has no ability to sustain itself.

From the loans distributed in 1999/00 season, about \$156 per tonne (35 per cent of value loaned) was recovered, Table 3.2. Given the cost of the program at \$438 per ton, \$282 was unrecovered. There are several reasons for this. Primarily, loan recoveries are low. There is a view that the majority of the farmers are delinquent when it comes to repaying loans. On the other hand farmers allege that the government appointed agents do not have any interest in recovering loans. The logistics put in place required that the agent collect maize from farmers. The cost of collecting maize from each individual farmer was insurmountable. As was the case in 1999/00, management fees paid to agents were based on fertilizer distributed and the incentives for recovering loans were largely ineffective. In addition, the government program operated on a Kwacha based account. The depreciation of the Kwacha added to the losses incurred. For example, prices of fertilizer were fixed at K800 000 per tonne in December 1999 but at the time of recovery, the Kwacha had depreciated by 20 per cent and government incurred a loss of \$33 per ton. Reducing the cost of fertilizer distribution and improving loan recoveries are some of the challenges government may have to deal with to sustain operations efficiently.

Table 3.2. Distribution of Fertilizer Loaned in 1999/00 and Recoveries of Maize and Cash by Province, Zambia 2000

Province	Cash recovered (ZK'000)	Cash recovered (US\$)	Maize recovered (tonnes)	Value of maize recovered (US\$)	Total value of loans recovered (US\$)	Amount of fertilizer loaned (tonnes)	Value of fertilizer loaned (US\$)	Loans recovered (%)
	(1)	(2)=(1)/3000	(3)	(4)=(3)*160	(5)=(2)+(4)	(6)	(7)=(6)*438	(8)=(5)*100/(7)
Central	11620	3873	3474.55	555928	559801	7030	3079140	18.2
Copperbelt	127881	42627	983.80	157408	200035	2196	961848	20.8
Eastern	7209	2403	6450	1032000	1034403	8476	3712488	27.9
Lusaka	33241	11080	2391.95	382712	393792	3284	1431824	27.5
Northern	168948	56316	2337.35	373976	430292	3951	1730538	24.9
N-Western	14925	4975	510.35	81656	86631	696	304848	28.4
Southern	813492	271164	12930.75	2068920	2340084	8118	3555684	65.8
Western & Luapula	7277	1567	1567.10	250736	253162	1260	551880	45.9
ZAMBIA	1184594	394865	30645.85	4903336	5298201	35011	15328250	34.5

Source: FRA Personal Communication, 2000

The loan recoveries shown in Table 3.2 reveal that the highest recoveries were recorded in Southern Province. The levels of recoveries in the remaining provinces were not impressive. These differences in loan recovery rates are largely due to the varying quality of program management exhibited by the government appointed agents. In 1999/00, the appointed agent who handled distribution of government fertilizer in Southern Province put in extra modalities and effort to recover government loans. The remaining provinces were handled by only one agent. The ability of a single agent to handle fertilizer distribution and loan recoveries in all these other provinces appeared limited.

The low recovery rate of 34 per cent makes the program less sustainable. Such a low level of recovery makes the program fail to meet the cost of fertilizer, let alone other costs. Ultimately, government as the guarantor, has had to pay all outstanding amounts to financiers and agents. The distribution of 35000 tonnes of government fertilizer in 1999/00 potentially forced government to divert tax revenue amounting to \$9.87 million to cover outstanding payments from the fertilizer loan program. It is this realization that has prompted calls for government to consider options of distributing its stocks in a manner that minimizes costs to the program, increases its effectiveness and phase out the financial burden on government over time.

3.3. Delivery of Right Products at Right Time

The range of fertilizers distributed under the government program was relatively narrow, Table 3.3. Soil tests conducted in several locations in the country show that the availability of P, K and S is not uniform and for a crop, such as, maize, the supplementary nutrient requirements will be different. These differences in nutrient deficiency implies that fertilizer products have to be distributed with regard to differences in soil conditions. In soil fertility evaluations, it is recognized that the application of soil amendments is site specific because of differences in soil properties (Lungu, 1985).

Table 3.3. Range of Products Being Distributed to Smallholder Farmers by Traders, Zambia, 2000

Fertilizer Type	Government	
	# of bags	%
Urea	68271	32.2
Compound D	90071	42.5
Calcium Ammonium Nitrate	15129	7.1
Compound MM	4003	1.9
Compound R	92	0
Ammonium Nitrate	16878	8
Compound X	17273	8.2
Group Total	211717	100

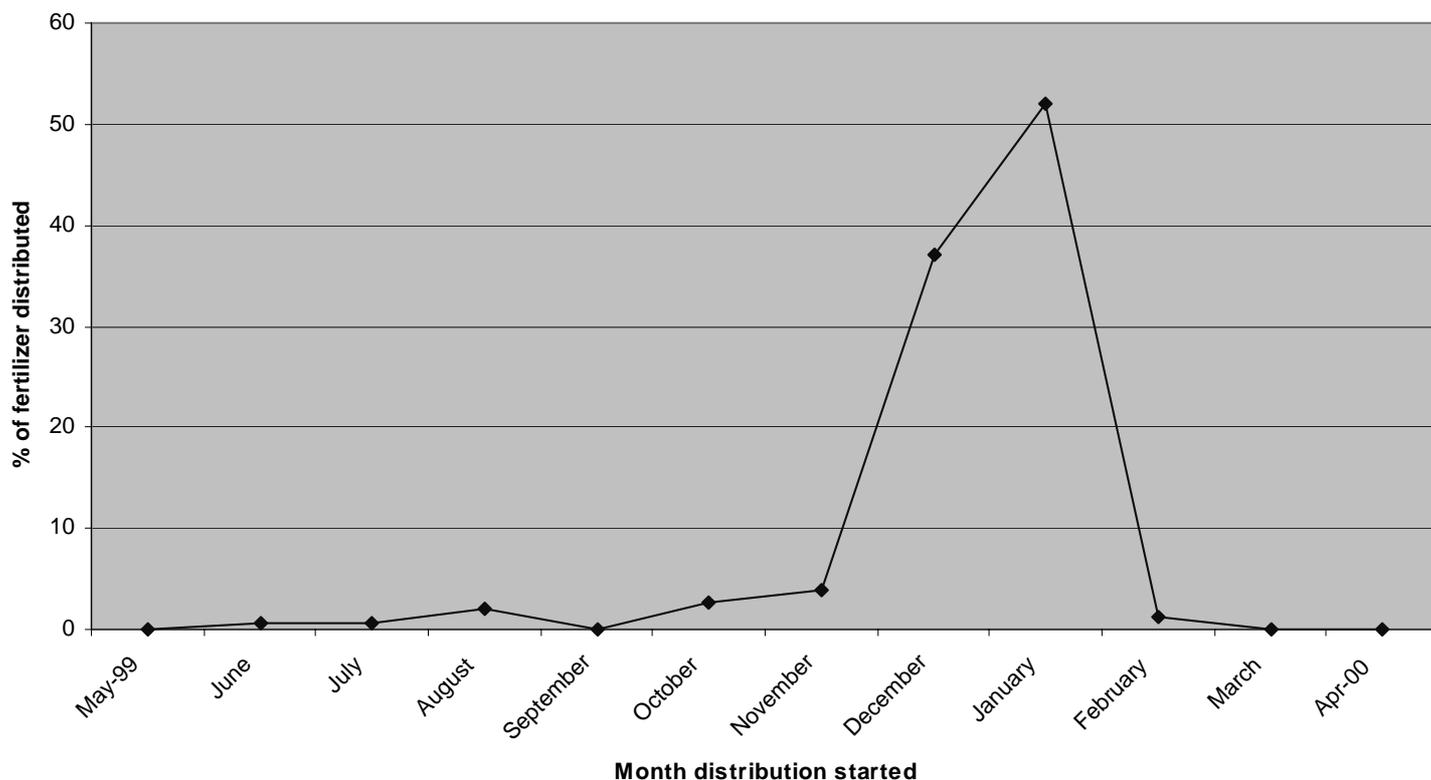
Source: Rapid Appraisal of Fertilizer Traders in Selected Districts, FSRP, Zambia, 2000

About 38% of the total arable land in Zambia belongs to the Oxisols and Ultisols group of soils (Singh, 1985). These soils are characterized by low pH, high Al and Mn, high P fixing capacity, low organic matter and low nutrient retention capacity. Continuous use of chemical fertilizers, particularly nitrogen and sulphur to maintain yields has the effect of lowering pH levels, increasing aluminum toxicities and eventually diminishing soil fertility. It is not clear whether farmers know and understand the benefits of using lime or they understand but cannot access lime from traders. Liming generally shares the most yield limiting soil fertility factor in soils with a history of continuous N fertilization. Despite the high levels of soil acidity in most parts of NR III in Zambia, government fertilizer loan package in this zone does not include lime. The distribution of lime to smallholder areas often costs more than it does to produce it. Despite the availability of locally produced lime in Zambia, commercial marketing of lime is centralized in major towns. Private fertilizer retailers established in smallholder farming areas generally do not stock lime. Ideally, traders need to stock lime or act as agents for lime producers. It is the responsibility of the private sector to educate farmers so that they know and understand why they need to use lime. Private firms should, in collaboration with the public research and extension wings, run demonstrations for smallholder farmers to reduce the information gap. Currently lime use is not popularized. Lime use by farmers is crucial for the growth of the fertilizer industry. Unless lime is introduced in the smallholder farming system, the much anticipated growth in crop productivity cannot be attained or even sustained (Min of Finance et al 1989). Blanket recommendations of fertilizer types and use levels ignoring soil and climatic variations are not only uneconomic, but fail to yield desired results. By promoting fertilizers to smallholder farmers without the complementary lime further reduces the long run productivity of the soil.

In 1999/00, the bulk of government fertilizer was distributed after the rains had started, that is, between November and January, Fig 3.1. The results in Fig 3.1 support claims that delays in getting government fertilizer to farmers before the rains are very common. The late distribution of fertilizer fails to tally with the extension advice on how farmers are expected to apply basal dressing. Therefore, the timing of government's fertilizer distribution may compromise the effectiveness of basal fertilizer applications. Although farmers accept basal fertilizer credit late in December/January, it is not clear what proportion of these farmers proceed to apply it after receiving it late in the season. Farmers planting maize in January may make effective use of basal application but maize planted earlier than January may not benefit from basal applications done in January. The delayed distribution of basal dressing renders the credit package less viable and may even threaten the farmer's ability to repay the loan as farmers cannot derive the full benefits of basal fertilizer application. Late distribution of fertilizer reduces the profitability of its use. In addition, delivering fertilizer late after the season has started is denying smallholder farmers a service.

In a typical year of operation, Government begins in-house negotiations of the procurement and distribution program modalities in March. These negotiations go on until August. Government approves the modalities in August and a tender document for fertilizer procurement is subsequently prepared and advertised in September. By October, contracts are awarded for the supply of fertilizer but the process is delayed by the finalization of funding arrangements which happens in November. Once funding is approved by banks, letters of credit are established and fertilizer is procured and distribution begins in December. Distribution of government fertilizer continues until February. This time line is significantly behind the crop production schedule of farmers which begins in October.

Fig 3.1. Proportion of Government Fertilizer Distributed by Month in Selected Districts of Zambia, 1999/2000



Source: FSRP Rapid Fertilizer Trader Survey, 2000

3.4. Profitability of Fertilizer Use in Zambia

While it is commonly accepted that fertilizer is a crop productivity enhancing technology, its usefulness or its adoption is expected to be non-uniform across sites in Zambia. There are conditions which constrain the effective use of fertilizer under smallholder farming systems. Assessing these conditions is important prior to designing a fertilizer distribution program. This is the subject of the following discussion.

3.4.1. Relative Degree of Fertilizer Use Profitability Across Zambia

The economic feasibility of fertilizer use by smallholder farmers is required first before fertilizer use can be thought to be of benefit to farmers. The relevant questions are whether fertilizer use is profitable and whether smallholder farmers can benefit from this profitability. The profitability of fertilizer use by smallholder farmers need to be assessed to identify circumstances under which its use is absolutely superior to the existing alternatives. Any approach to analyzing fertilizer profitability should look at type of cropping system, types of management practices, availability of resources and the market situation for both inputs and outputs. The belief that fertilizer use is good and should be promoted widely will not work equally in all areas of Zambia. Before the promotion of fertilizer use can begin, its use should be evaluated to determine whether the value of increased

produce generated by fertilizer use justifies the costs incurred and is the best alternative use of scarce resources. The ability of farmers to use fertilizer rests on market demand for the increased output and market supply of the fertilizer. The input and output market conditions differ significantly on smallholder farms spread across the country. Based on market potential and resource endowments, smallholder farmers located in agro-ecologically suitable areas and near major market centers are more likely to take advantage of fertilizer use than resource-poor farmers in remote areas.

Profitability of fertilizer use should be verified through economic analysis of physical response data. Economic analysis should pay attention to identifying the costs and benefits of fertilizer use. The Department of Research, MAFF, has developed fertilizer recommendations for major crops in Zambia. For example, maize general fertilizer recommendation is 200kg Compound D or C and 200kg of Urea per hectare (Donovan, 2002). The profitability of adopting this recommendation is not uniform across the country. The profitability will vary from site to site, from year to year and across different management regimes. An attempt to establish fertilizer profitability is underway and preliminary results indicate that fertilizer use on maize, for example, can be profitable but there are conditions under which fertilizer use can be risky (Donovan, 2002). The critical factors which determine fertilizer profitability are the variability in response rates and the farm gate prices of fertilizer and the output produced.

Response rates are influenced by the variation in soil and rainfall conditions from site to site. The rates obtained from four research stations in Zambia are shown in Table 3.4. Although this is not shown in the table, the same treatment will respond differently in the same location in different seasons. Some locations such as Msekera (Chipata District, Eastern Province) and Mochipapa (Choma District, Southern Province) in Region II have relatively high response rates than other locations such as Mansa (Mansa District, Luapula Province) in Region III. The response rates in Table 3.4 show that variation in response rates exists within the same region. Golden valley had a response rate of 3.5kg of maize for each kilogram of fertilizer applied compared to Msekera which had 10.1kg of maize per kilogram of fertilizer applied. The suitability of these locations to maize production is, therefore, not uniform. Response rates in Region III are relatively lower than those obtained in Region II. The prices of maize and fertilizer are also not uniform in these locations. Maize prices are relatively high in maize deficit locations such as Mansa and prices are lower in maize surplus areas such as Msekera. The price of fertilizer is influenced largely by transportation costs from major warehouses in Lusaka. Locations far from Lusaka such as Msekera have higher fertilizer prices relative to locations near Lusaka such as Golden Valley. The input/output price ratios are shown in Table 3.4. A high fertilizer response rate and a low input/output price ratio will favor fertilizer use.

The value cost ratios in Table 3.4 show that the profitability of fertilizer use is not uniform across these four sites. Use of fertilizer in Msekera yields the highest profit. The rate of return from fertilizer use was 120 per cent. Such a rate of return could allow farmers to recover the cost of capital and give them a risk premium cover. While the use of fertilizer in Golden Valley gave positive net benefits, the return to investment was low. The rate of return of 30 per cent may cover the cost of borrowed money (averaging 28 per cent) but will not provide any returns to management or provide cover against risk. Based on these results, use of fertilizers in Golden Valley appear to be economically less attractive than at Msekera. Use of fertilizer in Mansa at the recommended levels did not appear profitable. The use of fertilizer in Mansa results in the loss of revenue. A value cost ratio less than one indicates that the use of fertilizer gives out less additional value than the cost of the fertilizer used. Use of lower than recommended fertilizer levels may yield positive returns in Mansa. Overall, use of fertilizer in locations that do not give positive net returns and an attractive rate of return will result in non-optimal allocation of resources.

Table 3.4. Profitability Results for Fertilizer Use on Maize in Zambia, 2000/2001

Location	Average Response rate to 400kg/ha	Maize price (K/kg)	Fertilizer price (K/kg)	Input/output ratio	Value cost ratio	Net benefit/cost ratio
Mochipapa	6.3	345	1260	3.65	1.72	0.73
Golden valley	3.5	460	1240	2.70	1.30	0.30
Msekera	10.1	296	1360	4.60	2.20	1.20
Mansa	3.2	414	1360	3.29	0.97	-0.03

Source: Based on data from Donovan et al 2002, forthcoming.

This profitability analysis is a partial indication of the economics of fertilizer use in a few selected areas. Detailed guidelines on how to analyze fertilizer profitability using research trial data are provided in a forthcoming report (FSRP, 2002). Additional work is required in Zambia to evaluate the profitability of fertilizer use on different crops, locations, seasons and management regimes.

3.4.2. Targeting of Government Fertilizer Loans

In the 1999/00 season, 20 per cent of small and medium scale farmers acquired fertilizer. Of these, roughly three-quarters acquired fertilizer from commercial channels, and one-quarter acquired fertilizer through government programs. The private sector was serving more farmers than those served by government in all districts except locations such as Choma and Mazabuka Districts. (see Table A.1 Appendix A). It is not clear whether the private sector has better fertilizer distribution terms making their service attractive to more farmers than those served by government.

Since government programs are designed with the aim of reaching “resource poor” (GRZ 2000), farmers who cannot afford to purchase fertilizer, it would be anticipated that government programs should tend to be targeted toward farmers with relatively low incomes and limited assets who cannot purchase fertilizer from commercial outlets. Table 3.5 compares the attributes of farmers receiving fertilizer through government programs, farmers receiving from private traders on different commercial terms, and farmers not using fertilizer.

Government fertilizer recipients had higher farm incomes and higher total incomes than those who purchased from commercial outlets and especially those who did not use fertilizer. Over 90 per cent of these recipients planted maize in 1999/00. Government program recipients had total household incomes that were more than twice as high as non-users. However, the farmers who used their own cash to purchase fertilizer from commercial outlets had higher off-farm income than other farmers. Access to off-farm income contributes positively to farmers’ ability to purchase inputs on a cash basis. Credit purchase of fertilizer from commercial outlets was dominated by male headed households. It is difficult to identify here the information problems that lead female and male headed households to use commercial credit services unequally. Households who swapped maize for fertilizer had relatively large acreage under maize and the highest net crop income per capita in 1999/00, Table 3.5. These households are largely net-grain sellers. Households not using fertilizer had the lowest household income and lowest crop income per capita. Less than 24 per cent of households who did not use fertilizer planted maize in 1999/00. This group potentially represents households who are net-maize buyers but net sellers of other grains such as cassava. Households not using fertilizer may benefit more from interventions that boosts productivity of crops such as cassava than those that focus on maize. On the surface, these findings might indicate that the government fertilizer loans helped recipient households to achieve higher levels of crop income.

Table 3.5. Small- and Medium Farmer Characteristics by Source of Fertilizer Acquisition, 1999/00

Household attributes	Government fertilizer loan recipients	Private sector fertilizer recipients			Non-users
		Cash purchase	Credit purchase	Fertilizer Maize Exchange	
Count in sample (no.)	306	955	173	70	4890
Weighted Proportion (%) ^a	4.5	9.4	2.4	1.0	82.2 ^a
Land access (ha)	3.43	2.90	2.94	3.08	2.70
Land cropped (ha)	2.40	1.98	1.86	2.09	1.38
Area planted to maize (ha)	1.74	1.34	1.17	1.59	.85
Maize growers (%)	91	81	79	77	24
Purchase maize seed (%)	55	44	49	49	47
Purchase hybrid maize seed (%)	90	85	84	93	60
Education of the household head (years)	7.5	6.5	5.9	5.0	4.8
Female-headed households (%)	9.0	16.0	8.0	16.0	26.0
Civil service employee in household (%)	10.1	11.5	4.4	8.6	2.3
Net crop income (\$)	398	257	307	380	145
Net crop income per capita (\$/capita)	56	45	56	65	30
Net crop income per hectare (\$/hectare)	157	126	123	134	86
Total off-farm income (\$)	260	337	203	131	120
Livestock income (\$)	25	16	14	9	8
Total household income (\$)	683	611	525	521	274

^a Proportions do not add to 100% because roughly 0.5 per cent of the sample received fertilizer from both government and the private sector, and these households were excluded from results in this table; households receiving fertilizer from NGOs and from fellow farmers were also excluded (about 2% of the total sample).

Source: CSO/MAFF/FSRP 1999/00 Post Harvest Supplemental Survey, 2001

However, it was also the case that the recipients of government loans also had access to more land, higher levels of education, and more livestock income than farmers in the other two categories. Government recipients were less likely to be female-headed than non-recipients. These household attributes were not likely to have been influenced by the receipt of government credit, at least in the short run. Moreover, recipients of government loans were five times as likely to have a civil service employee in the household as those who did not use fertilizer. Overall, these findings suggest that government loans are not necessarily reaching the resource-poor households.

The proportion of small and medium scale farmers who use maize hybrid seed in Zambia is under 50 per cent. The majority of small and medium scale maize growers in 1999/00 purchased local seed or planted maize grain meant for consumption. Improved varieties will not only have immediate productivity impact but will make fertilizer use more attractive. The decision to use fertilizer on maize is made easier when hybrid seeds are available for purchase and use.

3.5. Impact of Government Programs on Maize Productivity and Market Efficiency

One of the views that has helped convince government to distribute fertilizer is that it is considered cheaper to import fertilizer than to import grain. This traditional argument is used to support fertilizer subsidies. The additional maize generated from using fertilizer not only averts maize imports but its value is larger than the cost of importing fertilizer. In their analysis, Smith et al (2000) estimated that the program saved the country \$13 million. This result is reviewed in the following sub-section. In addition, the impact of this program on maize marketing in general is also analyzed.

3.5.1. Impacts on Maize Output and Net Savings on Foreign Exchange

The results of fertilizer trials conducted in several research stations in Zambia (Mochipapa, Mansa, Golden Valley and Msekera) over the last 30 or more years show that the maize/fertilizer response ratios are in the range of 3.2 to 10.1 when the recommended amount of 400kg per hectare is applied (Table 3.6). An average response rate of 6.3 obtained in Mochipapa is considered representative of responses obtainable in Region II while an average response rate of 3.2 obtained in Mansa will be considered representative of responses obtainable in Region III (Table 3.4). A response rate of 6.75 is considered by Mt Makulu soil scientist as the national average response rate with optimum management (Smith et al, 2000).

In 1999/00 Government fertilizer was provided in packs of 400kg per ha (i.e., eight 50 kg bags), assumed to be appropriate for use on 1 hectare at recommended application rates. Each household could apply for a maximum of three packs. Hybrid seed was not part of the loan package. Farmers who used recycled or open pollinated varieties, obtained lower yield response. According to 1999/00 PHS data, 77 per cent of the maize seed planted by farmers was hybrid seed. Given this level of hybrid seed use, the average response rate of 6.3 and 3.2 kg of maize per kg of fertilizer applied in Region II and Region III, respectively, was feasible under the weather conditions prevailing in 1999/00 season. Assuming that all the 35 000 tonnes of government fertilizer entered the farm sector and none was re-exported, the incremental maize output as a result of this application is 183 446 tonnes. According to MAFF National Early Warning Unit, 1.31 million tonnes of maize was required for human and industrial use during the 2000/2001 consumption year, therefore, the incremental yield represents 14 per cent of maize required in 2000. In addition, PHS data also reveals that smallholder farmers sold 22 per cent of their maize in 1999/00. This is equivalent to 41 092 tonnes of surplus maize available for urban consumption, stock feeds and other uses. About 34 000 tonnes of maize was actually recovered as loan repayment from the 1999/00 government fertilizer loan program, Table 3.2

Table 3.6. Estimated Financial Impact of the Government 1999/00 Agro-support Program on Maize Production and Foreign Exchange Savings

	Current study		FAO Study
	Agro-ecological zone		Total
	II	III	
Fertilizer product application rate (kg/ha)	400	400	400
Response rate (maize /kg of fertilizer)	6.3	3.2	4.87
Incremental output per ha (ton)	2.515	1.285	1.950
Incremental output per tonne of fertilizer product (ton)	6.300	3.200	4.875
Amount of fertilizer distributed by govt (tonnes)	26610	8403	
Incremental output (ton)	165436	28010	146 000
Share of total national maize requirements for human	12.6	2.1	11.1
Total incremental output		183446	146000
Farm level maize retention (PHS 1999/00)		77.6%	0%
Maize import parity price in Lusaka (\$/ton)		165 ^a	165
Value of incremental surplus (\$ million)		25.66	24.1
Cost of fertilizer program (\$/ton)		438	288
Total costs for 35 000 tonnes of fertilizer product (\$		15.33	8.64
Foreign exchange savings (\$ million)		10.33	15.5

^a a price of \$130 is used to value the stocks that are retained on-farm.

Source: Smith et al, 2000

The total cost of the fertilizer program in 1999/00 was \$16.9 million (35 000 tonnes @ \$438 per ton), Table 3.6. This program averted maize imports to the tune of 43332 tonnes which would have cost the country \$7.15 million (@\$160 per tonne of maize). On-farm reserves had a value of \$18.5 million with a price of \$130 per ton. According to the results shown in Table 3.5, the fertilizer program in 1999/00 was a net foreign exchange saver. In 99/00 neither the government nor the private sector imported maize into Zambia. This result supports the finding by Smith et al in 1999/00 that the government fertilizer program partly saved foreign currency.

3.5.2. Possible Effects of Government Fertilizer Programs on Maize Marketing

Under commercial conditions, the purchase of farming inputs and the sale of commodities are often two distinct transactions that take place at opposite ends of the season. When inputs for maize cultivation are sourced commercially from the private sector, payment is made in cash or in kind, often without the provision of credit from the supplier. Under those commercial conditions, prices of fertilizer and maize each exhibit specific spatial and seasonal variations, reflecting marketing costs and market conditions.

The modalities under which Government distributes fertilizer to smallholder farmers, however, include the application of pan-territorial prices of fertilizer and the provision of seasonal credit. Although farmers are given the option to repay in cash, most farmers opt to repay their loans in

kind, in the form of maize, at pan-territorial maize-fertilizer exchange ratios. Hence, the price of fertilizer determines the price of the maize that is supplied by farmers as loan repayment. What are usually two separate transactions under commercial conditions, input purchase and output sale, now become one transaction.

The fact that government fertilizer pricing in cash and maize in-kind is pan-territorial means that one price for maize is set by government throughout the country, involving quantities of 40,000 metric tonnes of maize (repayment from the 99/00 season). Apart from the effects of pan-territorial pricing of fertilizer, distribution of Government fertilizer has a few other effects on the maize market. The fact that the fertilizer is sold at below-commercial prices introduces an element of subsidy. The effect of this subsidy manifests itself as follows: During the 1999/00 season, recipients of Government fertilizer paid three bags of maize for one bag of fertilizer, while private firms bartered one bag of fertilizer for four bags of maize. This essentially means that Government donates one bag of maize to the smallholder, thereby increasing on-farm retention or sales. At a larger scale, this would obviously increase the rural maize supply situation and would result in lower maize prices in rural areas unless other traders are there to buy maize. Having been paid one bag less than a commercial firm would have been paid, Government has one bag of maize less for onward sale to urban millers. Again, at a larger scale, this would result in less urban supply as compared to a commercial scenario, and a relative price increase, again unless other traders in sufficient numbers were there to soak up the additional retentions in rural areas and market them to urban areas. The above distortions are further amplified when low fertilizer loan repayment rates are taken into account, essentially increasing the level of subsidy.

To illustrate the above, two fertilizer-maize marketing scenarios are presented and compared in Figure B.1 in Appendix B. That of the private sector selling fertilizer for maize, and that of the Government distributing the same amount of fertilizer. The conclusions are as follows:

- Rural maize prices are depressed, and urban prices are higher, compared to what would occur if the Government fertilizer distribution program were not in effect. This could be expected to create greater price spreads between rural and urban markets than they would be without intervention. It is also likely to create disproportionate price changes, due to the fact that rural supply volumes are affected more severely than urban supply volumes. In the example in Figure B.1, under the government program whereby 50% of loans are repaid, rural maize supply is almost tripled as compared to a commercial scenario, while urban maize supply is only reduced by 63%.
- To some extent, one would expect to see the market respond to these greater rural-urban price spreads by coming in and buying in rural areas and then making a profit selling in urban markets. But only if cash was paid. The volume of private sector maize purchases in exchange for fertilizer would clearly be depressed by the less advantageous swap rates that the private sector is offering compared to the government. Farmers may cling to the hope that they may be able to acquire fertilizer from government rather than having to pay more dearly for it from the private sector. Also, using the Agricultural Credit Act, government appears to actively “keep out” private maize traders until loans have been repaid in the form of maize. This reinforces the hypothesis that the Government fertilizer program is not only depressing private sector sales of fertilizer but also private sector purchases of maize (through swaps or in cash).

To reduce market distortion in both the fertilizer and maize markets, it will be important to reduce direct or indirect subsidy levels, and to apply seasonally and spatially differentiated prices, where possible. The value of maize for repayment can be determined by using independent market

information sources in the main fertilizer distribution centers, and can form the basis of fertilizer-maize exchange ratios which would differ from one location to another, possibly even from month to month. This will arguably increase government's administration efforts, but it will de-link maize prices from fertilizer prices and will reduce market distortions, in the maize market.

3.6. Impact of Government Fertilizer Program on Commercial Trading

The involvement of government in fertilizer marketing impacts on the ability of the private sector to deliver fertilizer to smallholder farmers. These impacts were identified both at importation and retail levels of the marketing system. The incidence of the impacts were, however, not uniformly felt by private firms. At the importation stage, we distinguish between “*government suppliers*”, that is, those importers who win the tender to supply government with fertilizer and “*non-suppliers*” who fail to win the supply tender. In this section we discuss how the presence of government in the fertilizer marketing affects importation and retail decisions of commercial traders.

3.6.1 Importation Constraints

In order to determine the amount of fertilizer to import, private firms reported that they use several indicators including historical sales records, rainfall patterns, existing fertilizer stocks in the country, perceived level of competition, level of aggregate demand, estimates of area to be planted and what quantity government intends to handle. While most of the indicators are easy to determine, there are mixed signals on the amount and the timing of the amounts that government is going to import and distribute. Apart from the problems of transparency and logistics, the general timetable of government's involvement in fertilizer marketing is not clearly spelt out and this fuels further uncertainty in the industry. These issues are discussed in detail next.

Transparency

Among some of the constraints fertilizer importers face is lack of knowledge about what government is going to do in each season. When importers are planning to import fertilizer they do not know what government will import and this is a source of risk that adds costs to the business of fertilizer importation. If the importers bring a lot of product and government imports as well, the private firms are likely to get stuck with their products. Whatever government will do is revealed very late after importers have already committed themselves. Although discussions on government fertilizer procurement start in March, government deliberations go on until final decisions are made in December. This waiting causes anxiety and creates confusion in the market. In addition, commercial import decisions are made more difficult and risky by government final decisions which are perceived as inconsistent with official announcements made previously.

During the last three marketing seasons, government has purchased fertilizer locally from stocks brought in for commercial distribution. This practice has led importers to position stocks over and above their commercial volumes within the country anticipating a government supplier contract. In 1999/00, about 43 000 tonnes were procured for government's credit program. The bulk of this volume (24 000 tonnes) was obtained locally from stocks Omnia and Sasol had imported already. About 8 400 tonnes were manufactured locally by NCZ and the remainder were carryover stocks from 1998/99. Government's procurement of fertilizer from local outlets creates additional waves of uncertainty. It's difficult for importers to plan not knowing when you will know if they have won the tender to supply government and what volumes government intend to purchase. This lack of transparency causes unnecessary market uncertainties. The Food Reserve Agency Act of 1995

stipulates dates for which announcements have to be made in the case of farm products. This is not being applied for fertilizer products which the FRA handles.

Logistics

One of the common features of the fertilizer industry in Zambia is delays and late arrival of government imported fertilizer. While fertilizer for commercial transactions is always there where and when it is required, the same is not true for government fertilizer which is distributed on credit. The delays in distributing government fertilizer are partly due to the logistical problems of importing 30 - 40 000 tonnes in less than a month. Fertilizer importers in Zambia do not have the necessary logistics to independently deliver such orders within a limited time period. It is also difficult to secure big volumes from individual manufacturers as they also do not keep such volumes as buffer stocks. There is therefore need for time and hints given to manufacturers to plan ahead and produce some of the fertilizer as they cannot anticipate such volumes of demand. These delays mean that the cost of handling will be higher than normal and the resultant price the nation pays for fertilizer is high. For example, the imports have to be moved in by road rather than rail which is cheaper but takes longer. The process of importing fertilizer could be started early in order to save resources.

Once the fertilizer is in the country, there are additional logistical problems further delaying final distribution. Importers reported that the road infrastructure is in a deplorable state in some areas which result in delayed distribution. Transporters engaged by importers prefer to operate in areas where the roads are well maintained. According to the importer's experiences, the feeder road networks are in bad state during the rainy season. Unless deliveries are made before the rains, it becomes difficult to deliver fertilizer in time.

Private sector perception of policy environment

The view among importers is that the current fertilizer policy environment is not conducive to private sector investment. They indicate that there is no consistency in policy implementation by government. Part of government policy since 1991 has been to allow private firms to enter the fertilizer market but at the same time continue direct government involvement in procuring, distribution and pricing of fertilizer targeted at smallholder farmers. Understandably, the policy decision to have government exit fertilizer marketing at the onset of market reforms was impracticable. Government had, therefore, retained direct involvement in fertilizer marketing since 1991 as part of a transition towards complete private sector involvement. While the private sector acknowledges government involvement in fertilizer marketing, there is uncertainty regarding the length of the transition phase and how involved government will continue to be. The policy strategy government adopted over the last five years is to gradually decrease the volumes that it distributes and engage the private sector in the distribution to boost the latter's capacity. In addition to the uncertain timetable for pulling out, private firms are also concerned that government fertilizer distribution modalities change every year and these changes are not easy to anticipate. Government keeps experimenting with new modalities each year changing both the target groups and the appointed agents. Needed changes can be incorporated as long as this is done in a timely manner. Prior announcement of policy will add transparency even when there are changes. The environment in which the private sector operates can be improved to reduce costs of distribution. A more transparent environment can lead to significant savings in fertilizer distribution costs (see Section 4).

3.6.2. Government's Active Presence in the Smallholder Fertilizer Retail Market

In 1999/00 production season, government was a significant player in the market distributing 35 per cent of the fertilizer that was used by farmers, Table 3.7. By contrast, 63 per cent of the

fertilizer received by farmers in 1999/00 was from private traders (after deducting fertilizer distributed by private firms under government programs). Government fertilizer distribution competes with commercial fertilizer which is distributed by specialized trading firms, out-grower firms and non-government organizations. Specialized trading firms operating supply chains are the main source of commercial fertilizer even the stocks distributed by out-grower firms and NGOs. Out-grower firms provide fertilizer as part of pre-harvest input loans to smallholder farmers growing cotton, tobacco, paprika, coffee and other industrial crops. The distribution channel run by NGOs is organized in the same manner as that of out-growers except that the former assert they provide service at cost while the latter runs a commercial service. Details of marketing costs provided in Section 4 show that NGOs are not necessarily efficient in marketing fertilizer.

About 82 per cent of this fertilizer acquired by farmers from private firms was sold on cash or barter terms; the other 18% was distributed on credit. These findings indicate that smallholder farmers have greater ability to afford fertilizer on a cash basis than is generally acknowledged. In addition, the perception that private fertilizer traders have no capacity to give fertilizer on credit to smallholder farmers is not supported empirically. Outgrower firms supported the production of tobacco and cotton by providing fertilizer on loan as part of their pre-harvest input package. Small and medium scale farmers have an alternative option to procure fertilizer through direct exchange with maize and other crops. Traders are willing to exchange fertilizer with maize to increase volumes of fertilizer sales. The exchange allows traders to increase their profit margins as they collect maize soon after the harvest, store it, and then sell later when prices are at their peak. Exchanging fertilizer with maize is less risky than offering fertilizer on credit.

The distribution of fertilizer by government in 1999/00 was concentrated in Central, Southern and Eastern Provinces, Table 3.7. The dominance of government fertilizer deliveries in Southern Province was unexpected given that this is the gateway for private firm fertilizer coming from South Africa. The bulk of government fertilizer distributed in Southern Province was targeted for Choma, Kalomo, Mazabuka and Monze Districts while in Eastern province, the target was Chipata and Petauke Districts. (Table A.2, Appendix A). Given the level of commercial fertilizer demand in Southern Province, the volume of government fertilizer is clear evidence of serious overlap in delivery of service between government and the private sector. The private sector's share of the market in 1999/00 was greater than that of government in all other provinces. Copperbelt, Central, Northern and Lusaka Provinces have a reliable network of roads and communication infrastructure which is essential for success in commercial transactions. The weaker presence of government fertilizer in Luapula, Western and Northwestern provinces is unexpected as the demand for fertilizer at full cost is limited and few commercial distributors would find these provinces attractive for business.

Table 3.7. Total Fertilizer (Tonnes) Acquired by Small and Medium Scale Farmers by Province and Source, 1999/2000.

Province	Fertilizer transaction channel					Group Total
	FRA Loan	Private sector loans	Commercial exchange	Cash purchases	Gift	
Central	1,461	1,053	988	4,765	174	8,443
Copperbelt	610	258	30	1,920	23	2,843
Eastern	2,473	2,475	2,040	5,743	126	12,859
Luapula	112	16	0	731	25	886
Lusaka	383	30	188	1,245	56	1,903
Northern	3,068	484	55	2,395	150	6,155
N/Western	246	71	21	214	63	617
Southern	8,279	1,005	509	4,063	72	13,931
Western	111	69	0	183	10	375
Total	16,748 (34.8%)	5,465 (11.4%)	3,834 (8.0%)	21,264 (44.3%)	704 (1.5%)	48,017 (100%)

Source: CSO/MAFF/FSRP 1999/00 Post Harvest Supplemental Survey, 2001

The traditional view that government must distribute fertilizer because the private sector will not serve these areas appears to be incorrect, insofar as the private sector does distribute in most areas, and there are only a few districts where the government program operates where commercially-oriented private traders do not. Considering that there was no private sector fertilizer marketing service to smallholder farmers prior to 1991, there has been a remarkable response from private firms as they were able to deliver more than 65 per cent of the fertilizer consumed by smallholder farmers in 1999/00 production season, Table 3.7.

3.6.3. Impacts of General Government Programs on Commercial Fertilizer Trading

There is debate as to whether government programs have stifled private sector participation in distributing fertilizer even though some of these programs actively engage private firms to distribute the fertilizer as seasonal credit. To understand this issue better, traders were classified into two groups. One group “*government agents*” was composed of traders who were appointed by government as agents to distribute government fertilizer alongside their own commercial stocks. The other group had traders who were not involved in distributing government fertilizer and are referred to as “*non-government agents*”. The impacts of government programs on private fertilizer trading business were not uniform depending on whether the trader was a government agent or non government agent. Traders were asked to explain how, if anything, the government fertilizer program positively and negatively affected their business. The traders gave more than one explanation but only the most important explanations are presented in Table 3.8 and 3.9.

Table 3.8. Trader perceptions of the Positive Aspects ^a of Government Programs, Zambia, 2000

Most important positive aspects of government fertilizer programs	Govt. Agents		Non-Govt Agents	
	Count	%	Count	%
Created business opportunities for selected private firms	5	26	3	13
Boosted grain surplus and sales by farmers creating opportunities for grain traders	6	32	3	13
Extended fertilizer delivery service to remote locations	3	16	1	4
No positive aspects	5	26	16	70
Total	19	100	23	100

^a only one effect per firm is reported

Source: Rapid Appraisal of Fertilizer Traders in Selected Districts, FSRP, Zambia, 2000

By designating selected private companies to distribute fertilizer on behalf of the government, the fertilizer program benefits some firms and depresses commercial opportunities for other firms. The un-level playing field accounts for the differences in perception between government agents and non-government agents as identified in Table 3.8. A majority of government agent traders, 74 per cent, stated that the government program created more business for their firm, boosted grain sales by farmers and thus created a market for other firms to buy grain, and the programs allowed them to expand commercial operations into areas they would otherwise not have serviced. By contrast, only 30 per cent of the non-agent traders identified any positive aspects of government fertilizer programs. The most positive impacts non-agent traders cited were similar to those identified by government agents. As mentioned earlier the incidents of these positive impacts is not broad based. Only grain traders and government agents benefit from distribution of government fertilizer. The government fertilizer program extended the frontier of fertilizer use. With the government program, fertilizer products were able to reach sites that private traders would have failed to cover strictly on commercial terms.

Government agents have benefitted immensely in terms of expanding their capacity to engage in commercial fertilizer business. Because the government paid agents a management fee per bag of fertilizer distributed and a recovery fee for collecting maize from farmers, it appears that government agents used these funds to set up satellite depots and other investments that could be used both to implement the government program as well as for their own commercial operations. Government agents have, therefore, incurred very minimal additional costs of operating commercial sales in areas where they have already made the fixed cost investments of communication equipment, labor, and storage facilities to operate the government program. Government agents have been able to extend their service coverage as a result of carrying out the government distribution program. This opportunity also allowed selected private firms a chance to develop a business relationship with their clientele. During the survey, it was observed that when a government agent sends a truck to collect maize under the government program, it could also procure maize for the agent's own commercial enterprise. In this way, it appears that the costs of the agent's commercial operations could to some extent be connected to activities paid for by government for the implementation of the government program. Since some of the agent's costs of

its commercial operations were covered by the government, this gave the government agent a distinct advantage over non government agent fertilizer and maize traders.

The traders were also asked in the survey to indicate the negative impacts of government fertilizer programs on commercial business (Table 3.9). The majority (68%) of the government agents felt that there were no negative impacts of government programs on commercial business. However, the only drawback that other government agents cited was loss of market share due to government programs which distributed fertilizer to farmers who the traders could serve. By contrast, 53 per cent of non-government agents indicated that there were negative aspects of the government programs on commercial fertilizer trading. The loss of customers and market share was the main complaint (25%) that non-government agents noted. The government fertilizer distribution programs partially substituted for cash sales by the private sector in relatively accessible areas. Retailers surveyed indicated that their fertilizer sales dropped during the months in which government fertilizer was being distributed to farmers and commercial sales only picked up during the following marketing season.

Non-government agents felt that they were being driven under because they could not compete on level terms with subsidized government fertilizer and the agents who handled the fertilizer. Non-government agents have to compete aggressively to get customers who have to pay \$49/ton more than what they would pay if they obtained the fertilizer from government and repaid the loan. The full cost price of fertilizer in Macha village in Choma District was \$356 per tonne in 1999/00 yet farmers who obtained government fertilizer on loan were only expected to pay \$307 per tonne (see Section 4.2). Besides this un-level playing field, the selection of one private firm in each region to operate as the sole distributor of government fertilizer created further unfair competition. The selected firm could cross-subsidize its own commercial operations using the government program and gain advantages over other competitors.

Having procured their allotment of fertilizer, government fertilizer recipients off-loaded part of fertilizer to pay for cash advances they may have obtained in order to cover down payments and also to pay for transport from the depot to their farms. Fertilizer which leaked from the government program through various schemes ended up being sold cheaply at public markets. Retailers who acquired their fertilizer at full cost could not compete with this cheap fertilizer. During the survey, we found instances of traders who bought this cheap fertilizer to stock in their shops. Some of the traders who purchased leaked fertilizer felt that government programs started late and this inhibited their chances of getting more of this leaked fertilizer, Table 3.9.

Table 3.9. Trader Perceptions of the Negative Aspects^a of Government Programs, Zambia, 2000

Most important negative aspects of government programs	Govt. Agents		Non-Govt Agents	
	Count	%	Count	%
Lose customers we can service and our market share is depleted	7	32	8	25
Cannot compete on level terms with subsidized FRA fertilizer and the agents who handle the fertilizer	0	0	7	22
Program starts late and we only get few leaking fertilizer for further resale	0	0	2	6
No negative aspects	15	68	15	47
Total	22	100	32	100

^a only one effect per firm is reported

Source: Rapid Appraisal of Fertilizer Traders in Selected Districts, FSRP, Zambia, 2000

The expectation that firms appointed as government agents will grow and develop their commercial business has not been met in its entirety. The experience of Omnia Small Scale in Southern Province in 1999/00 is not only indicative but also an illustration of how the presence of government fertilizer stocks in an area debilitates the capacity of the private sector. After Farmers Friend replaced Omnia Small Scale as the agent in Southern Province in 1999/00, Omnia Small Scale scaled down its commercial operations in the province the same year. The total quantities Omnia was able to sell commercially in Southern Province in 1999/00 were less than half of what it sold the previous year when they operated as a government agent (Table 3.10). The trend in Omnia withdrawal continued even into the 2000/01 season as it downsized its operations in Western, Eastern and Central Provinces after other firms were appointed as government agents in these provinces. It appears that Omnia's operations in the provinces it was withdrawing from were largely sustained by the government business rather than Omnia's commercial operations. The downward trend in maize prices also contributed to low turnover as Omnia failed to continue with maize-fertilizer swaps.

Table 3.10. Distribution of Commercial and Government Fertilizer Stocks (Tonnes) by a Private Firm with and Without Government-agent Contract in Southern Province, Zambia

Source/Production Season	With Agent-Contract (1998/99)	Without Agent-Contract
Commercial	1860	593
Government	7681	8118
Total ^a	9541	8711

^a The figures in this row do not include commercial fertilizer sales made by other private firms

Source: FSRP Interviews with managers of FRA and private firms, 2000

4. SOURCES OF POTENTIAL COST REDUCTION IN FERTILIZER SUPPLIES AND IMPACT ON ENTERPRISE PROFITABILITY

The price that farmers pay for fertilizer is influenced by the organization of fertilizer marketing channels. In this chapter we investigate the potential for reducing costs when importing and distributing fertilizer, and the effect of such cost reductions on farm level fertilizer prices and enterprise profitability.

4.1. Costs of Fertilizer Importation and Distribution

The main cost items incurred by importers when bringing in fertilizer in Zambia are transport, handling at the port and other stages in the system, damages, insurance, warehousing, and thefts. Transport charges are generally on the rise because of increased fuel prices. International transport companies offer a reliable service of trucking imported stocks into Zambia and charge competitive rates. Domestic transportation significantly affects the cost of fertilizer marketing as fuel is taxed up to 60 per cent. Most of the importers do not own warehouses but lease from government and other private owners. Fertilizer handling costs are incurred when traders use laborers to load and off-load trucks. Handling charges are higher in urban centers than in rural areas because of the variation in wages. Products that are channeled through urban centers are likely to incur higher handling costs than products that are routed directly to the farms. Although the product is insured against losses in transit, pilferage at warehouses is typically high. While there are no import duties on fertilizer, there are costs associated with clearing the cargo at border crossings.

This section concentrates on estimating the price structure for Urea imported through Durban and Beira ports from Western Europe in 1999/00 season. Urea is the main top dressing fertilizer product used in Zambia. There are four main routes by which fertilizer can be imported into Zambia: from Dar es Salaam via Nakonde to Lusaka by rail or road; from Beira to Lions Den via Harare by rail and by road to Lusaka via Chirundu; from Durban port via Livingstone to Lusaka by rail or via Chirundu by road; and from Beira port via Tete to Katete and Lusaka by road. Neither of the importers interviewed used the Dar es Salaam port to off-load their shipment despite this route being the shortest for Northern, Luapula and Copperbelt provinces nor the Beira - Tete route despite being the shortest route into Eastern Province. Greater distances from sources of fertilizer generally implies higher procurement costs. However, the economic significance of distance is not simple and direct. Dar es Salaam port may be the closest to Northern Province but not necessarily the most economic route.

Several cost structures will be presented in this section. The presentation will show differences in costs of importing urea fertilizer through Beira port of Mozambique as compared to importing through Durban port of South Africa. Table 4.1 shows estimates of the cost structure for distributing fertilizer originating from Western Europe and imported through Durban port and trucked to Macha farming area in Choma District in Southern Province of Zambia. Table 4.2 shows estimate costs of importing urea fertilizer through Beira port, railed through Harare to Lions Den, bagged and trucked to Mbabala farming areas in Choma District of Southern Province in Zambia. The presentation will also have cost structures depicting the various levels of vertical integration. There are some firms who import, wholesale and then retail fertilizer to farmers through a chain of main and satellite depots. On the other hand, there are other firms who import and then contract agents to retail consignments to farmers. The route for which cost estimation is performed will also include channels which involve out-grower firms and NGOs operating farmer agro-support programs. Detailed tables showing the individual cost items are shown in Appendix C.

4.1.1. Importing via Durban Port

Fertilizer importers with parent companies in South Africa use the Livingstone rail line and the road route via Chirundu. While the rail route from Durban to Lusaka cost less (\$70/tonne) than the road route (\$90/tonne), the duration of the former route is about two months and about 20 per cent of the cargo is lost to pilferage. Rail transport is traditionally the most efficient long distance carrier, but in this case it is not the most economic. The prolonged period of delivery is caused by inadequate capacity of the Zimbabwe Railways to move all of the rolling stock from South Africa in one trip. For example, thirty wagons may be dispatched from South Africa but once in Zimbabwe, ten wagons will be delivered on each occasion because of the limited capacity of the Zimbabwe engines. The rail route is used when large supplies are transported but are not required immediately. If the importer knows well ahead of time what quantity they require, the rail route is preferred. Often, importers establish the quantities they need to import late and they are then forced to use trucks which are more expensive but faster than the rail route. A truck loaded in Durban will take a maximum of ten days to arrive in Lusaka. The bulk of the time is spent at border crossings. Despite Beira port being physically closer to Lusaka, the bulk of the product imported from the Middle East is handled at Durban port. There is a preference for Durban because of congestion at Beira and the discrimination that Zambian cargo faces versus Zimbabwean cargo. Zimbabwean cargo is given priority ahead of Zambian cargo and this causes delays and extra costs for the importers.

The standard case of cost estimation considers a fertilizer order shipped from W. Europe into Durban port and then transported by road to a warehouse in Lusaka, re-shipped to a regional depot in Choma and moved finally to a satellite retail outlet in Macha. The cost are estimates provided by fertilizer importers. The distribution costs are the actual costs faced and the retail prices were the actual ones charged. The farm gate price shown in Table 4.1 is the 1999/00 estimated retail price plus the average reported cost of transport from the retail outlet to a smallholder farm. A detailed cost estimation is presented in Table C1 in Appendix C.

According to the estimation in Table 4.1, the FOB acquisition cost represent slightly over one quarter of the present farm gate price. The CIF cost of Urea delivered to Durban is 37 per cent of the farm gate price in Zambia, Table 4.1. Ocean transport is a relatively inexpensive cost item especially if the individual order or total shipment is large. The cost of bagged fertilizer, free-on-truck Durban, is about 45 per cent of the farm gate price. Road transport from Durban to Lusaka is a major cost item, equivalent to about 25 per cent of the farm gate price. Fertilizer importers incur a cost of finance equivalent to one per cent of the wholesale price per month for the entire period for which the product is in transit and in storage. Assuming a 90 day storage period, the cost will be about US\$7.50 which is about two per cent of the final farm gate price (row 11). After adding to the road transport cost, clearing and documentation charges, bank charges, handling costs and damages, the estimated delivered cost to a Lusaka warehouse is \$269 which represents about 81% of the farm gate price. The cost into Lusaka is relatively higher than the cost of urea into neighboring Lilongwe, Malawi, estimated at US\$220 per tonne (Westlake, 1999). The major cost difference is in road transport cost. The Beira- Lilongwe route is US\$55 per tonne compared with \$90 per tonne for the Durban - Lusaka route. Despite allegations that Lusaka CIF prices carry higher margins, the transport cost is responsible for the difference in prices. The cost of domestic transport is relatively significant, accounting for about 8.4% of the final farm gate price (Table 4.1).

The distribution margins shown in Table 4.1 for both wholesale and retail levels were derived from the difference in estimated prices (based on the sum of costs) with observed prices in the particular area between October to December 1999. The margins are derived as balancing items in the

estimation and do not reflect the actual margins wholesalers and retailers made during 1999/00. The margins at the wholesale level are low at \$28/ton or 10.6 per cent but retail margins had a mark up of 17.6 per cent. Wholesale margins fail to completely cover transfer costs. This is not surprising since the ownership title of the fertilizer in this channel only changes at the point of delivery to the farmer. The retailer in Macha, the distributor in Choma and the Lusaka importer are all part of one firm. If stocks for the Choma distributor are ordered and delivered directly from South Africa, the margins are likely to change. The simulation of distribution costs with limited reshipment is discussed below.

Table 4.1. Estimated Price Structure for Urea Imported Through Durban and Beira Ports, into Zambia 1999/2000

	Imported via Durban Port		Imported via Beira port	
	US\$/ton	% of Farm Price	US\$/ton	% of Farm Price
1. FOB Western Europe ports, bulk	100	28.1	90	25.2
2. Ocean transport & insurance to port	33.3	9.3	27.5	7.7
3. CIF port (rows 1+2+3)	133.3	37.4	117.5	33.0
4. Port Charges, bags, bagging and handling	27.5	7.7	29.5	8.3
5. FOT port (rows 4 to 7)	160.8	45.2	147.0	41.2
6. Road Transport port - Lusaka	90	25.3	50.0	14.0
7. CIF Lusaka (rows 8+9)	250.8	70.4	197.0	55.2
8. Bank charges, customs, handling & losses	17	4.8	13.2	3.7
9. Cost into Lusaka Warehouse (rows 7 & 8)	267.8	75.2	210.2	58.9
10. Transport costs to Distributor in Choma	17.0	4.8	18.7	5.3
11. Handling, interest, storage, labor, losses	14.4	4.0	28.3	7.9
12. Cost into Distributor (Rows 15 to 21)	299.2	84.0	257.2	72.1
13. Distributor's margin (Row 15 minus Row 9)	28.3	7.9	69.8	19.6
14. Distributor's % Mark - Up [$100(\text{Row}15-9)/9$]	10.6		33.2	
15. Distributor's Observed Price	296.1	83.2	280.0	78.5
16. Transport costs to Retailer in Macha	12.8	3.6	4.0	1.1
17. Handling , interest, storage, labor, losses	10.2	2.9	29.0	8.1
18. Costs into Retailer (Rows 24 to 30)	319.1	89.8	313.0	97.8
19. Retailer's margin (Row 21 minus Row 15)	52	14.6	68.6	19.2
20. Retailer's % Mark-Up [$100(\text{Row}21-15)/15$]	17.6		24.5	
21. Retail Observed Price	348.0	97.8	348.6	97.8
22. Transport to farm	8.0	2.2	8.0	2.2
23. Farm Gate Price	356.0	100.0	356.6	100

Rate of Exchange Oct 1999: ZK/US\$ = 2500

Source: Rapid Appraisal of Fertilizer Traders in Selected Districts, FSRP, Zambia, 2000

4.1.2. Importing via Beira Port

While South African based firms utilize the port of Durban to handle urea imports, other firms utilize the port of Beira as a transit point for fertilizer imports to Zambia. Table 4.1 column 4 shows the estimation of the cost structure of importing fertilizer using this route.

A detailed presentation showing high and low costs is presented in Table C2 in Appendix C. The cost items which importers can get a bargain include the free-on-board price at source, the ocean transport to Beira, port charges, customs clearing and documentation and management costs.

The f.o.b. price that importers pay to producers is a function of the individual size of the order. Firms with market outlets in several countries in the region are able to bulk all country specific orders into one and this can earn the importer a purchase discount from the fertilizer producers. In 1999 FOB prices ranged between \$90 - 105 per ton. Shipping rate concessions are made for individual shipments above certain size limits. Larger shippers have carriers adjusting schedules and service more often than small shippers. The ocean transport costs to Beira can also vary depending on whether tramp vessels or US liners are used. Tramp vessels are cheaper but risky unlike liners which are still strong. Ocean transport rates can vary between \$25 and \$30 per ton.

Port charges at Beira are also not fixed. The charges are a function of the tonnage being handled and how busy the port is. Huge tonnage attract lower per unit charges. When the port is busy especially when handling emergence cargo for Zimbabwean such as oil or relief food, port charges are raised. Port charges are in the range of \$15 to \$20 per ton. Transport charges from Lions Den to Lusaka also vary within a range of \$25 - 28 per ton. Transport rates will vary according to the outlook situation for Zimbabwean trucks and the direction traffic is flowing. When the demand for haulage in one direction is high, the rates will also be high in that direction and vice-versa. The total effect of all these possible rate concessions is shown in Table C2 in Appendix C. The cost difference between the low and high cost estimate is about \$35 per tonne (row 24). These cost savings can be realized from purchase of fertilizer from the manufacturer up to the distributor/wholesale stage. Beyond this stage, the management cost can vary between \$4 - \$8 per tonne depending on which area the operations are conducted. Locations near urban centers have relatively high demand for labor and warehouse space than remote locations and management costs in the former locations will be higher than the latter.

The two cost structures presented in Table 4.1 have interesting similarities. While the cost structure at the retail stage between the two firms are the same (row 18) the cost at the wholesale stage are different. If the firm importing through Beira adopts the high cost structure, the cost to the distributor will be somewhat similar but there are potentially large differences if the importer adopts the low cost structure. An important observation is that, while importers may obtain price discounts for costs incurred up to the retail stage, it does not necessarily follow that such benefits will be passed on to farmers. Despite the firms having different delivery routes, the farm gate prices shown in Table 4.1 are the same. The two firms in 1999/00 season were charging the same retail prices in the two areas of Choma District even when faced with different cost estimates. This stickiness in prices is expected in an oligopoly market as discussed in Section 5.

Cost-build-up estimates were also developed for an importer who distributes fertilizer to farmers through agents. Agents handle fertilizer on a consignee basis. This means that the incidence of costs of handling fertilizer is different from that involving a trader who purchases the products for further resale. As shown in Table 4.2, payment of bank charges is not handled by the agent but the principal supplier. Therefore, the liabilities incurred by an agent are somewhat less than liabilities faced by independent traders. The channel described in Table 4.2 involves an agent importing fertilizer from the principal supplier in Johannesburg, South Africa.

Table 4.2. Estimated Price (US\$/ton) Structure for Urea Imported from Johannesburg Warehouses for Out-grower Firms in Chipata District, Zambia, April 1999.

	NGO procured for cash but retailed on credit		Outgrower procured on credit & retailed on credit	
	US\$/ton	% of farm gate	US\$/ton	% of farm gate
1. FOT Johannesburg	198	42.1	198	49.5
2. Road transport Johannesburg to Lusaka	80	17.0	80	20.0
3. CIF Chipata (rows 1+2)	278	59.1	278	2.8
4. Bank charges	0	0.0	0	6.0
5. Customs clearing and documentation	5	1.1	5	4.0
6. Handling off trucks	0.5	0.1	0.5	298.3
7. Damages and losses	2	0.4	2	42.5
8. Cost into Chipata Warehouse (rows 3 to 7)	285.5	60.7	285.5	14.9
9. Losses	2.8	0.6	2.8	328.0
10. Storage Costs	6.0	1.3	6.0	1.5
11. Labor, security, utilities	4.0	0.9	4.0	1.0
12. Cost into Distributor (rows 8 to 11)	298.3	63.4	298.3	74.6
13. Distributor's margin (row 15 less 8)	42.5	9.0	63.5	15.9
14. Distributor's % mark-up (row 13*100/row 8)	14.9		22.2	
15. Distributor's observed price	328.0	69.7	349	87.3
16. Transport to Vizege	0.0	0.0	11.2	2.8
17. Handling	19.7	4.2	1.3	0.3
18. Interest Charges	108.2	23.0	7.2	1.8
19. Losses	6.6	1.4	3.4	0.9
20. Storage Costs	0.0	0.0	3.5	0.9
21. Labour, security, utilities	0.0	0.0	2.5	0.6
22. Costs into retailer (rows 15 to 21)	462.5	98.3	378.1	94.5
23. Retailer's margin (row 26 less row 15)	134.5	28.6	43.0	10.8
25. Out grower's % mark-up (row 23*100/row15)	41.0		12.3	
26. Out-grower Observed price	462.5	98.3	392	98.0
27. Transport Cost to farm	8.0	1.7	8	2.0
28. Farm Gate Price	470.5	100.0	400.0	100.0

Source: Rapid Appraisal of Fertilizer Traders in Selected Districts, FSRP, Zambia, 2000

On arrival in Chipata, the fertilizer is distributed to an out-grower firm and an NGO operating a farmer support scheme who further distribute the fertilizer to farmers. Fig D2 in Appendix D shows the fertilizer flow diagram involving these market participants. The case presented in Table 4.2 shows an NGO receiving fertilizer on cash terms from a fertilizer importer and the NGO retailing fertilizer on credit. The second situation has the importer wholesaling fertilizer to an out-grower firm on credit and the out-grower retailing it on credit to farmers. The cash price the NGO paid was \$328/ton while the loan price offered to the out-grower firm is \$349 per tonne (row 15).

While the out-grower firms assert that they distribute fertilizer on cost to farmers, Table 4.2 shows this not to be the case. Out-grower firms charged a price with a 12 per cent mark up. The price observed covered more than the cost of distributing fertilizer. The NGO were charging farmers

relatively high prices. In all the channels analyzed, fertilizer distributed by the NGO concerned was the most expensive. The main factor contributing to this high fertilizer price was the interest charges. The NGO slapped a 33 per cent interest charge, 6 per cent administration charge and 2 per cent risk fee charge. Fertilizer procured at a price of \$328 per tonne attracted an extra charge of \$134.5 to cover interest, administration and a risk fee. It was not clear whether farmers were able to recoup these extra costs on fertilizer from services provided by this NGO. Without there being any other benefit to farmers from this NGOs services, the fertilizer delivery service does not appear competitive for farmers. NGOs which are in the business of handling fertilizer are not necessarily efficient at doing this. Farmers are burdened unnecessarily by being asked to pay for administrative inefficiencies.

4.2. Reducing Price of Fertilizer at the Farm Gate

The bulk of fertilizer imported into Zambia passes through Lusaka first before it is dispatched to retail outlets in all other provinces. This type of operation forces the fertilizer industry into double handling or reshipment of the product. Double handling adds costs in terms of additional transport, drop-off and pick-ups, damage and pilferage. Table 4.3 simulates the cost build-up for two scenarios depicting reduction of reshipment and reduction of fuel tax. If the product is off loaded first in Lusaka and picked up and moved to a regional depot and then moved to a satellite depot, the additional cost of the handling and transport alone can amount to 12 per cent of the final price.

The first reshipment scenario shows fertilizer trucked directly from Durban to the transit regional depot and then finally to a retail outlet. When the distribution follows this channel, the distributor in Choma will receive the order at the same price as that of orders received in Lusaka, that is, ZK33 475 per bag. The total costs to the distributor are reduced by ZK2 250 per bag, Table 4.3. The implication of this result is that distributors can reduce transfer costs if they are able to import and have their order delivered directly to their warehouse.

The other scenario eliminates reshipment completely by trucking the load from Durban directly to the retail outlet. This routing eliminates the role of the wholesaler. The retailer can receive his order at the same price as orders received in Lusaka, that is, ZK33 475 per bag, Table 4.3. If retail margins are kept constant at ZK3 866 per bag, the final retail price would be ZK38 243 per bag which represents a saving of ZK 5 258 per bag (US\$42 per tonne) to the farmer.

There are several reasons why fertilizer firms are involved in reshipment. The main challenge fertilizer firms have is in estimating the demand schedule for these locations prior to the onset of the season. Carryover stocks in relatively remote areas create high costs. The amount of fertilizer that private firms can sell in a given location is largely a function of what the government is going to supply there. Government's actual supply is not known until well after the rains have started given the problems government faces in securing finance. The presence of government in the market has a major influence on the amount of double handling private firms endure.

The other reason for double handling stocks is that the feeder roads leading to the ultimate retail outlets generally cannot accommodate trucks with cargo weighing more than ten tonnes. A 30 tonne load has to be split up into three batches and hauled by smaller trucks and this ultimately increases the cost of fertilizer to the farmer.

Table 4.3. Estimated Price Structure (Zk/bag) for Urea Imported Through Durban, into Zambia Simulating Reduction in Fuel Tax and Elimination of Reshipment, 1999/2000

	Reshipment	67 % cut in Fuel Tax	Partial Reshipment	No Reshipment
1. FOB Western Europe ports, bulk	12500	12500	12500	12500
2. Ocean transport and insurance to port	4163	4163	4163	4163
4. CIF Durban (rows 1+2+3)	16663	16663	16663	16663
5. Port Charges, bags, bagging and handling	3438	3438	3438	3438
8. FOT Durban (rows 4 to 7)	20100	20100	20100	20100
9. Road Transport Durban - Lusaka	11250	11250	11250	11250
10. CIF Lusaka (rows 8+9)	31350	31350	31350	31350
11. Bank charges, customs, handling & losses	2126	2126	2126	2126
15. Cost into Lusaka Warehouse (rows 10 to 14)	33475	33475	33475	33475
16. Transport costs to Distributor in Choma	2130	1940	0	0
17. Handling, interest, storage, labor, losses	1794	1794	1674	0
22. Cost into Distributor (Rows 15 to 21)	37400	37210	35150	0
23. Distributor's margin (Row 25 minus Row 15)	3537	3537	3537	0
24. Distributor's % Mark - Up $[(25-15)*100/15]$	10.6	10.6	10.6	0
25. Distributor's Observed Price	37012	37012	37012	33475
26. Transport costs to Retailer in Macha	1600	1456	1600	0
27. Handling, interest, storage, labor, losses	1020	1020	1020	1020
32. Costs into Retailer (Rows 24 to 30)	39633	39490	39633	34376
33. Retailer's margin (Row 35 minus Row 25)	6488	6488	6488	10025
34. Retailer's % Mark-Up $[(Row35-25)*100/Row 25]$	17.6	17.6	17.6	29.9
35. Retail Observed Price	43500	43500	43500	43500
36. Cost to farm	1000	1000	1000	1000
37. Farm Gate Price	44500	44500	44500	44500

Rate of Exchange Oct 1999: ZK/US\$ = 2500

Source: Rapid Appraisal of Fertilizer Traders in Selected Districts, FSRP, Zambia, 2000

Double-handling adds significant costs to the farm gate price as compared to a scenario when the product is transported directly to the rural outlet. To the extent that fertilizer importers and retailers can estimate the demand in their respective areas of operation and rural feeder roads are developed and maintained, the potential savings to farmers are significant. Importers who are vertically integrated downstream are likely to achieve such savings by routing their product directly to the retail outlet. Companies which operate with independent agents, wholesalers and retailers can route the product directly to the agent, wholesaler or retailer but this requires advance coordination between importer/wholesalers and retailers.

Table 4.4 is a transport cost schedule for selected districts in Zambia. A farmer can order fertilizer from a Lusaka warehouse but if the farmer is not in a hurry to have his order delivered, they can order directly from South Africa. The charges shown in the second column are administered on all stocks ordered from Lusaka warehouse. Charges shown in the third column are the additional costs to the c.i.f. Lusaka price for an order to be delivered. For example, farmers in Chisamba can save themselves US\$5 per tonne if there were to order fertilizer directly from South Africa than from Lusaka. The importer can pass this saving to the client because the importer does not have to

handle the order as it is loaded in South Africa and delivered straight to the farm in Chisamba. Most importantly, a client can access these savings if they are prepared to order full truck loads amounting to 28 tonnes. The difference in column 2 and 3 reflect the potential savings a farmer can get by ordering directly from South Africa. The savings are greater for locations along the transport route such as Livingstone, Kalomo, Choma, Monze and Mazabuka. For the districts along the transport route, there is no additional charge beyond the CIF Lusaka price. However, districts along the transport route beyond Lusaka are expected to pay an extra transport charge.

Table 4.4. Additional Transport Costs (Us\$/ton) for Fertilizer Deliveries from Lusaka, Zambia, 2001

District	From Lusaka warehouse	Additional costs from Lusaka for deliveries from South Africa	Additional costs from Lusaka for deliveries from Zimbabwe
Chisamba	8	3	5
Kabwe	14	5	10
Kapiri	15	10	15
Mumbwa	18	10	18
Mkushi	25	12	20
Mpongwe	25	12	20
Ndola	25	15	20
Serenje	32	18	23
Mazabuka	12	0	0
Monze	14	0	6
Choma	20	0	10
Kalomo	25	0	15
Livingstone	35	0	30

Source: Fertilizer Importer, 2001

A second potential way to reduce farm-gate fertilizer prices involves reduction of fuel costs. The distances between the central warehouses in Lusaka and the retail outlets are as long as 300km and stocks have to be delivered to the retailer in small loads. At an estimated average transport cost of ZK150/t/km, this gives a cost of transport per tonne of ZK 45 000 equivalent to US\$18.00. If the road is in bad condition, the transport rate increases to ZK185/t/km which translate to ZK55 500 per ton. About 36 per cent of this transport charge is fuel (Personal communication with transporter, 2001). Retail diesel prices in Zambia are the highest in the region largely because the retail price has a 60 per cent tax component. In the case considered in Table 4.3, reducing diesel tax from 60 to 20 per cent resulted in a saving of ZK334 per bag. While the price reduction as a result of decline in fuel tax is marginal, the elimination of this tax and accompanying investment in good roads can reduce the price of fertilizer farmers pay and add an incentive to distant farming areas to increase the demand for fertilizer.

During the rapid appraisal survey, fertilizer traders were asked to suggest changes in fertilizer marketing system that could reduce the cost of fertilizer to farmers. Their suggestions are shown in Table 4.5. The main suggestion (33%) was to allow entry of more traders in the industry and avoid giving monopolies to a few selected traders for distribution of government fertilizer. This is

particularly relevant at the retail stage of the market. As expected, 38 per cent of non government agent traders identified this constraint as opposed to only 16 per cent of government agents.

About 22 per cent of the traders suggested that government should subsidize energy tariffs and scrap duties on imported raw materials required in local manufacture of fertilizer. Traders recognize that the current energy source used by NCZ makes its products expensive relative to imports. Besides, imported raw materials attract customs duty of about 15 per cent while finished fertilizer product imports are zero rated. Other suggestions were: government should eliminate the tax on diesel (13%); fertilizer supplies should be delivered to the villages rather than off-loaded only at central places (9%); the performance of commodity markets should improve (9%); and government should subsidize fertilizer in general and discontinue the fertilizer credit program (9%).

Table 4.5. Ranking of Major Suggestions by Traders on How to Improve Fertilizer Marketing in Zambia, 1999/00

Major Suggestions to Improve Marketing	Govt. Agents	Non-Govt. Agents	Total	
	Rank	Rank	Rank	Col %
Allow entry of as many traders of different sizes in government program	2	1	1	31
Subsidize energy tariffs and scrap import duty on materials imported for local production	1	2	2	22
Deliver product close to villages	6	3	4	9
Improve performance of output markets	2	6	4	9
Offer a blanket subsidy for fertilizer as a way to discontinue govt loans	6	3	4	9
Remove fuel taxes	2	3	3	13
Stabilize the exchange rate	5	8	7	5
Reduce demand by encouraging adoption of organic fertilizers	0	6	8	4
TOTAL	18	37	55	100

Source: Rapid Appraisal of Fertilizer Traders in Selected Districts, FSRP, Zambia, 2000

4.3. Fertilizer Price Reduction and Enterprise Profitability

The enterprise budget in Table 4.6 shows that fertilizer comprises about 54 per cent of the variable costs incurred in maize production. Maize enterprise profitability is likely to be influenced by the price of fertilizer especially in those production areas distant from major market centers. Efficient marketing of fertilizer, therefore, has potential to reduce the costs of maize production through reduction in the farm gate price of fertilizer. The gross margin on maize production in 2000/01 season was K30 448 per hectare. The returns to maize production were relatively low compared to returns of crops such as groundnuts and soyabean which had gross margins of K1 472 256 and K397 105, respectively (ZNFU, 2001). Reduction in the cost of fertilizer through efficient marketing and distribution improves the profitability of maize production crop enterprises which utilizes fertilizer as a major input. A crop budget simulation was developed for maize using prices obtaining under more efficient market conditions (Table 4.6). The original cost analysis was developed by the Zambia National Farmer's Union and the details used in this study are for illustrative purposes only.

Under the market conditions prevailing in 2000/01 production season, urea and compound D fertilizers were priced at K62 000 and K60 000, respectively at the market center. The cost analysis gave a gross margin value of K30 448. This represents a rate of return of 3 per cent to every Kwacha invested in variable cost. This is an unattractive enterprise because the capital interest rate is at 28 per cent.

Table 4.6. Simulating the Impact of a Fertilizer Price Reduction on the Profitability of Maize Production for Smallholder Farmers, Zambia, 2001

Inputs	Unit cost (ZK/ha)	Unit (kg)	Rate per ha	Total cost	12% fall in fertilizer cost with direct shipment
Seed	45000	10	10	45000	45000
Fertilizers					
Compound D	60000	50	200	240000	216800
Urea	62000	50	200	248000	218700
Labor	3200	labor-day	22	70400	70400
Transport					
fertilizer	5000	50	8	40000	40000
maize	5000	90	35	175000	175000
Packaging	2500	90kg bag	35	87500	87500
Variable costs				905900	853400
Interest @ 28% p.a.				253652	238952
Total variable costs				1159552	1092352
Gross income	34000	90kg bag	35	1190000	1190000
Gross margin				30448	97648
Rate of return				.03	.11

Source: Adapted from "Farm Enterprise Cost Analysis", Zambia National Farmers Union, 2001

Simulating the maize enterprise budget with a 12 per cent reduction in fertilizer price due to total elimination of reshipment of stocks from one depot to the next has the effect of increasing the gross margin per hectare by more than three-fold. The rate of return to variable cost expenditure rose to

11 per cent. Although the new rate of return is below the cost of capital, improving the efficiency of fertilizer marketing improves maize enterprise profitability. The reduction in prices is likely to encourage intensive use of fertilizer and boost maize productivity further increasing the gross margins and net returns.

5. PERFORMANCE OF COMMERCIAL FERTILIZER MARKETING CHANNELS

Ten years after being allowed entry in the fertilizer market, both foreign and domestic private sector investment in the fertilizer industry has grown in leaps and bounds. Fertilizer distribution networks have been developed to serve large scale commercial and smallholder farmers. At present, all the needs of large scale commercial farmers are met by the private sector. The organization of the private sector's fertilizer distribution service in the smallholder sector is discussed next.

5.1. Profile of Fertilizer Suppliers

The market structure of fertilizer importers is an oligopoly. Only four firms import all the fertilizer required in Zambia, that is, Omnia, Sasol, Farmer's Friend and Norsk Hydro. All these firms have manufacturing plants in South Africa except for Farmer's Friend. Apart from these multi-national firms, farmers, agents and other firms such as International Commodity Holdings (ICH) also import fertilizer into Zambia. Of all these independent channels, only two supply more than two thirds of seasonal requirements. With such a degree of concentration in the market, the two large firms are the market leaders in the industry. It is often argued that oligopolies emerge in industries whose production methods require large capital investment (FAO 1999). Fertilizer production is indeed highly capital intensive. The benefit or harm of having only a small number of fertilizer importers to supply Zambia is debatable.

In Zambia, fertilizer importers operate a comprehensive type of vertical integration which includes stages of raw material processing to the completion and distribution of the final product. There are three commercial supply chains in Zambia that are run by Omnia, Sasol and Farmer's Friend. Farmer's Friend does not carry out production but does blending of different fertilizer products. Sasol's supply chain has loosely integrated retail networks. It is not clear whether these firms are carrying out these operations more efficiently than would be the case if a number of individual firms each handled one stage of the market chain. The traditional argument is that when technologically complementary processes can be brought together under a single firm or group of firms, there may be a resultant gain in efficiency resulting from improved coordination of output rates at various production stages (Marion 1976). Vertical integration may also eliminate substantial shipping costs and payments to middlemen.

Brief profiles of the main fertilizer suppliers are presented next.

5.1.1. *Omnia Small Scale Zambia Limited*

Omnia's marketing operations in Zambia are done under Omnia Fertilizer Zambia Limited and Omnia Small Scale Zambia Limited registered in 1994 and 1996, respectively. These two companies are wholly owned subsidiaries of Omnia Holdings South Africa whose core business is fertilizer production and marketing. Omnia Holdings South Africa exports its products to several countries in Africa including Malawi, Mozambique, Madagascar, Botswana, Kenya, Tanzania and Lesotho. Omnia is also established in Kenya (Omnia Kenya) and in Zimbabwe (Omnia Zimbabwe). In addition, Omnia operates a bulk blending factory in Zimbabwe and this factory supplies other fertilizer products to Zambia.

About 60 per cent of Omnia's sales in 1999/00 were to commercial farmers. The proportion of fertilizer distributed to smallholder farmers has increased in each of the last five years. Omnia Zambia started a pilot fertilizer distribution project in 1996 in which it distributed fertilizer to smallholder farmers in Lusaka and Central Provinces in exchange for maize and other crops. This

was after the realization that smallholder demand for fertilizer was limited by liquidity shortages. Because of the success of this pilot project, Omnia Small Scale was formed in 1997 as a wholly owned subsidiary of Omnia Zambia. Omnia Small Scale Zambia supplies fertilizer to smallholder farmers through a country wide network of about 150 depots. Despite the potentially high overhead costs of operating own retail networks, the model overcomes the problem of recouping credit from would-be agents. There is no further expansion of depots beyond the network that exist unless low cost operating business agents can be incorporated to extend the service to outlying areas. Omnia Small Scale also wholesale fertilizer to independent retailers, NGOs and out-grower firms. Omnia Small Scale buys groundnuts, soybeans and sunflower for resale. Omnia Small Scale has alliances with Zamseed, Pannar, and Seed Co to distribute hybrid maize seed. An estimated 60 per cent of the value of Omnia Small Scale's business turnover is from fertilizer trading.

In the last three years, Omnia was contracted by the Food Reserve Agency to supply fertilizer, administer a fertilizer credit scheme and recover the credit through collection of maize. As of September 2000, 60 per cent of Omnia Small Scale's activities were devoted to handling government fertilizer and maize recoveries (Omnia Management, Personal communication, 2000).

5.1.2. Sasol Fertilizers Zambia Limited

Sasol Fertilizers Limited is one of the Divisions of the Sasol Group of companies in South Africa. Sasol Fertilizers manufactures a full range of fertilizers for the South African and export market. In Zambia, Sasol Fertilizer markets fertilizers in Zambia under Sasol Fertilizers Zambia Limited. Although Sasol Fertilizers has been exporting fertilizer to Zambia over the last seven years, Sasol Zambia was established in 1998. Until 1998, all fertilizer orders were delivered directly from South Africa to the buyer (usually a commercial farm or organization). Substantial amounts of fertilizer are still being delivered this way as the model is cost-effective and reduces handling and subsequent overhead costs. Sasol Fertilizer is expanding its sales operations in Africa with specific attention being paid to smallholder markets where technical advisors are being appointed to increase service and transfer knowledge. Sasol Fertilizers Zambia's business is 100 per cent in fertilizer trading. Sasol welcomes retail traders buying fertilizer for resale to smallholder farmers. Sasol has in the last few years sold fertilizer to FRA although the transaction has often been through a third party.

Sasol agents are specialized in selling fertilizer to large scale commercial farmers, out-grower firms and smallholder farmers. The agents are well known in the areas they operate and are able to have fertilizer delivered directly to their clients with minimum drop-offs and pick-ups.

5.1.3. Farmer's Friend Zambia Limited

Farmer's Friend Zambia Limited, established in 1999, is a wholly owned subsidiary of Avignon Holdings group of companies. Avignon Holdings is a commodities company, marketing agricultural inputs in Southern and Eastern Africa. The parent company has capacity to import or export commodities within and outside the region. Avignon Holdings has retail outlets in a number of countries in the region and has two fertilizer bulk blending plants in Zimbabwe and Malawi. Avignon has also invested in cargo handling facilities at the Mozambican port of Nacala. The perception is that there is more value added in fertilizer handling and logistics than from retailing fertilizer alone. Farmer's Friend Zambia entered the market in 1999/00 alongside a sister company, Farmer's Finance.

Farmer's Friend Zambia's long term strategy is to build a marketing network of one-stop agricultural input stockists and output collection centers in the smallholder sector. Meanwhile, Farmer's Friend sells agricultural inputs including fertilizer for cash or exchange with maize, soybeans and sunflower. The exchange scheme gives smallholder farmers flexibility in payment and boost fertilizer sales for traders. In addition, the company also wholesales fertilizer to retailers and out-grower firms. About 90% of Farmer's Friend's business is based on fertilizer trading.

Besides selling fertilizer on cash basis and exchange basis, Farmers Friend has a sister company Farmer's Finance whose specialty is to distribute fertilizer on credit to smallholder farmers. Farmer's finance's strategy is to target those areas where they can easily get information about potential clients from organizations already operating in these areas. It is not clear how Farmers Finance can operate a successful commercial credit scheme alongside a subsidized government program which Farmers Friend implements on behalf of government. At the time this study was being finalized, Farmer's Finance had not begun operating. The interest to develop a commercial credit scheme may have been shelved as the company turned its resources and strategies towards implementing the government fertilizer distribution contract.

5.1.4. Norsk-Hydro

In 1999, Norsk-Hydro South Africa acquired Kynoch South Africa which used to export fertilizer from South Africa into Zambia. Kynoch operated a retail network in Zambia between 1992 and 1998. Norsk-Hydro with 51% shares in the new company now handles marketing of fertilizer to Kynoch's customers in Zambia and the rest of the region. Unlike its operations in Zambia, Norsk-Hydro has retailing businesses in South Africa, Malawi, Kenya and Zimbabwe. Norsk-Hydro is active in bidding for fertilizer tenders in Zambia both independently and as part of a group of companies. Norsk-Hydro's business in Zambia is 100% fertilizer-oriented and most of the fertilizer supplied to Zambia is produced in South Africa although supplies from the Middle East are sourced during factory shut downs.

5.1.5. International Commodity Holdings (ICH)

ICH is a trading company of South Africa involved in agricultural commodities and input trading. The company does not produce any fertilizer but has capacity to source and supply fertilizer as part of a consortium of South African based fertilizer manufacturing firms including Sasol, Omnia and Norsk Hydro. ICH has been successful at handling bulk imports particularly for Government of Zambia but does not undertake further distribution of fertilizer. The success of ICH in winning government tenders is attributed to its ability to organize and submit a group bid (of several independent firms) to supply a large tonnage required at short notice usually less than two months.

5.1.6. Other importers

Apart from the well established importers, there are agents of some of the mentioned firms who import fertilizer for further resale. Sasol Zambia has several agents in Central, Eastern and Southern Provinces who import fertilizer on behalf of their clients, especially large scale commercial farmers. Other firms who import fertilizer intermittently are NCZ, Sable Zambia and others. Commercial farmers also import fertilizer directly from South Africa.

5.2. The Emergence of Commercial Retail Fertilizer Markets

Prior to market reforms initiated a decade ago, there was a dearth of private fertilizer distributors in Zambia. Fertilizer marketing was the preserve of NAMBOARD, and it was illegal for private traders to handle fertilizer. In this section we look at the period when traders established fertilizer trading business and relate the rate of establishment to the general timing of reforms.

The figures shown in Table 5.1 indicate that out of the 56 traders interviewed, only four retailers had experience trading fertilizer before the deregulation of fertilizer marketing. It is not clear how these traders were able to handle fertilizer at a time when fertilizer was a designated product. Immediately after the reforms, there was a limited response from private traders. The response was minimal within the first five years even in locations that are typically high fertilizer use areas. Only a quarter of the retailers interviewed were handling fertilizer five years into the reform process. This period signified the emergence phase of private fertilizer trading in Zambia.

Table 5.1. Private Sector Entry into the Fertilizer Retailing Business in Selected Districts of Zambia, 1999/2000

Year started Trading	Relative Degree of Fertilizer Use				Proximity to Line of Rail			
	High use		Low use		Close to rail		Far from rail	
	Count	%	Count	%	Count	%	Count	%
1999	15	40.5	4	21.1	9	32.1	10	35.7
1998	5	13.5	8	42.1	8	28.6	5	17.9
1997	7	18.9	3	15.8	5	17.9	5	17.9
1996	1	2.7	2	10.5	0	0	3	10.7
1995	1	2.7	2	10.5	3	10.7	0	0
1994	0	0	0	0	0	0	0	0
1993	1	2.7	0	0	0	0	1	3.6
1992	1	2.7	0	0	1	3.6	0	0
1991	2	5.4	0	0	0	0	2	7.1
1990	4	10.8	0	0	2	7.2	2	7.2
Total	37	100	19	100	28	100	28	100

Source: Rapid Appraisal of Fertilizer Traders in Selected Districts, FSRP, Zambia, 2000

Within the first five year period, none of the private fertilizer traders interviewed in the low fertilizer use areas had entered the market. This may imply that fertilizer use in these locations was less attractive for farmers and there was no effective demand to attract firms to move in with services. The last five years has seen continued entry of private traders in the high fertilizer use areas (70 per cent entered in the past five years) and emerging investment by private traders in the low use areas. Care should be exercised in interpreting these results as this sample of retailers excludes those who operated for a few years and then exited before the enumeration of traders in the specified locations in 2000. A majority of the indigenous traders trained and supported by government to trade in fertilizer between 1993 - 1997 had folded down by 2000.

The period from 1990 to 1994 could be considered an emergence phase for private fertilizer distributors and was a difficult period because of obstacles in securing finance and perceived risks in the market. Since 1995/96 the response of private firms investing in fertilizer distribution has grown each year. This can be attributed to the continued government policy to open up the fertilizer market and the deliberate attempts by government to engage private traders in a partnership to distribute government fertilizer.

There is surprising similarity in the entry of traders in locations that are considered to be near the present line of rail and those that are far from the present line of rail. Areas along the line of rail are relatively accessible and are in close proximity to the major urban centers. This line of rail belt stretches from Southern Province and passes through Lusaka, then Central, Copperbelt and Northern Provinces. The traditional argument has been that locations that are close to the line of rail will be serviced ahead of locations that are distance from the line of rail. The results in Table 5.1 show that the pace of entry was similar in locations in both categories. The view of a dualistic fertilizer services based on the distance from the line of rail is not supported by these results. The results show that the private sector firms also invests in areas far from the old line of rail. Proximity to the line of rail is not the only factor that influences where fertilizer traders will operate. Other communication infrastructure like good roads and access to telephone services attract private sector investment in fertilizer trading. Equally important is the agro-ecological potential of an area and farmer's awareness of fertilizer use benefits. Areas that have good infrastructure and reliable rainfall have potential to provide good returns from fertilizer use. Overall, areas outside the line of rail but with good roads and adequate reliable rainfall are equally likely to attract fertilizer traders as those areas near the line of rail. This inference is limited to the sites that were visited and does not in anyway represent the picture in the rest of the country. It would require a census of fertilizer dealers to investigate whether the private sector investment is just as great far from the line of rail as near it.

5.3. Behavior of Traders

In this section, the organization of fertilizer distribution channels and the competition in the market will be discussed. Fig D.1 and D.2 in Appendix D have been developed to illustrate the major fertilizer flows observed in 1999/00. The flow of stocks and the type of financial arrangement used to move fertilizer from source to farm are shown. The movement of government stocks and stages where fertilizer leaked out of the channel are also illustrated. Fig D.1 and D.2 also show importers distributing fertilizer on behalf of government and how this fertilizer is procured. The linkages fertilizer firms have with local private traders and with farmers and farmer cooperatives are also shown.

5.3.1. Fertilizer Product Flows

Omnia and Farmer's Friend do not utilize dealers or stockists to distribute their fertilizer. This is illustrated in Fig D.1 and D.2 in Appendix D. Instead, these firms operate a chain of regional, main and satellite depots. The major rationale they cite for using this approach is to have a competitive edge in the market by promoting an identity and establishing a reputation via a direct firm-farmer extension interface. Another rationale fertilizer importers gave for integration was to maintain product identity and ensure that farmers receive products of good quality. Given the absence of a regulatory framework to control the quality of fertilizer products, integration gives firms an opportunity to develop a reputation of product quality throughout the market chain up to the farm gate. Rural entrepreneurs are welcome to purchase fertilizer for further resale but a very small flow of products passes through this channel. Indigenous traders are considered to be uninterested in taking the risk and lack capacity to distribute fertilizer in areas outside major town centers. A significant proportion of sales by importers are also made to government (Fig D.2).

Sasol sells fertilizer to farmers directly from their warehouses and through agents in several major consumption areas. This is a principal-agent arrangement and a variation from firms operating a depot network. Firms who integrate retail networks face relatively higher overheads than firms with an agent based system, but have lower risks associated with principal-agent relationship. However, the operation of supply chains in Zambia can be a major entry barrier to potential competitors. Entry is seasonal and commonly observed at the retail level but entry at the importer stage is difficult and appears saturated.

5.3.2. Competition in Fertilizer Trading

There is some degree of competition between these firms at both importation and retail levels. These firms compete to win bids for importing fertilizer for government programs and estate needs. Given the large volumes of government fertilizer tenders, some of the importers benefit directly while others do so indirectly. In one season, one firm won the bid but purchased supplies from the other firm to meet the supplies required by government.

One negative aspect of oligopoly market structures is that prices tend to be sticky. Zambia fertilizer importers are less likely to lower prices because they know that their fewer competitors will immediately match the cuts, resulting in lower profits. There have been accusations of price fixing agreements between these firms. If these firms are indeed engaged in price-fixing, the prices that these firms charge would be identical and they would move at the same time. A snap shot survey of the importers in Lusaka revealed prices shown in Table 5.2. The indication is that the prices are not similar at all through out the industry but the differences are relatively small. It is also not clear whether price-fixing agreements, no matter how reasonable, constitute a violation of competition laws in Zambia.

Table 5.2. Variation in Product Prices (\$/ton ex Lusaka Warehouse Without Hagglng) as of September 2001 for Different Fertilizer Importers in Zambia, 2001

		SASOL	OMNIA	FARMERS' FRIEND
Compound D (10:20:10)	Sept 2001	295	285	300 ^a
	May 2002	295	276	300 ^b
Urea	Sept 2001	285	310	267 ^a
	May 2002	295	290	300 ^b

^a this is c.i.f Lusaka price adjusted for storage and management costs ^b this is quoted for Mazabuka but adjusted for distributor costs estimated in Table C2.

Source: Interviews with company sales managers, September 2001

Methods of competition which do not involve changes in selling price include product differentiation and advertising. Firms go to great lengths to provide a product that suits farmer demand. Periodic restyling of products is also common as firms try to improve product quality and efficiency, for example, adding micro nutrients in common formulations and changing pellet size. At the time of the survey, name brands were not heavily established in the market although different firms were still putting up effort to create brand differentiation. Another prominent type of non-price competition is the provision of favorable terms of payment and customer service (soil and plant analysis). Firms compete aggressively for clients by offering favorable terms, for example, 60-90 days extended payment period. As a result, firms who only distribute fertilizer upon receiving cash payment eventually lose clients. Other firms offer technical back-up in order to retain clients and gain a competitive edge over firms who simply deliver the product. However, benefits of non-price competition are enjoyed more by large scale commercial farmers than smallholder farmers.

There is also no evidence of price discrimination where the largest importers charge different prices to large scale commercial farmers and smallholder farmers for the same product. When smallholder farmers pay prices higher than prices paid by large scale commercial farmers the discrepancy might be perceived simply as price discrimination. A closer look reveals that the difference reflect lower marketing costs traders face when distributing for large scale commercial farmers.

5.4. Fertilizer Retailing Operations

In this section, fertilizer retailing operations are discussed. The insights were obtained from the rapid appraisal of fertilizer traders. These results are not nationally representative. Nevertheless, the results depict the operations fertilizer traders conduct and the circumstances they operate under.

5.4.1. Distribution Modalities

Sources of finance for procuring stocks

Fertilizer supplied to retailers can be either through transfer from one depot to another or through credit and/or cash. Commercial stocks handled by all the appointed government agents were transferred from regional to main depot and eventually to satellite depots (Table 5.3). On the other hand, 64 per cent of non-government agents obtained credit to procure fertilizer. About 25 per cent of the non-government agents used their own cash savings and 11 per cent obtained consignments to distribute as agents (Table 5.3).

Table 5.3. Source of Finance and Reasons Why Traders Use or Do Not Use Credit to Procure Fertilizer Supplies, Zambia, 1999/00

	Govt. Agents		Non-Govt. Agents		Total	
	Count	Col %	Count	Col %	Count	Col %
<i>Source of finance</i>						
Product transferred from parent company or principal	20	100	5	11	25	45
Credit	0	0	23	64	23	41
Own cash	0	0	8	25	8	14
TOTAL	20	100	36	100	56	100
<i>How did you qualify for credit?</i>						
Good business reputation - can deliver on time	n/a		12	55	12	55
Offered bank guarantee	n/a		3	14	3	14
Paid down payment	n/a		2	9	2	9
Have trading skills and have facilities	n/a		4	18	4	18
Personal relations	n/a		1	4	1	4
TOTAL	n/a		22	100	22	100

Source: Rapid Appraisal of Fertilizer Traders in Selected Districts, FSRP, Zambia, 2000

Table 5.3 shows that for traders to qualify for credit, more than half of them relied on their good business reputation. A good business reputation in this instance meant being able to deliver loan repayments in full and promptly. The other traders had to demonstrate that they were properly trained in handling fertilizer and had proper storage facilities (19%) or they had to provide bank guarantees (14%) or down payments (9%). Access to finance or to business alliance relationships may be an important entry barrier for indigenous fertilizer retailers in Zambia. Being a high value

but high bulk commodity, financing procurement, delivery and storage involve considerable amount of working capital beyond the ordinary savings that independent indigenous retailers may have access to.

Exchange Mechanisms and Stock Management Strategies

Although government-appointed agent traders interviewed purchased twice as much fertilizer for commercial resale than non-agent traders, the former only managed to sell 46% of these stocks (Table 5.4). Given a 2% carry over of stocks, about 52% of the stocks acquired by government appointed agent traders were potentially transferred to the government program. This diversion of fertilizer from commercial sales to government credit program was a common practice at government agent depots. This meant that farmers who wanted to buy fertilizer cash or in exchange with maize were shut out as soon as the government fertilizer credit program commenced.

By diverting commercial stocks to the government program, agent traders were able to reduce their carryover stock and related management and other overhead costs. The fixed costs for government agent traders were, therefore, indirectly subsidized by the government program by virtue of distributing some portion of their supplies for government on a commission basis, while the same overhead operations used for the government program were also used before and afterward to facilitate the agents' commercial sales. Overall, government agents faced relatively lower risks in distributing their own commercial fertilizer than non-agent traders, because their product was shielded from competing with government fertilizer.

Table 5.4. Total Commercial Fertilizer Handled (Bags) by Traders in Zambia, 1999/2000

	Government-Agents		Non-Govt. Agents		Total	
Opening Stock	5091		8628		13719	
Purchases	329675		157908 ^a		487583	
<i>Carry Over</i>	6143	2%	9728	6%	15871	3%
<i>Total Sales</i>	155356	46%	154977	94%	310333	62%
<i>Potential Transfers^b</i>	171526	52%	0	0%	171526	35%
Total Stocks Handled	334765	100%	166536	100%	501301	100%

^a This total includes volumes that leaked from the government agents' distribution system ^b This is the volume of stocks unaccounted for under commercial transactions

Source: Rapid Appraisal of Fertilizer Traders in Selected Districts, FSRP, Zambia, 2000

More than half (58%) of the fertilizer handled by appointed agents was government fertilizer (Table 5.5). This shows the extent to which the government has provided business to some private firms albeit in a selective and non-competitive manner. Government appointed agents are aided by government to reduce their commercial operational costs and out-compete outsiders. Overall, government is still a key player in fertilizer marketing as its products takes up 40 per cent of the total volume of fertilizer handled by all traders interviewed during the survey. This result is consistent with PHS results which show that government's direct involvement in fertilizer distribution is very significant and input market reforms in Zambia have not been fully implemented.

Table 5.5. Distribution Mechanisms Utilized by Fertilizer Traders in Zambia, 1999/2000

Sales Transactions	Government - Agents		Non-Agents		Total	
	# of bags	(%)	# of bags	(%)	# of bags	(%)
Credit	6526	4	49928	33	56454	18
Cash	109782	71	46770	30	156552	51
Exchange	39048	25	57891	37	96939	32
Total Commercial Sales	155356	100	154977	100	310333	100
Total Commercial Sales	155356	42	154977 ^a	100	310333	60
Govt stock distributed on credit	211742	58	0	0	211742	40
Total Distributed	367098	100	154977	100	522075	100

^a This total includes volumes that leaked from the government stocks distributed on credit, so there is a limited degree of double counting

Source: Rapid Appraisal of Fertilizer Traders in Selected Districts, FSRP, Zambia, 2000

Table 5.6. Traders Beliefs of the Major Reasons Farmers They Deal with Purchase Fertilizer for Cash, Zambia, 1999/00

Reasons	Govt. Agents		Non-Govt. Agents		Total	
	Count	Col %	Count	Col %	Count	Col %
Farmers growing cash crops cannot wait for government fertilizer	6	33	3	10	9	18
Farmers sell their products for cash	1	7	6	19	7	14
Farmers are established and have savings	3	16	9	29	12	25
Want self-control - loans associated with harassment and embarrassment	4	22	9	29	13	27
Access to non-crop income e.g., livestock, fishing etc	4	22	4	13	8	16
TOTAL	18	100	31	100	55	100

Source: Rapid Appraisal of Fertilizer Traders in Selected Districts, FSRP, Zambia, 2000

The bulk (51%) of the fertilizer distributed by private traders to smallholder farmers is distributed on cash terms, Table 5.5. This may appear surprising given the conventional wisdom that farmers do not have money to buy fertilizer. Government appointed agents distributed 71 per cent of their fertilizer on cash terms. The main reasons given by traders why farmers they deal with can afford to pay cash for fertilizer are shown in Table 5.6. More than a quarter of all the traders felt that farmers buying fertilizer on cash terms want to have self control of their products and want to avoid harassment and embarrassment associated with loan defaulting. Twenty five per cent of the traders

considered farmers paying cash for fertilizer as well established and having savings. Other important reasons were that farmers paying cash had access to cash crop as well as non-crop income, Table 5.6. This corroborates earlier PHS results discussed in Section 2.

About 31 per cent of the fertilizer distributed by private traders was exchanged directly with farm produce especially maize, Table 5.5. In terms of volume distributed, non-agent traders utilized this strategy more than government appointed agents. However, in terms of participation, 75 per cent of appointed agents exchanged fertilizer with maize compared to 30 per cent of the non agent traders (Table 5.7). The major reason cited by 50 per cent of the traders why they exchanged fertilizer with maize was to increase fertilizer sales. In addition, 38 per cent of the traders felt that swapping increased their profit margins as they collected maize soon after the harvest, stored it, and sold later when prices were at their peak. Exchanging fertilizer with maize is less risky than offering fertilizer on credit, Table 5.7.

Table 5.7. Trader Rationale for Distributing Fertilizer Through Direct Exchange with Maize, Zambia, 1999/00

	Govt. Agents		Non-Govt. Agents		Total	
	Count	Col %	Count	Col %	Count	Col %
<i>Did you directly exchange fertilizer for maize</i>						
Yes	15	75	11	30	26	46
No	5	25	26	70	31	54
TOTAL	20	100	37	100	57	100
<i>What are the benefits of direct exchange?</i>						
Can extend trading margins	5	33	5	45	10	38
Can increase product sales	7	47	6	55	13	50
It is less risky than a direct loan	3	20	0	0	3	12
TOTAL	15	100	11	100	26	100

Source: Rapid Appraisal of Fertilizer Traders in Selected Districts, FSRP, Zambia, 2000

About 18 per cent of the product handled by private traders was distributed on credit, Table 5.5. The traditional understanding that private firms have no capacity to distribute fertilizer on credit is thus challenged. Non-agent traders in particular distributed 33 per cent of their fertilizer on credit. It is not clear whether non-agent traders have better capacity to distribute fertilizer on credit than appointed agent traders or the latter are only prepared to distribute fertilizer on credit through the government program and not independently in order to minimize risks of non repayment. Among non-agent traders are out grower firms who have adopted interlocking arrangements with farmers to provide fertilizer on credit in return for in-kind payment. Out-grower schemes for industrial crops (cotton, tobacco, paprika) operate in Zambia and deliver seasonal inputs including fertilizer on credit. The view that the private sector has failed to deliver agricultural credit applies only to maize and non-industrial crops because the multiplicity of disposal channels make it difficult to weed-out side-selling. It is relatively easy to integrate input and output marketing for industrial crops than non-industrial crops.

Table 5.8. Reasons Why Some Traders Sell and Others Do Not Sell Fertilizer on Credit, Zambia, 1999/00

Reasons	Govt. Agents		Non-Agents		Total	
	Count	Col %	Count	Col %	Count	Col %
<i>Did you sell fertilizer on credit?</i>						
Yes	5	30	26	72	31	58
No	12	70	10	28	22	42
TOTAL	17	100	36	100	54	100
<i>Why did you sell on credit?</i>						
Increase sales	0	0	20	77	20	64
Confident that customers will repay	5	100	4	15	9	29
To assist my friends and relatives	0	0	2	18	2	7
TOTAL	5	100	26	100	31	100
<i>Why didn't you sell on credit?</i>						
Lack information about clients	3	23	9	82	12	50
Lack of confidence and trust	2	15	2	18	4	17
It is company policy	8	62	0	0	8	33
TOTAL	13	100	11	100	24	100

Source: Rapid Appraisal of Fertilizer Traders in Selected Districts, FSRP, Zambia, 2000

Seventy-two per cent of non-agent traders provided fertilizer on credit as compared to 30 per cent of government agent traders, Table 5.8. The major reason (77%) non-agent traders provided fertilizer on credit was to increase volume of sales. Meanwhile, all the government agent traders who sold their commercial fertilizer on credit did so because they were confident that their clients will repay the loan. The majority (82%) of those non-agent traders did not sell fertilizer on credit because they did not have enough information to screen their potential clients. Meanwhile, company policy was the main reason that kept government agent traders from distributing fertilizer on credit to farmers. There is a perceived need by traders to review the Agricultural Credit Act and make it cost-effective to address problems of loan default by smallholder farmers (Govereh *et al*, 2000).

5.4.2. Distribution Calendar

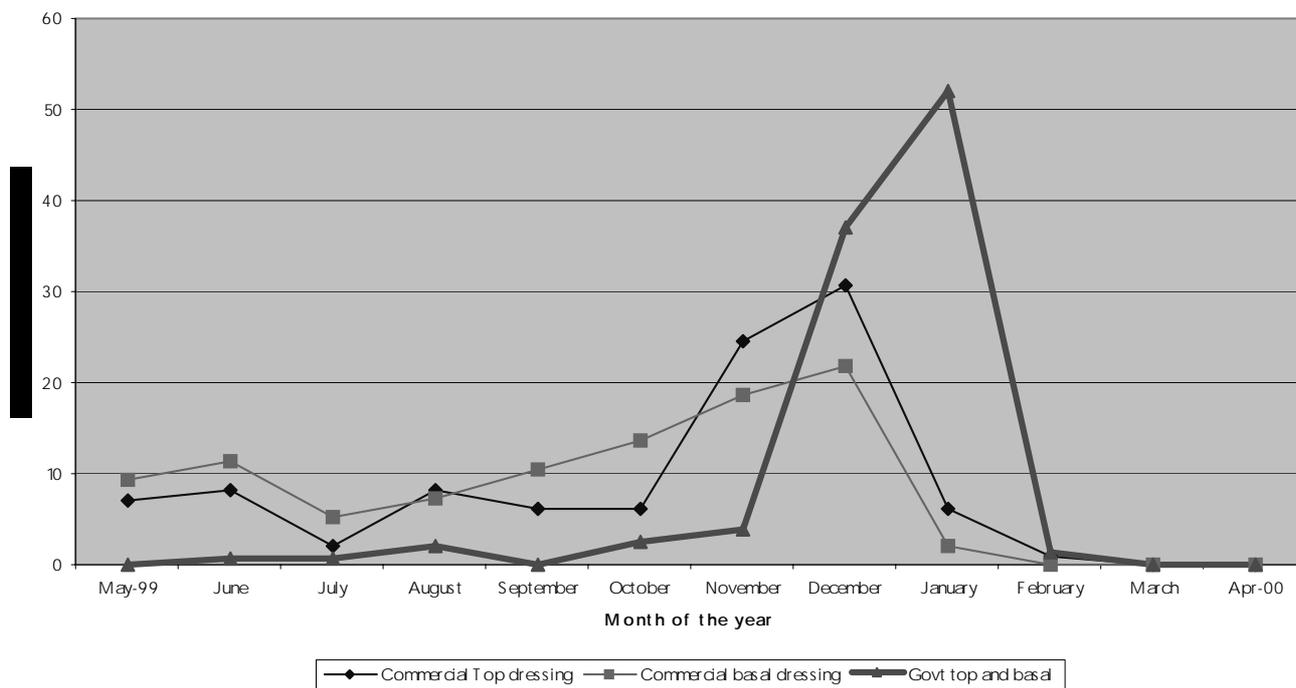
The fertilizer distribution calendar in 1999/2000 is shown in Fig 5.3. Traders start selling their commercial stocks soon after the harvest period. This is the period when farmers have cash realized from selling their crops. Traders sell more basal than top dressing during this period. Traders prefer to distribute their commercial stocks soon after the harvest through direct exchange. At this period of the year, these fertilizer distributors compete with government fertilizer loan recovery. The government agent traders exchange maize with fertilizer at the same time they are suppose to collect maize from government loanees.

Government agent traders felt that the recovery of loans in-kind by government reduced the potential for fertilizer-maize swaps. Under the Agricultural Credit Act, it is illegal for any trader to have interest in farm produce which has been registered as an agricultural charge. This implies that traders cannot exchange fertilizer for maize with those farmers who have not completed repaying their loans to the government.

Later in the season when surplus maize stocks typically become scarce, traders concentrate on cash as well as credit sales. The majority of the farmers start purchasing fertilizer once the rainy seasons sets, that is, October to December and farmers purchase more top than basal dressing during this period, Fig 5.3.

Sales by private traders start declining from December and end in January. The period when sales by private traders decline coincides with the period that government fertilizer distribution rises and reaches its peak. Farmers who could purchase fertilizer from traders had their demand met by supplies provided through the government loan program. The government distribution program has the potential to partially substitute for cash sales by the private sector in relatively accessible areas. Fertilizer retailers interviewed revealed that their fertilizer sales dropped during the period in which government fertilizer was being distributed. Despite government fertilizer coming late, farmers' anticipation to receive government fertilizer reduced demand for commercial fertilizer.

Figure 5.1. The Month in Which Clients of Private Firms and Government Started to Obtain Fertilizer in Zambia



Source: FSRP Rapid Appraisal of Fertilizer Traders, 2000

5.4.3. Sources of Fertilizer Trading Risks

The risks that government agent traders and non-agent traders faced were different, Table 5.9. The sources of risk for government agents were: unsafe trading conditions, such as, theft of fertilizer by staff members; and robberies of cash receipts. There were two main sources of risk for non-agent traders namely: loan defaulters; and uncertain fertilizer demand. Traders who advanced loans to farmers faced problems in recovering their loans because of side-selling of produce by farmers. Non-agent traders were equally burdened with the risk of not knowing in advance whether and how much government fertilizer would be distributed in their area, and hence having to make their own purchase decisions in an environment of highly uncertain demand. As mentioned earlier, carry-over stocks are costly and reduce the overall profitability of private sector trading operations.

Other sources of risk included price undercutting behavior by traders who procured government fertilizer leaking from the distribution system. Such behavior temporarily reduced sales of commercially procured stocks. Fertilizer delivery losses were high during the rainy season. Wet conditions make it extremely difficult to handle fertilizer unless facilities are water tight.

Table 5.9. Ranking the Major Risks Faced in Fertilizer Trading, Zambia, 1999/00

Major Sources of Risk	Government Agents	Non-Govt agents	Total
	<i>Rank</i>	<i>Rank</i>	<i>Rank</i>
Theft of fertilizer by staff & robbers	1	3	1
Loan defaulters	2	1	1
Undercutting by fellow traders	3	3	4
Loss of quality in storage & delivery	3	5	5
Uncertain demand		1	3
Health and safety hazard		6	6

Source: Rapid Appraisal of Fertilizer Traders in Selected Districts, FSRP, Zambia, 2000

More than a quarter of the government agent traders felt that they faced none of the risks mentioned. It may well be that participating in government distribution programs cushions traders from potential fertilizer market risks and non-agent traders are exposed to a higher degree of market risk than government agent traders.

6. KEY FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

6.1. Rationale and Objectives of the Study

This study was identified by the Advisory Board of the Food Security Research Project, composed of government and private sector stakeholders in Zambia's agricultural sector. The study, and this report, are a product of a consensus building process among the Ministry of Agriculture, Food and Fisheries (MAFF), private fertilizer marketing firms (importers, wholesalers and retailers), donors and agriculturally based NGOs.

The objectives of the study were to describe how the fertilizer industry has developed under the process of liberalization, to examine the effects of liberalization, to identify feasible opportunities to reduce farm-gate fertilizer prices and increase smallholder farmers' access to fertilizer. Particular attention was given to the impact of government programs on the objective of increasing the private sector's capacity and incentives to distribute fertilizer, and policy options for increasing fertilizer use in areas where it is profitable and contributes to agricultural productivity.

This study is designed to feed into ongoing policy processes in Zambia, especially the formulation of the successor program to ASIP and the Poverty Reduction Strategy Paper. MAFF and FSRP contributors to this study are directly involved in the working groups connected with these initiatives, namely the Rural Finance Committee and the Agricultural Markets Committee.

6.2. Summary of Findings

Some of the main findings of the study are as follows:

1. **The private sector has demonstrated potential to handle total import requirements provided the macroeconomic environment is conducive and finance is available**

Private sector investment in the industry has grown steadily to service estate and high value crop farms, large scale commercial and smallholder farmers. The commercial market for fertilizer has been increasing over time, and this is reflected in a rise in private sector commercial imports. Overall private sector imports in the late 1990s have ranged from 100,000 to 130,000 tonnes per year. Private firms are doing the actual importation of fertilizer distributed through the government program essentially as agents for the government.

2. **Government remains a significant fertilizer distributor on credit to smallholder farmers only**

Government remains involved in the allocation of fertilizer to specified cooperatives. Government programs accounted for about one-third of the fertilizer for smallholder farmers in 1999/00, all of it sold on credit. GRZ fertilizer distribution program substitutes at least partially for commercial credit distribution by private firms. Both the private and the government credit distribution operations target the same type of clients and operate mostly in the same areas of relatively high agricultural productivity. Household survey evidence indicates that the recipients of government fertilizer had greater purchasing power than those buying commercially on a cash basis from private traders. However, not all

recipients of government loans would have purchased fertilizer commercially, so the government program has expanded fertilizer use for some households.

3. Cash demand for fertilizer by smallholder farmers exists but is not being exploited fully by the private sector

The perception that there is no cash demand for fertilizer among smallholder farmers is not supported by the evidence. The bulk of the fertilizer distributed by private firms is sold on cash terms. These findings indicate that smallholder farmers have greater ability to afford fertilizer on a cash basis than generally acknowledged. However, it would follow that the expansion of private sector retail networks would likely increase the level of farmer fertilizer purchases.

4. Government distributes fertilizer alongside the private sector in all districts

There is a geographic overlap of delivery services between government and commercial fertilizer marketing services for smallholder farmers, in that government operates in selected districts where smallholder farmers also purchase fertilizer from private traders.

5. Government fertilizer was indirectly subsidized, even when loans were repaid in full

The fertilizer distributed on credit through the government program is subsidized even if the loans are fully paid back. The program distributed fertilizer at a unit cost of about \$436 per tonne but farmers were expected to repay only \$307 per ton. The swap rate amount at the time of repayment resulted in an implicit fertilizer subsidy of \$129 per ton. Cost build-up estimates confirm that the full market cost of distributing fertilizer generally exceeds the price farmers pay for fertilizer distributed through the government program by 15 to 30 per cent. This makes it difficult for private traders not acting as agents to the government programs to compete, because they must sell their fertilizer at full cost to operate profitably.

6. Subsidized fertilizer is likely to cause somewhat lower maize prices especially in rural areas

Due to the fact that fertilizer distributed by the Government is marketed at lower than full cost prices, and that re-payment is done in-kind in the form of maize, the value of maize in the rural areas decreases in relative terms. The effect would be that rural maize prices are lower than what they would be under commercial terms. Farmers would benefit more in terms of higher maize prices if the terms of the transaction are commercial oriented. Reducing farm gate prices by indirectly expanding supply in rural areas advantages those who get low cost fertilizer and disadvantages those producers without fertilizer or with full cost fertilizer both of which were found to be lower income households compared with those receiving government fertilizer. The many net buyers of maize in rural areas would also benefit.

7. The fact that government contracts a small number of private traders to distribute subsidized fertilizer creates an uneven playing field of business opportunities and risks to those traders not selected

Government involvement in fertilizer marketing expands market access opportunities for private firms that are appointed government agents, but hampers the operation of private

firms not selected as agents. In addition, by providing subsidized fertilizer on credit, the operations of the government undermine commercial demand for fertilizer by farmers that had the purchasing power to afford fertilizer (see point 5 above). In this way, the government fertilizer distribution programs create uneven effects on private sector investment; they are attractive to firms chosen by government to earn risk-free commissions to distribute fertilizer, but they impede broader investment in the system by other private traders.

8. Geographical targeting is complicated because well-off and resource poor smallholder farmers live next to each other

National Post-Harvest Survey data shows that relatively well-off and poorer rural households in Zambia are not segregated into different parts of the country, but rather live together in the same villages. Targeting of fertilizer through government programs will continue to cause difficulties for non-affiliated private traders operating in the same areas and attempting to meet the commercial demand for fertilizer from farmers who do have the purchasing power to afford fertilizer but who obviously prefer to acquire it at subsidized levels from the government program.

9. There exist scope to reduce the farm gate price of fertilizer

About two-thirds of the farm gate cost of fertilizer is accounted for by transactions between the port of entry e.g., Durban and the farm. The opportunities for reducing farm gate prices can be identified between these two locations. Reducing the levels of double-handling or re-shipments can reduce the farm-gate price of fertilizer by more than 10 per cent. Double-handling occurs when traders import and unload their stocks in centrally-located warehouses before re-loading and shipping fertilizer to district depots later in the season. Double-handling has become necessary because of private traders' uncertainty about where government programs will operate. Evidence shows that commercial sales of fertilizer decline when subsidized government fertilizer is being distributed in an area. More reliable advance information on the location and timing of government programs would allow direct shipment of commercial stocks from import sources.

6.3. Trends in Zambia's fertilizer marketing system

10. The liberalization of fertilizer marketing has only been partial, making it difficult to fully assess the strength of the private sector to market fertilizer to smallholder farmers

Although government sought to remove previous market distortions in the fertilizer industry, introduce new competition into the market and stimulate growth of new markets, these reforms did not result in government withdrawing from participation in the process of importing fertilizer and determining how and where it would be allocated. The perception of weak private sector capacity provided the rationale for continued government programs. This vicious cycle of perceived weak private sector capacity leading to continued government distribution of fertilizer, causing even less incentives for private investment must be squarely redressed in a coherent government policy to promote a well-functioning market-oriented fertilizer distribution system.

11. Donor support to government fertilizer programs and local fertilizer production have disappeared and led to a decrease of government stocks in the market but private sector involvement is increasing

The direct involvement of government in importing fertilizer has declined steadily since the reforms were initiated. Direct government imports have declined from over 100,000 metric tones at the beginning of 1990s to less than 50,000 metric tones at the close of 1990s. The decline in government fertilizer distribution is mainly due to the cessation of local production of fertilizer since 1993/94 and the end of fertilizer donations to the government in 1996/97.

Government has for the last ten years created arrangements to distribute fertilizer to smallholder farmers: Agricultural Credit Revolving Fund, Trader Agent System, Fertilizer Supplier Loan Facility, Agricultural Credit Management Program and Agro-Support Program. These programs demonstrate the intentions of government to develop an indigenous cadre of entrepreneurs who can handle and trade in fertilizer. However, these programs lacked consistency, transparency and accountability and were economically difficult to sustain.

Over the last four years, fertilizer consumption by smallholder farmers has increased. The proportion of farmers using fertilizer has also increased in the same period. The effect of this increase in fertilizer use has been an increase maize production. Both the area under maize and maize output has gone up during the last four years.

6.4. Performance of government fertilizer programs

12. Fertilizer distribution by government is cost-inefficient

The recovery of government fertilizer loans is not designed to get farmers to pay all the costs of the program. The mismatch creates a trading account loss even before the distribution of fertilizer begins. The trading loss is exacerbated by running the operation based on the local currency account. The generally low repayment of loans and the limited effort by agents to recover these loans makes the program financially unsustainable.

13. Government fertilizer product range needs to be expanded to meet soil-specific agronomic demands

Despite the site-specific differences in soil nutrient availability across Zambia, there are only two fertilizer products dominant in the market (compound D and urea). Furthermore, the recommended application rates of these fertilizer products are uniform across the country. Ignoring soil and climatic variation when applying supplementary nutrients reduces the contribution of fertilizer to maize production, and lowers the profitability of using fertilizer. Not only are right fertilizer products required but the timing of application is important for effective results.

14. Fertilizer application on maize is not necessarily profitable in all areas, due to geographically varying response rates and market conditions

In the case of fertilizer use on maize, site to site variation in soil and climatic conditions implies that the physical response of maize to fertilizer application is non-uniform. Lower

response rates are recorded in Region III than in Region II. The physical location of an area in relation to market centers influences transportation costs and ultimately the market prices of fertilizer and maize. The physical response and prices of fertilizer and maize together affects the degree to which fertilizer use is profitable on maize. Not only are net benefits expected to be positive prior to promotion of fertilizer use, the rate of return should be large enough to cover the cost of capital and risk.

When all these factors are included in the evaluation, fertilizer use appears profitable in relatively few areas. Put simply, more farming areas will find fertilizer use profitable when the price is subsidized than when the full cost is applied. At the national level, promotion of fertilizer use can result in foreign currency losses if the value of the additional maize output is less than the cost of the fertilizer. Targeting fertilizer use to those locations that yield the greatest additional value would produce larger societal net benefits. But, promoting fertilizer use in areas where it is not profitable, would represent a loss in national income. Lack of data made it difficult to fully assess the net benefits of the 1999/2000 government fertilizer program. (Future research will attempt to examine the profitability of fertilizer use in a greater number of districts in Zambia, under a set of alternative weather and maize price scenarios and taking into account cropping practices.)

15. Government agents and non-government agents face different business opportunities and risks

While government involvement has created business opportunities for those private firms it partners with, the practice may discourage competition and new entry by non-agent traders. Firms appointed as agents benefit from the government distribution program while firms that are outside of the government system arguably are adversely affected. The playing field between government appointed agents and other firms is uneven because of the following:

- a. Non-government agents sales are totally commercial, and their sales are highly dependent on whether the government program operates in their areas. Since this decision is not made until after the planting season, non-government agents must make their own purchase decisions in a highly uncertain environment
- b. The leakage of government fertilizer to a resale market erodes the competitiveness of non-government agents' commercial sales
- c. Government agents receive a flat commission per tonne of fertilizer handled through government programs and hence incur no risk by selling fertilizer under this program.
- d. The subsidized maize-fertilizer swap rate under the government program further erodes the competitiveness of non-government agents' commercial sales.

16. Lack of information on government's short and long run intentions coupled with mutual mistrust between public and private sectors creates uncertainty in the market

Private sector companies complain that their import decisions are made more difficult and risky by government import decisions, which are perceived of as late and often inconsistent with official announcements made earlier. Traders identified a vicious cycle, in which private sector import decisions are predicated on expectations of where and how much fertilizer will be distributed under non-commercial government programs. Stated

differently, the possibility exists that private sector response to liberalization could have been very different depending on the extent of long term government involvement. For this reason, it is not clear that government programs have really expanded the total use of fertilizer by smallholder farmers. Scheduled announcements of government's intentions and plans could help reduce market uncertainties and promote additional private investment in commercial fertilizer distribution. Furthermore, a timetable for eventual government pull-out is a crucial signal for the private sector to consider further investment in the fertilizer sector.

17. A third of the farmers who used fertilizer in 1999/2000 received fertilizer from government and these farmers were better off, on average, than those who did not receive the subsidized fertilizer.

While the intention of government is to reach resource poor farmers who cannot access commercial loans, the government fertilizer program was accessed by a small proportion of all smallholder farmers and these farmers were not the poorest. About 7 per cent of smallholder farmers received subsidized fertilizer and they had incomes three times the average for those using no fertilizer. The relatively better off households benefitted from the subsidized fertilizer in 1999/2000. It is not clear whether this was the designed target group and what is the justification for targeting this group of farmers with cheap government fertilizer. The government fertilizer program, as currently designed, is unable to redress the existing inequities in rural welfare.

6.5. Strategies for reducing fertilizer marketing costs

18. Reducing transaction costs in fertilizer marketing could improve farm profitability and productivity

Transport and handling costs from the landing port constitute 70 per cent of the farm gate price of fertilizer. This stage of the product flow is the main target for any opportunities to reduce the cost of fertilizer.

Fertilizer costs stand out as a major cost item in a crop budget of those using fertilizer. Improving market efficiency in fertilizer distribution is likely to result in significant effects on enterprise profitability. The change in fertilizer price as a result of direct shipment of an order to a client had the effect of tripling the enterprise gross margins for maize produced under smallholder conditions. Reductions in fertilizer prices are likely to generate further productivity improvements through increased input application.

19. Cost-saving routes and transport modes exist and could be explored

There are possibilities for fertilizer imports to Northern, Luapula and Copperbelt Provinces to transit through Dar es salaam port and imports to Eastern province to transit through Nacala port. The bulk of the imports were transiting through Durban and the remainder through Beira port. While these other ports may appear attractive for specific locations in Zambia, these ports were not being used to import fertilizer into Zambia. Chirundu border point and, to a limited extent, Livingstone were the only entry points for fertilizer imports into Zambia.

The bulk of the imports were being hauled by road transport despite rail transport being \$20 per tonne cheaper. Use of the rail network can bring about significant cost savings if the existing bottlenecks in the network can be reduced.

20. The small number of firms participating in the import and wholesale stages of fertilizer distribution may result in some problems in pricing

Firms importing through cheaper routes or with cheaper cost structures had similar price levels with firms importing fertilizer through more expensive routes or operating a higher cost structure. There are allegations of price fixing in the market by the foreign based-firms to keep fertilizer prices high but there is very limited evidence to substantiate these claims. The structure of the market is, however, prone to making prices “sticky”. It is important to consider incentives for firm competition given economies of scale. Threat of entry by new players puts pressure to keep prices at competitive levels.

21. Eliminating double handling/ reshipment can lower fertilizer prices significantly

There is a high degree of reshipment or double-handling involved in the fertilizer market. Fertilizer is off-loaded and positioned in a central warehouse usually in Lusaka, and then re-handled and distributed to a regional market once demand conditions (influenced by the timing and location of government fertilizer programs) are better understood. Cost build-up analysis indicates that the elimination of “double-handling” would have the effect of reducing the farm gate price by some ZK 5,250 per 50kg bag. Lack of information about the specific quantities government will off-load in a given area causes traders to ship stocks to a central warehouse and re-load to ship to the consumption areas. These additional costs are passed on to farmers, reducing the profitability of using fertilizer and the incentive to purchase it.

22. Reducing fuel taxes would further reduce farm gate price of fertilizer

The 60 per cent excise tax on diesel fuel in Zambia makes fuel costs among the highest in the region. A reduction in the diesel fuel tax from 60 per cent to 20 per cent was estimated to reduce the farm-gate price of urea by K334 per bag. A more comprehensive approach to rehabilitate major routes can have significant impacts in reducing the cost of fertilizer.

6.6. Performance of the commercial fertilizer traders

23. Private traders distribute fertilizer in areas with commercial agricultural activities

Private fertilizer retailers have established themselves in locations both far and close to the old line of rail; the rate of new entry has been roughly the same in both types of districts. Factors that do appear to influence private sector investment in input distribution include presence of surplus maize and cash crop production, proximity to roads and communication infrastructure. Establishment of retail fertilizer distribution services have been unsurprisingly low in areas of low agricultural production.

24. Private traders distribute fertilizer on credit to smallholder farmers for industrial crops such as tobacco, paprika and coffee

The perception that private fertilizer traders have no capacity to give fertilizer on credit to smallholder farmers is not supported empirically. Out-grower firms supporting the production of tobacco, cotton, paprika provide fertilizer on loan as part of their pre-harvest input package. Private firms, however, find it risky to offer fertilizer on credit for the production of food crops with multiple marketing channels.

25. A cash market for fertilizer by smallholder farmers exist but it is not exploited fully by the private sector

The perception that there is no cash demand for fertilizer among smallholder farmers is also not supported by the evidence. The bulk of the fertilizer distributed by private firms is sold on cash terms. These findings indicate that smallholder farmers have greater ability to afford fertilizer on a cash basis than generally acknowledged. However, it would follow that the expansion of the private sector retail network would likely increase the level of farmer fertilizer purchases.

26. Government operates in the same districts that the private sector operates

Government fertilizer distribution program substitutes at least partially for commercial distribution by private firms. When government fertilizer credit program begins, the operations of private fertilizer retailers sharply declines. Private firms' sales pick up when production preparations for the next season start.

6.7. Study Recommendations

A key role of government is to identify cost-effective strategies to make fertilizer profitable for more of the 80 per cent of small-scale farmers who currently don't use fertilizer. "Cost-effective" strategies are those that, at a minimum, provide a greater value of output than the cost of the input. While promoting the profitable use of fertilizer for "resource poor" farmers is important, it must be borne in mind that fertilizer use is not appropriate in areas where the agro-ecology is unsuitable for it. But there appears to be great scope for government to raise the use of fertilizer in Zambia by taking steps to overcome some key constraints that currently limit its profitable use by small-scale farmers. These include:

1. Government should take direct steps to identify the most fertilizer responsive maize varieties for each agro-ecological region of Zambia and pro-actively support the distribution of these varieties to smallholder farmers.
2. Given that there is a blanket recommendation on fertilizer application levels throughout Zambia, government, in collaboration with the private sector, should develop fertilizer application recommendation domains that are more appropriate to local conditions, and then work with the extension service to publicize improved new recommendation rates to smallholder farmers in each area. Emphasis should also be given to publicizing the benefits of using lime and to provide incentives for the private traders to distribute it.
3. Given that fertilizer prices are sensitive to transportation costs, it is recommended that government should determine where the highest payoffs from increased road and transport

investments would occur, and consider making these investments to make fertilizer use by small-scale farmers more profitable. Further investments in rural electrification and communication services are instrumental in the establishment and expansion of existing smallholder cash crop production schemes.

4. Recognizing that well-off and resource poor farmers live side by side, regional targeting might be inappropriate. Government should explore the possibility of having profiles of farmers and promote self-targeting mechanisms on fertilizer programs. To allow self-targeting mechanisms for conferring benefits to resource poor smallholder farmers, government should eliminate the need to administer a costly credit program by replacing it with a program where beneficiaries work for inputs. A "service for work" program may also help government extricate itself from spending resources to recover loans. Relevant experiences need to be studied closely to identify how a "fertilizer for work" program can be designed and implemented.
5. Creating a more level playing field between agents of government programs and non-agent private companies will lead to greater incentives for new entry by other firms and will discourage the potential for non-competitive practices. Government programs should complement and not compete with non-agent private sector.
6. To facilitate effective preparation and planning by the private sector, government should make clear statements backed by consistent action about its on-going and intended operations in the fertilizer market.
7. To facilitate the smooth exit of government from programs providing fertilizer on credit to smallholder farmers, government needs to specify a plan for phasing out the programs. Clearly stating how long and under what conditions the government plans to continue in the fertilizer business, that is, the length of the transitional phase, could provide more long-term clarity for the sector and would facilitate long-term investment decisions on the part of the private sector.
8. Recognizing that the private sector is not fully exploiting the cash market for fertilizer due to inherent market risks, government should facilitate further reduction of these risks by dissemination of market information, establishing market centers, capacity building of farmer organizations, and by exploring co-financing and risk sharing opportunities with the private sector.
9. To facilitate the smooth passage of fertilizer at ports and borders, it is recommended that government should negotiate for favorable terms for handling Zambia's fertilizer cargo at shipping ports through Joint Permanent Commissions (JPCs) and regional bodies.

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Appendix A: Distribution of Fertilizer used by Smallholder Farmers

Table A.1 The distribution of farmers who used fertilizer by district and the proportion of farmers using each marketing channel, Zambia, 1999/00

LOCATION	FERTILIZER DISTRIBUTION CHANNELS								
	Government		Commercial Cash Sales		Commercial loans		NGOs distribution		Total
	# of HH	% of users	# of HH	% of users	# of HH	% of users	# of HH	# of HH	# of HH
Chibombo	1684	18.7	5859	65.1	1351	15.0	116	1.3	9010
Kabwe Urban	18	2.6	600	87.7			67	9.7	685
Kapiri Mposhi	614	15.5	3275	82.5			80	2.0	3968
Mkushi	455	9.3	2365	48.5	1616	33.2	437	9.0	4873
Mumbwa	721	18.6	2708	70.0	436	11.3			3865
Serenje	469	21.2	1427	64.6	313	14.2			2210
CENTRAL P	3961	16.1	16235	65.9	3716	15.1	699	2.8	24611
Chililabombwe	103	17.9	402	69.6	31	5.4	42	7.2	578
Chingola			1228	86.7	188	13.3			1416
Kalulushi	133	16.1	528	77.4	111	13.4	55	6.7	827
Kitwe			469	100.0	55	10.5			524
Luanshya	117	16.1	608	83.9					725
Lufwanyama	708	23.2	1742	57.0	436	14.3	165	5.4	3050
Masaiti	344	9.2	3110	83.4	275	7.4			3729
Mpongwe	197	28.1	362	51.5			143	20.4	702
Mufulira	65	19.2	275	80.8					340
COPPERBELT	1667	14.0	8724	73.4	1096	9.2	406	3.4	11892
Chadiza	2177	26.8	5614	69.2	193	2.4	139	1.7	8123
Chama	193	59.4	132	40.6					325
Chipata	2066	7.7	18772	70.3	5872	21.9	106	.4	26816
Katete	324	6.9	3712	79.0	528	11.2	134	2.8	4697
Lundazi	1613	15.0	8425	78.2	540	5.0	199	1.8	10777
Nyimba			60	100.0					60
Petauke	1770	31.7	3081	55.2	615	11.0	122	2.2	5588
EASTERN	8143	14.4	39796	70.6	7748	13.7	699	1.2	56386
Chiengi			92	100.0					92
Kawambwa	105	5.7	1736	94.3					1841
Mansa	245	11.0	1863	83.4			127	5.7	2235
Milenge	178	24.4	549	75.6					727
Mwense			330	100.0					330
Nchelenge			129	100.0					129
Samfya			614	100.0	168	17.6	174	18.2	957
LUAPULA	528	8.4	5313	84.2	168	2.7	301	4.8	6310
Chongwe	516	8.9	4870	83.5	300	5.1	141	2.4	5827
Kafue	937	39.5	1420	59.8	16	.7			2373
LUSAKA	1453	17.7	6290	76.7	316	3.9	141	1.7	8200
Chilubi					113	100.0			113
Chinsali	159	6.5	2038	83.5			242	9.9	2440
Isoka	291	42.8	217	31.9	172	25.3			679
Kasama	424	14.3	1904	64.2	318	10.7	318	10.7	2963
Luwingu			1008	100.0					1008
Mbala	583	20.2	1927	66.8	376	13.0			2887
Mpika	435	5.0	7224	83.8	558	6.5	408	4.7	8624
Mporokoso	56	5.3	921	87.5	76	7.2			1053
Mpulungu			1073	100.0					1073
Mungwi	256	12.4	1648	80.1	155	7.5			2059
Nakonde	616	28.4	916	42.3	633	29.2			2165
NORTHERN	2819	11.2	18877	75.3	2402	9.6	968	3.9	25066
Kabompo			237	63.4	137	36.6			373
Kasempa	484	43.2	303	27.0	334	29.8			1121
Mufumbwe	72	100.0							72
Mwinilunga	23	50.0	23	50.0					46
Solwezi	75	9.5	493	62.2			225	28.4	792
NORTHWESTERN	654	27.2	1056	43.9	470	19.6	225	9.3	2404
Choma	5226	62.9	2790	33.6	104	1.3	187	2.3	8306
Gwembe	761	42.9	1014	57.1					1775
Itezhi-tezhi	24	12.3	170	87.8					194
Kalomo	3985	37.0	5211	48.4	1333	12.4	251	2.3	10781
Livingstone			164	100.0					164
Mazabuka	5171	36.6	6718	47.1	2713	15.2	195	1.4	14257
Monze	3958	59.2	1830	27.4	896	13.4			6683
Namwala	645	57.7	483	42.8					1128
Siavonga	382	100.0							382
Sinazongwe			112	14.9	642	85.1			755
SOUTHERN	20151	45.4	18492	41.6	5148	11.6	634	1.4	44425
Kaoma	322	17.9	1273	70.6	103	5.7	103	5.7	1802
Mongu					69	100.0			69
Senanga			12	100.0					12
WESTERN	322	17.1	1285	68.2	173	9.2	103	5.5	1884
ZAMBIA	39699	21.9	116067	64.1	21237	11.7	4177	2.3	181180

Source: CSO/MAFF/FSRP 1999/00 Post Harvest Supplementary, 2001

Table A.2 The market share of government distributed fertilizer (tonnes) relative to commercial channels of distribution, Zambia, 1999/00

LOCATION	FERTILIZER DISTRIBUTION CHANNELS								
	Govt	Private traders	Out-grower firm	Other NGOs	Total distributed	Market Share (%)			
						Govt	Private traders	Out grower firms	
Chibombo	1,321.8	801.7	105.9	32.7	2,262.0	58.4	35.4	4.7	
Kabwe Urban	3.3	71.8	90.3	0.0	165.4	2.0	43.4	54.6	
Kapiri Mposhi	174.1	928.9	0.0	20.1	1,123.1	15.5	82.7	0.0	
Mkushi	297.5	943.2	0.0	364.4	1,605.2	18.5	58.8	0.0	
Mumbwa	159.6	703.8	153.3	128.1	1,144.7	13.9	61.5	13.4	
Serenje	39.8	271.8	0.0	117.5	429.1	9.3	63.3	0.0	
CENTRAL P	1,996.0	3,721.3	349.5	662.8	6,729.6	29.7	55.3	5.2	
Chililabombwe	0.0	254.1	0.0	0.0	254.1	0.0	100.0	0.0	
Chingola	39.0	351.0	0.0	29.7	419.7	9.3	83.6	0.0	
Kalulushi	39.7	182.7	0.0	57.6	280.0	14.2	65.2	0.0	
Kitwe	5.7	65.8	0.0	0.0	71.5	8.0	92.0	0.0	
Luanshya	16.7	216.4	0.0	3.0	236.0	7.1	91.7	0.0	
Lufwanyama	274.0	878.0	0.0	48.5	1,200.5	22.8	73.1	0.0	
Masaiti	183.4	591.2	0.0	30.0	804.7	22.8	73.5	0.0	
Mpongwe	55.9	101.0	0.8	49.9	207.7	26.9	48.7	0.4	
Mufulira	28.6	37.5	0.0	15.7	81.8	35.0	45.8	0.0	
COPPERBELT	643.1	2,677.6	0.8	234.5	3,556.0	18.1	75.3	0.0	
Chadiza	430.7	638.4	8.6	48.6	1,126.3	38.2	56.7	0.8	
Chama	45.3	6.6	0.0	38.6	90.4	50.0	7.3	0.0	
Chipata	2,044.7	2,713.1	825.9	307.4	5,891.1	34.7	46.1	14.0	
Katete	468.4	628.2	0.0	58.1	1,154.7	40.6	54.4	0.0	
Lundazi	655.9	899.2	7.8	18.9	1,581.8	41.5	56.8	0.5	
Mambwe	15.2	0.0	0.0	0.0	15.2	100.0	0.0	0.0	
Nyimba	87.6	0.0	0.0	0.0	87.6	100.0	0.0	0.0	
Petauke	1,082.1	450.5	23.6	61.9	1,618.1	66.9	27.8	1.5	
EASTERN	4,829.8	5,336.1	865.9	533.5	11,565.3	41.8	46.1	7.5	
Chiengi	0.0	11.5	0.0	0.0	11.5	0.0	100.0	0.0	
Kawambwa	91.4	62.2	0.0	48.0	201.6	45.3	30.8	0.0	
Mansa	119.1	142.6	0.0	11.6	273.4	43.6	52.2	0.0	
Milenge	72.0	40.4	0.0	0.0	112.5	64.1	35.9	0.0	
Mwense	59.4	8.2	0.0	0.0	67.6	87.8	12.2	0.0	
Samfya	37.7	52.7	0.0	0.0	90.3	41.7	58.3	0.0	
LUAPULA	379.6	317.6	0.0	59.7	756.9	50.2	42.0	0.0	
Chongwe	196.9	499.3	0.0	79.3	775.5	25.4	64.4	0.0	
Kafue	87.6	364.8	3.3	20.1	475.7	18.4	76.7	0.7	
LUSAKA	284.5	864.1	3.3	99.4	1,251.2	22.7	69.1	0.3	
Chilubi	11.3	0.0	0.0	0.0	11.3	100.0	0.0	0.0	
Chinsali	45.3	335.2	0.0	15.4	396.0	11.4	84.7	0.0	
Isoka	83.1	18.6	0.0	0.0	101.8	81.7	18.3	0.0	
Kasama	174.2	473.9	0.0	27.0	675.0	25.8	70.2	0.0	
Luwingu	0.0	29.5	0.0	0.0	29.5	0.0	100.0	0.0	
Mbala	343.4	137.6	0.0	0.0	481.0	71.4	28.6	0.0	
Mpika	152.8	470.2	148.5	120.1	891.5	17.1	52.7	16.7	
Mporokoso	60.3	63.1	0.0	19.1	142.5	42.3	44.3	0.0	
Mpulungu	0.0	115.7	0.0	0.0	115.7	0.0	100.0	0.0	
Mungwi	155.5	208.8	0.0	0.0	364.3	42.7	57.3	0.0	
Nakonde	306.2	200.1	0.0	25.0	531.2	57.6	37.7	0.0	
NORTHERN	1,332.1	2,052.8	148.5	206.4	3,739.8	35.6	54.9	4.0	
Kabompo	40.0	10.0	0.0	0.0	50.0	80.0	20.0	0.0	
Kasempa	10.0	10.6	0.0	5.3	25.9	38.7	40.9	0.0	
Mwinilunga	23.4	0.0	0.0	0.0	23.4	100.0	0.0	0.0	
Solwezi	78.1	25.4	0.0	0.0	103.6	75.4	24.6	0.0	
NORTHWESTERN	151.6	46.0	0.0	5.3	202.9	74.7	22.7	0.0	
Choma	2,045.7	2,241.7	0.0	66.6	4,354.0	47.0	51.5	0.0	
Gwembe	182.6	70.4	0.0	22.8	275.8	66.2	25.5	0.0	
Itezhi-tezhi	13.7	0.0	0.0	0.0	13.7	100.0	0.0	0.0	
Kalomo	1,650.0	646.7	13.5	188.8	2,499.0	66.0	25.9	0.5	
Livingstone	8.1	15.3	0.0	2.4	25.9	31.4	59.2	0.0	
Mazabuka	2,095.6	828.6	0.0	302.5	3,226.7	64.9	25.7	0.0	
Monze	1,069.7	100.6	0.0	172.8	1,343.2	79.6	7.5	0.0	
Namwala	258.7	55.8	0.0	147.1	461.7	56.0	12.1	0.0	
Siafonga	166.7	0.0	0.0	0.0	166.7	100.0	0.0	0.0	
Sinazongwe	48.1	0.0	0.0	25.7	73.8	65.2	0.0	0.0	
SOUTHERN	7,538.8	3,959.3	13.5	928.8	12,440.3	60.6	31.8	0.1	
Kaoma	107.9	110.6	0.0	0.0	218.5	49.4	50.6	0.0	
Mongu	2.9	0.0	32.4	0.0	35.3	8.3	0.0	91.7	
WESTERN	1109	110.6	32.4	0.0	253.8	43.7	43.6	12.8	
ZAMBIA TOTAL	17262	19082	1410	2726	40480	42.7	47.1	3.5	

Source: CSO/MAFF/FSRP 1999/00 Post Harvest Supplementary, 2001

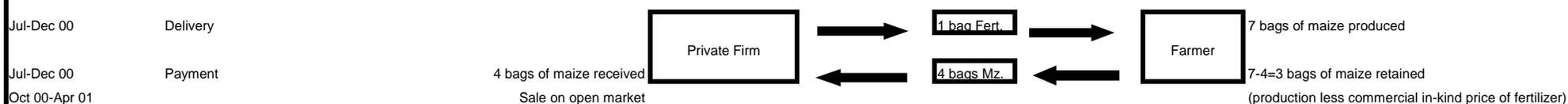
APPENDIX B: Possible Effects of Government Fertilizer Programs on Maize Marketing

Figure B.1. Possible Effects of Government/FRA Fertilizer Sales on the Maize Market, Comparing Government and Private Sector Sales

Assumptions:

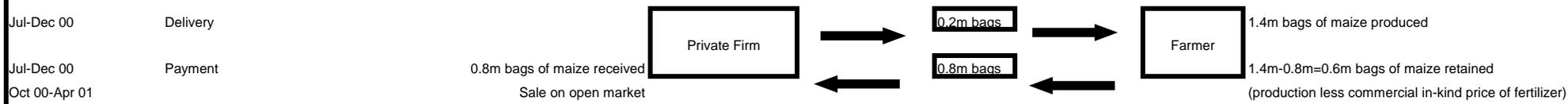
Private firm's price of fertilizer = 4 bags (50kg) of maize
 FRA's price of fertilizer = 3 bags (50kg) of maize
 Each bag of fertilizer produces 7 bags (50kg) of maize (FAO, 1998)
 Subsidy/direct price differential = 1 bag (50kg) of maize per bag of fertilizer loaned
 Government fertilizer loan repayment rate = 50%
 In-kind payments are in maize and these payments eventually supply the urban markets
 FRA in-kind repayments in maize occur at the same general time period as private sector fertilizer sales, both cash sales and maize swaps.
 FRA and private firms sell maize to supply urban markets throughout the year, but mainly between December and April

Private firms selling 1 bag of fertilizer



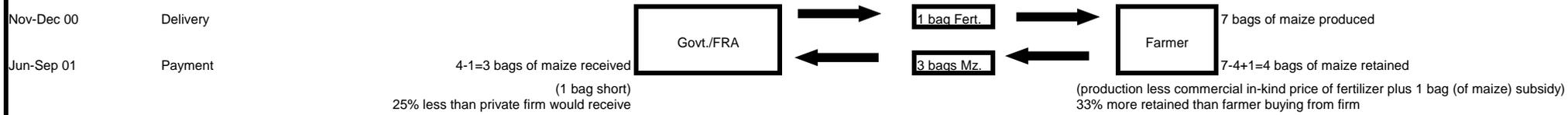
Notes: This scenario suggests that the farmer pays spot in-kind with 4 out of the 5 bags of maize (80%), harvested during the previous season, and is left with 20%. In-kind payment in maize comes from the previous season, unlike FRA repayments which come at the end of the same season.

Private firms selling 0.2 million bags of fertilizer (10,000 MT)



Notes: This scenario assumes that the private sector sells 10,000 MT to smallholders. 0.8 million bags of maize are recovered as payment. 0.6 million bags are retained by the smallholder buyers for consumption or sale.

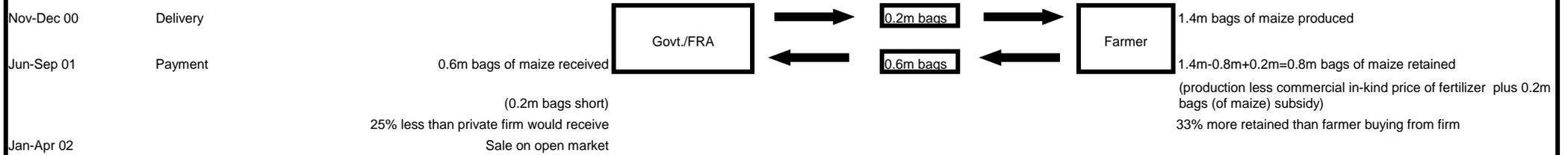
FRA selling 1 bag of fertilizer



Notes: This example suggests that the farmer pays FRA with 3 out of the 7 bags of maize that were harvested, and is left with 43% of his maize, 33% more than farmers who bought from firms. FRA receives 3 bags for onward sale, 25% less than a private firm would receive.

Figure B.1. Possible Effects of Government/FRA Fertilizer Sales on the Maize Market, Comparing Government and Private Sector Sales

FRA selling 0.2 million bags of fertilizer (10,000 MT)



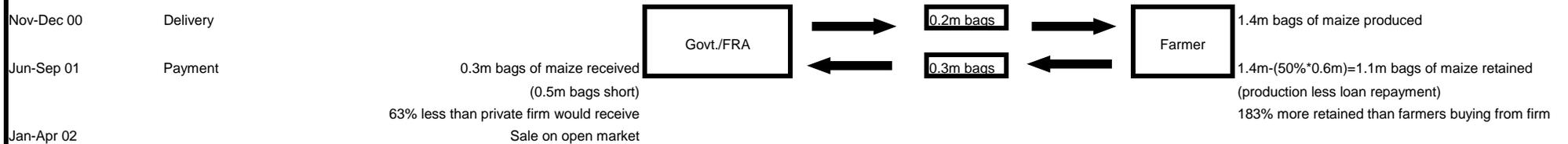
Notes: This scenario assumes that FRA distributes 10,000 MT of fertilizer to smallholders. 0.6 million bags of maize are recovered as payment, which constitutes 100% loan recovery.

Retentions of 0.8m bags of maize by fertilizer recipients, which is 0.2m bags (10,000 MT or 33%) higher than retentions by farmers who buy the same amount of fertilizer from the private sector.

FRA receives 0.6m bags of maize, which is 0.2m bags (25%) less than private firms would receive. Compared to commercial operations, FRA increases rural retentions/supply by 33%, while that constitutes only a 25% reduction in comparable urban private sector maize supply.

Therefore, disproportionate price differences between rural and urban maize can be expected, whereby rural prices drop disproportionately compared to an urban price increase.

FRA selling 0.2 million bags of fertilizer (10,000 MT) with 50% loan repayment



Notes: This scenario assumes again that FRA distributes 10,000 MT of fertilizer to smallholders. Only 0.3 million bags of maize are recovered as payment, which constitutes 50% loan recovery.

Retentions of 1.1m bags of maize (55,000 MT) by fertilizer recipients are 0.5m bags (25,000 MT or 183%) higher than retentions by farmers who buy the same amount of fertilizer from the private sector.

FRA receives 0.3m bags of maize, which is 0.5m bags (63%) less than private firms would receive. FRA almost triples rural retentions/supply as compared to what it would be under commercial conditions, while that would constitute only a 63% reduction in urban maize supply.

Therefore, further disproportionate price differences between rural and urban maize can be expected, whereby rural prices drop disproportionately compared to an urban price increase.

Appendix C: Fertilizer Marketing Cost Build-up Analysis

Table C.1 Estimated Price Structure for Urea Imported Through Durban, into Zambia 1999/2000

	US\$/ton	ZK/ton	ZK/Bag	% of Farm Price
1. FOB Western Europe ports, bulk	100	250000	12500	28.1
2. Ocean transport to Durban	30	75000	3750	8.4
3. Insurance and import duty	3.3	8250	413	0.9
4. CIF Durban (rows 1+2+3)	133.3	333250	16663	37.4
5. Port Charges	5.5	13750	688	1.5
6. Bags and bagging	17	42500	2125	4.8
7. Handling onto truck	5	12500	625	1.4
8. FOT Durban (rows 4 to 7)	160.8	402000	20100	45.2
9. Road Transport Durban - Lusaka	90	225000	11250	25.3
10. CIF Lusaka (rows 8+9)	250.8	627000	31350	70.4
11. Bank charges	7.5	18750	938	2.1
12. Customs clearing and documentation	2	5000	250	0.6
13. Cost of unloading	5	12500	625	1.4
14. Damages and losses	2.5	6250	313	0.7
15. Cost into Lusaka Warehouse (rows 10 to 14)	267.8	669500	33475	75.2
16. Transport costs to Distributor in Choma	17.0	42600	2130	4.8
17. Handling Costs	1.0	2400	120	0.3
18. Interest Charges	2.7	6750	337	0.8
19. Losses	2.7	6750	337	0.8
20. Storage Costs	4.0	10000	500	1.1
21. Labor, security, utilities	4.0	10000	500	1.1
22. Cost into Distributor (Rows 15 to 21)	299.2	748000	37400	84.0
23. <i>Distributor's margin (Row 25 minus Row 15)</i>	28.3	70745	3537	7.9
24. <i>Distributor's % Mark - Up [(25-15)*100/15]</i>	10.6	10.6	10.6	
25. Distributor's Observed Price	296.1	740245	37012	83.2
26. Transport costs to Retailer in Macha	12.8	32000	1600	3.6
27. Handling costs	1.0	2400	120	0.3
28. Interest Charges	2.7	6750	337	0.8
29. Losses	3.0	7529	376	0.8
30. Storage Costs	2.0	5000	250	0.7
31. Labor, security, utilities	1.5	3750	187	0.4
32. Costs into Retailer (Rows 24 to 30)	319.1	797674	39883	89.8
33. <i>Retailer's margin (Row 35 minus Row 25)</i>	52	129755	6488	14.6
34. <i>Retailer's % Mark-Up [(Row35-25)*100/Row 25]</i>	17.6	17.6	17.6	
35. Retail Observed Price	348.0	870000	43500	97.8
36. Cost to farm	8.0	20000	1000	2.2
37. Farm Gate Price	356.0	890000	44500	100.0

Rate of Exchange Oct 1999: ZK/US\$ = 2500

Source: Rapid Appraisal of Fertilizer Traders in Selected Districts, FSRP, Zambia, 2000

Table C.2 Estimated Price (US\$/ton) Structure for Urea Imported Through Beira into Zambia, April 1999.

	Low Estimate	% of farm price	High Estimate	% of farm price
1. Fob Western Europe ports, bulk	90.0	25.2	105.0	29.4
2. Ocean transport to Beira	25.0	7.0	30.0	8.4
3. Insurance and import duty	2.5	0.7	2.5	0.7
4. CIF Beira (rows 1+2+3)	117.5	33.0	137.5	38.6
5. Port charges	15.0	4.2	20.0	5.6
6. Handling onto rail	1.5	0.4	1.5	0.4
7. FOT Beira (rows 4+5+6)	134.0	37.6	159.0	44.6
8. Rail transport to Lions den	25.0	7.0	25.0	7.0
9. Handling	3.0	0.8	3.0	0.8
10. Bags and bagging	10.0	2.8	10.0	2.8
11. Road transport Lions Den to Lusaka	25.0	7.0	28.0	7.9
12. CIF Lusaka (rows 7+8+9+10+11)	197.0	55.2	225.0	63.1
13. Bank charges	4.1	1.1	4.6	1.3
14. Customs clearing and documentation	2.5	0.7	2.8	0.8
15. Handling off-loading	1.5	0.4	1.5	0.4
16. Damages and Losses	5.1	1.4	5.8	1.6
17. Cost into Lusaka Warehouse (rows 12 to 16)	210.2	58.9	239.7	67.2
18. Transport costs to distributor in Choma	18.7	5.3	18.7	5.2
19. Handling costs	1.0	0.3	1.0	0.3
20. Interest Charges	7.2	2.0	8.1	2.3
21. Damages and Losses	2.1	0.6	2.4	0.7
22. Storage Costs	14.0	3.9	14.0	3.9
23. Labor, security, utilities	4.0	1.1	8.0	2.2
24. Cost into Distributor (rows 17 to 23)	257.2	72.1	292.0	81.9
25. <i>Distributor's margin (rows 27 less 17)</i>	69.8	19.6	40.3	11.3
26. <i>Distributor's % mark-up (25*100/17)</i>	33.2	9.3	16.8	4.7
27. Distributor's observed price	280.0	78.5	280.0	78.5
28. Transport cost to retailer in Mbabala	4.0	1.1	4.0	1.1
29. Handling costs	1.0	0.3	1.0	0.3
30. Interest Charges	7.2	2.0	8.1	2.3
31. Damages and Losses	2.8	0.8	2.8	0.8
32. Storage Costs	14.0	3.9	14.0	3.9
33. Labor, security, utilities	4.0	1.1	4.0	1.1
34. Costs into retailer (rows 27 to 33)	313.0	87.8	313.9	88.0
35. <i>Retailer's margin (rows 37 less 27)</i>	68.6	19.2	68.6	19.2
36. <i>Retailer's % mark-up (35*100/27)</i>	24.5	6.9	24.5	6.9
37. Retailer's observed price	348.6	97.8	348.6	97.8
38. Transport cost to farm	8.0	2.2	8.0	2.2
39. Farm Gate Price	356.6	100.0	356.6	100.0

Rate of exchange Oct 1999:ZK/US\$ = 2500

Source: Rapid Appraisal of Fertilizer Traders in Selected Districts, FSRP, Zambia, 2000

Table C.3 Estimated Price Structure (ZK/Bag) for Urea Imported Through Durban, into Zambia Simulating Reduction in Fuel tax and Elimination of Reshipment, 1999/2000

	Reshipment	67 % cut in Fuel Tax	Partial Reshipment	No Reshipment
1. FOB Western Europe ports, bulk	12500	12500	12500	12500
2. Ocean transport to Durban	3750	3750	3750	3750
3. Insurance and import duty	413	413	413	413
4. CIF Durban (rows 1+2+3)	16663	16663	16663	16663
5. Port Charges	688	688	688	688
6. Bags and bagging	2125	2125	2125	2125
7. Handling onto truck	625	625	625	625
8. FOT Durban (rows 4 to 7)	20100	20100	20100	20100
9. Road Transport Durban - Lusaka	11250	11250	11250	11250
10. CIF Lusaka (rows 8+9)	31350	31350	31350	31350
11. Bank charges	938	938	938	938
12. Customs clearing and documentation	250	250	250	250
13. Cost of unloading	625	625	625	625
14. Damages and losses	313	313	313	313
15. Cost into Lusaka Warehouse (rows 10 to 14)	33475	33475	33475	33475
16. Transport costs to Distributor in Choma	2130	1940	0	0
17. Handling Costs	120	120	0	0
18. Interest Charges	337	337	337	0
19. Losses	337	337	337	0
20. Storage Costs	500	500	500	0
21. Labor, security, utilities	500	500	500	0
22. Cost into Distributor (Rows 15 to 21)	37400	37210	35150	0
23. Distributor's margin (Row 25 minus Row 15)	3537	3537	3537	0
24. Distributor's % Mark - Up [(25-15)*100/15]	10.6	10.6	10.6	0
25. Distributor's Observed Price	37012	37012	37012	33475
26. Transport costs to Retailer in Macha	1600	1456	1600	0
27. Handling costs	120	120	120	0
28. Interest Charges	337	337	337	337
29. Losses	376	376	376	376
30. Storage Costs	0	0	0	0.0
31. Labor, security, utilities	187	187	187	187
32. Costs into Retailer (Rows 24 to 30)	39633	39490	39633	34376
33. Retailer's margin (Row 35 minus Row 25)	6488	6488	6488	10025
34. Retailer's % Mark-Up [(Row35-25)*100/Row 25]	17.6	17.6	17.6	29.9
35. Retail Observed Price	43500	43500	43500	43500
36. Cost to farm	1000	1000	1000	1000
37. Farm Gate Price	44500	44500	44500	44500

Rate of Exchange Oct 1999: ZK/US\$ = 2500

Source: Rapid Appraisal of Fertilizer Traders in Selected Districts, FSRP, Zambia, 2000

Appendix D: Product and Financial Flows in fertilizer Trading in Zambia

Figure D.1 Flow diagrams of fertilizer from the primary source into Zambia and the channels of distribution by government and private firms to smallholder farmers in Choma District of Zambia, 1999/00

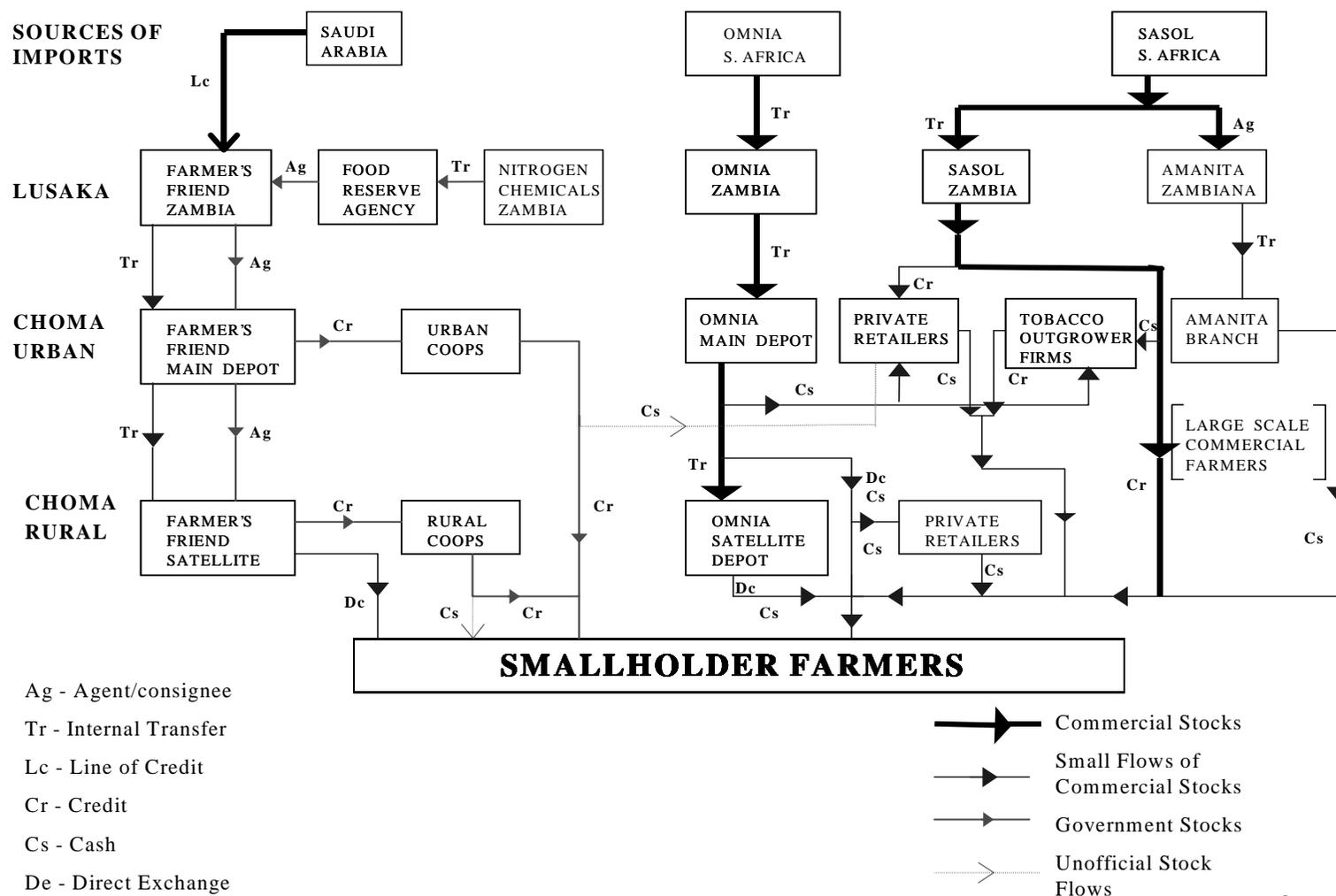
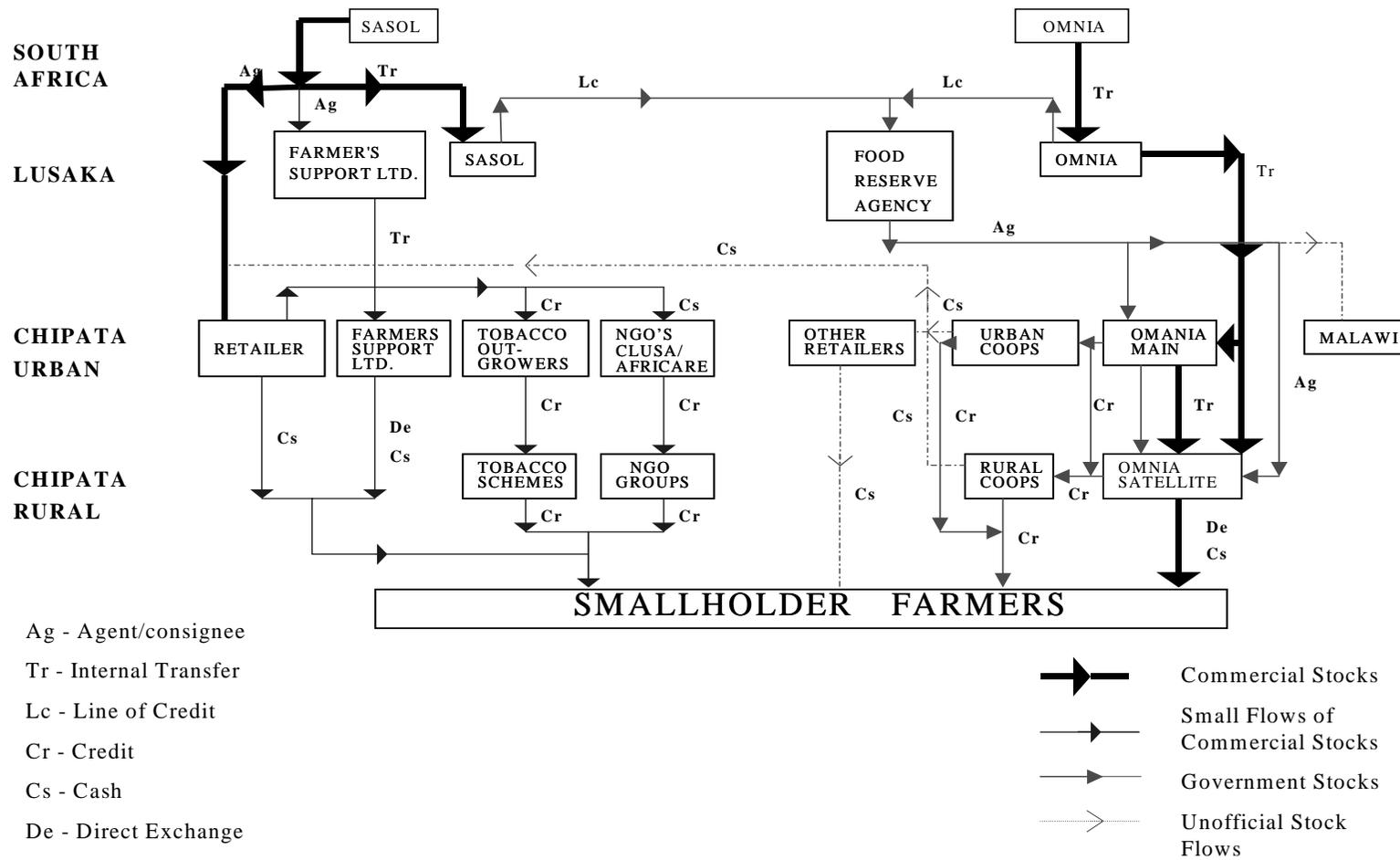


Figure D.2 Flow diagrams of fertilizer from the primary source into Zambia and the channels of distribution by government and private firms to smallholder farmers in Chipata District of Zambia, 1999/00



Appendix E: Research Procedures

The study locations were selected on the basis of observed demand for fertilizer use and the perceived profitability of using it. The production environments and access to both input and product markets play an important role in guiding demand and profitability of using fertilizer. The manner in which these factors were utilized to select target areas for rapid appraisal of traders is discussed next.

Selection of Agro-ecological Zones

The rapid appraisal survey of fertilizer traders was targeted at agro-ecological zone II and III. There is limited demand for fertilizer in zone I because the sorghum and millet cropping system utilizes limited amounts of purchased inputs. Private input retailers are expected to target their investment in locations that produce crops which utilize purchased inputs intensively, for example, maize and tobacco. The payoff to investing in input retailing is influenced by the crop choice or crop combinations prevalent in the area. Using 1997/98 Post Harvest Survey data from the Central Statistics Office, the total amount of fertilizer used in each district was estimated and the districts were then classified into three stratum: low, medium and high fertilizer use. Chipata and Choma were selected as high fertilizer use districts. Katete, Mansa and Mpongwe were selected as medium fertilizer use districts. Finally, Namwala, Kaoma and Nakonde were classified in the low fertilizer use districts.

Proximity to major consumption centers

The relative degree of remoteness from major market centers affects the value of outputs and cost of inputs. For fertilizer retailers, transport charges play a major role in the decision to invest or not invest in a fertilizer retail service. It would be expected that locations facing high transportation costs are associated with thin fertilizer markets. Both product and input markets grow thinner as you move away from the main roads and from major consumption centers. Private sector distribution systems are more likely to evolve quicker in areas close to main roads and consumption centers than locations that are distant.

In this survey we selected districts that were near and far from the main consumption center. Namwala, Mansa, Kaoma and Nakonde qualified as the isolated districts. Nakonde is 1020km from Lusaka, however the major market is across the border in Tunduma, Tanzania. Not only is Namwala 600km from Lusaka, the road linking Namwala to Lusaka is poor. Choma, Mpongwe and Chipata were relatively close to major towns. We expected to observe a lower number of fertilizer traders as the distance from the major consumption centers increased.

Trader Selection

The starting point in each of the District appraisal was to interview the Marketing, Entrepreneurial and Development Officer (MEDO) to execute the following steps:

Step 1

Develop a list of firms, traders and cooperatives by location who sold or handled fertilizer during 1999/00 season

Step 2.

Categorize the retailers and coops by some common mode of operation, that is, fertilizer depots, out-grower firms, sole traders or agent and non-governmental organizations. Depot managers sold

fertilizer on cash or exchange terms. In addition, some of the depot managers distributed fertilizer on credit to FRA cooperatives while others only handled their company stocks. Outgrower firms distributed fertilizer on credit to tobacco, paprika, sunflower growers as pre-harvest support and the fertilizer loan was recovered when the firm collected the product at the time of marketing. Sole traders were retailing fertilizer primarily on cash terms. These channels are not independent of each other, i.e., a depot manager can sell fertilizer to an outgrower who then distributes it to farmers on credit. Understanding the relationships between the fertilizer dealers in each district was crucial in coming up with a fertilizer flow diagram depicting the way fertilizer changed hands and the financial terms used between the parties involved.

Step 3

Obtain the agricultural block map for the district and list the firms and trading outlets or depots of fertilizer in each agricultural block. There was need to understand the organizational set up of each of these channels, for example, a firm operating depots had the main depot at the district center (BOMA) and satellite depots in outlying areas and mobile depots in remote areas. Outgrower firms had a head office/depot at the district center and satellite managers in the outlying areas. Sole traders were entirely confined to the district centers. There were no sole trader outlets selling fertilizer outside the district center in all districts except Mpongwe District. Mpongwe is unique because of the facilitative role played by CARE-International Rural Enterprise and Agribusiness Promotion project. The common fertilizer distribution channel operating outside the district centers was that of cooperatives. Cooperatives were of different strains. The majority of the coops were FRA coops formed in November 1999 to receive fertilizer. NGOs, for example, CLUSA, World Vision, Africare and ZNFU had their own groups or associations who also handled fertilizer that was privately procured. What was important was to show in each agricultural block, the types of distribution channels that operated in 1999/00 season.

Step 4

Identify the list of blocks that are most representative of the district i.e., the blocks have those characteristics that led to the district being chosen. Stratify the agricultural blocks into two strata guided by the transport cost to district center. The survey design wanted to capture the experiences of fertilizer operations in locations that are near and far from the district center. The demand for fertilizer and the profitability of using fertilizer varies within the district according to the distance from the center given that the center is the main market for both fertilizer and the outputs.

Step 5

Overlay each stratum of agricultural blocks over the Central Supervisory Area and Statistical Enumeration Area boundaries selected for the Post Harvest Survey conducted by the Census Statistical Office from 1994/95 to 99/00. Identify the agricultural blocks which overlap with the CSAs and SEAs selected for the Post Harvest Survey and target these agricultural blocks for the appraisal visits. The PHS data is at household level and could complement data obtained from the traders. Randomly select a block in each stratum that coincides with PHS sample site(s).

After executing steps 1 to 5, we obtained a list of fertilizer traders and cooperatives operating from:

- a. the District center or BOMA,
- b. an agricultural block far from the center
- c. an agricultural block close to the center.

We then set out to visit these blocks and administer our questionnaires to the sales manager or executive board of each firm and cooperative, respectively. Overall we interviewed 22 depot managers, 12 out-growers, 23 sole traders and 79 cooperatives. The composition in each district is shown in Table E1, below.

Table E1. The Composition of Respondents Interviewed During the rapid Appraisal Survey of Fertilizer Traders, Zambia, 2000.

Districts	Number of interviews conducted for each category				Total
	<i>Private traders</i>	<i>Depot based private traders</i>	<i>Out-grower firms</i>	<i>Farmer groups</i>	
Chipata	3	2	5	8	18
Choma	5	6	2	9	22
Kaoma	2	1	0	11	14
Katete	2	3	3	12	20
Mansa	3	1	0	12	16
Mpongwe	6	1	0	7	14
Nakonde	1	2	2	9	14
Namwala	1	6	0	11	18
TOTAL	23	22	12	79	136

Source: rapid Appraisal of Fertilizer traders in Selected Districts, FSRP, Zambia, 2000.

Survey Instruments

Individual questionnaires were developed to capture data on the operations of depot managers, out-grower firms, sole traders and cooperatives. Although there were common questions across these distribution channels, some of the operations were unique for each channel. The depot questionnaire had special questions inquiring about the procurement and distribution of the FRA fertilizer. Firms with a network of depots transferred fertilizer products between depots whilst sole traders made direct cash and/or credit purchases of fertilizer to stock their shelves. While out-growers operated as traders in some operations including procurement, they were not engaged in direct exchange or selling fertilizer for cash a common feature among traders and depot managers. All the cooperatives interviewed obtained fertilizer on credit. None of the cooperatives interviewed purchased fertilizer with cash or through direct exchange. Each of the distribution channels had unique components which led to the development of separate questionnaires for each channel. In the survey, there was a questionnaire developed for depot managers who handled FRA fertilizer. Depot managers who did not handle FRA fertilizer were interviewed using the sole trader questionnaire. The third questionnaire was developed for outgrowers and the final questionnaire was developed for cooperatives. Copies of the instruments are available on request.

Discussions with fertilizer importers were also structured. There were several subsequent discussions with the importers to get additional information on fertilizer cost build-up. A loosely structured questionnaire was also used to guide discussion with the District Agricultural Officers for each of the district visited. The District officers were responsible for facilitating in the development of FRA cooperatives and played an important advisory and supervisory role in procurement and distribution of fertilizer among cooperators.