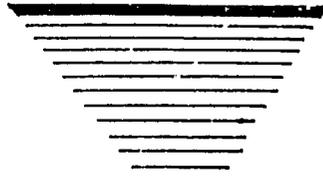


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A New Fertilizer Marketing System for Zambia



May 1989

The Ministry of Finance and
National Commission for Development Planning
and
Ministry of Agriculture and Cooperatives

in conjunction with the

Zambia Agricultural Training, Planning and
Institutional Development Project (ZAIPID II)
and the
International Fertilizer Development Center
(IFDC)

EXECUTIVE BRIEF

One of the principal objectives of the Fourth National Development Plan (FNDP) is the achievement of self-sufficiency in the production of basic staple food crops. This can only be achieved if Zambia's fertilizer marketing system adequately serves the needs of Zambia's farm population by providing the right types of fertilizer, at the right time, and at the right price. Providing the right type of fertilizer at the right time and at the right price will not only help Zambia's farmers increase production, but will also help achieve yet another FNDP objective of helping to help alleviate poverty among the economically disadvantaged and vulnerable groups within Zambian society. One concrete way to do this is by providing small farmers with the means of raising their incomes by increasing their access to affordable fertilizers in the most timely manner possible. The challenge which faces Zambia is how to meet self-sufficiency and poverty alleviation goals at the same time that Zambia reduces its budget and trade deficits.

In order to meet the three above-mentioned FNDP goals, the GRZ commissioned a study to identify the best possible means of meeting these goals. The GRZ recognizes that there is an urgent need to have an efficient and effective fertilizer marketing system in Zambia. The present non-centrally managed system is becoming a burden to the Government and people of Zambia. The present system suffers from deficiencies in terms of logistical problems, price subsidies, demand forecasting, fertilizer related policies, performance of the marketing functions and management techniques. It is conservatively estimated that in 1988 physical losses of fertilizers in the marketing system amounted to about K70.0 million and across the border sales to neighbouring countries amounted to 20,000 tonnes valued at about K76.0 million. Even more alarming is the fact that late fertilizer arrivals will reduce the 1989-90 maize yields by an estimated 5-10 bags per hectare. Increased food production and farmer income and reduced pressure on the national budget can be achieved through the implementation of a more efficient fertilizer marketing system. The recommended fertilizer marketing system (RFMS) will incorporate improvement in the areas of appropriate fertilizers, use, timely availability, organizational structure, institutional linkages, competition and pricing.

The efficient use of adequate amounts of the appropriate fertilizers is one of the keys to self sufficiency in food production in Zambia. Chemical fertilizers, because of their high concentration of the three primary nutrients plus sulfur, will always be critical to the performance of the agricultural sector. Organic fertilizers, crop rotations, green manures, alley cropping and liming are also viewed as playing a complementary role in the efficient use of chemical fertilizers. Recent research findings

also confirm that current high yield levels of crops cannot be maintained without the adaptation of a regular liming program to reduce soil acidity and supply calcium and magnesium. Zambia is fortunate to have a number of lime deposits and it is recommended that these be developed without delay. Zambia also has deposits of phosphate rock that may be utilized to help reduce the dependence on imported phosphates.

The actual demand for fertilizers in Zambia has not been established. In recent years there has not been a timely supply available to farmers. Fertilizer consumption in the past few years has been declining due to the lack of availability. It is estimated that only about 200,000 tonnes of fertilizers are currently being used in Zambia. Given timely fertilizer arrivals, it is estimated that use would increase by at least 8% per year. Zambian farmers are generally aware of proper fertilization practices and follow to a reasonable extent the Ministry of Agriculture and Cooperatives (MACO) recommendations for crop production. Although the subsidized price of fertilizers in Zambia favor sales across the border into Malawi, there is no documented evidence that the subsidized price levels have contributed to either excessive or careless use of fertilizers in Zambia.

Among the alternatives examined, one emerges as being best suited to service Zambia's fertilizer needs. For this system to work properly a centrally managed autonomous fertilizer marketing organization needs to have authority, responsibility and accountability for its operation and performance. It is recommended that the current system be restructured to better serve Zambia's agriculture and to increase operational and cost effectiveness.

Under the present system, NCZ would replace NAMBOARD as being the primary supplier of fertilizers within Zambia. NCZ would assume this role for several major reasons. First, as NCZ becomes fully operational when the rehabilitation of the Kafue plant is completed, NCZ will be better able to adjust import needs in accordance with its production capabilities in the quickest and cheapest manner possible. Given the size of Zambia's fertilizer needs relative to world market conditions, it is simply uneconomical for more than one buyer to procure Zambia's external fertilizer needs. Second, since NCZ specializes in fertilizers, it would be in a better position to more quickly identify the types of fertilizer that are both needed and are ecologically appropriate for Zambian farmers. It could thus ensure that the right types of fertilizers were being provided to the right provinces. Third, because of its limited storage capacity, there would be a greater incentive for NCZ to transport fertilizers to the provinces as soon as fertilizers are either produced or received from abroad. This would increase the likelihood that more fertilizers would be made available to small farmers in each of the

nine provinces, thereby helping the poorest of the poor to raise their incomes through increased production made possible by the timely availability of fertilizers. Fourth, with NCZ assuming the responsibility for determining when purchases should be made on the world market, rather than simply leaving this responsibility with the Tender Board, the GRZ could save precious foreign exchange by buying fertilizers when their prices are at their lowest possible level. Again, NCZ would be in the best position to move as expeditiously as possible to make these purchases as inexpensively as possible.

Under the recommended fertilizer marketing system (RFMS), NAMBOARD would discontinue all fertilizer operations. NCZ, because of its position in the fertilizer business, would become the apex organization in the marketing system and perform those marketing functions required in delivering fertilizer to the provincial level. Title to fertilizers will pass with the product as it passes from NCZ to the marketing channel members. When those marketing fertilizer take title and actually own the fertilizers, they will strive to be more efficient because of accountability and profit considerations. Marketing channels that are efficient and can do the best job of satisfying the farmers' demands for fertilizer and fertilizer-related services can be identified.

For the RFMS to operate as efficiently as possible, support is needed from many different organizations, each of which performs unique functions. NCDP, in close collaboration with NCZ, would continue to liaise with donors to plan for aid fertilizer supplies. It is suggested that a Fertilizer Information Unit (FIU) be established within MACO to provide accurate and timely market information to all of the entities involved in the fertilizer subsector. Similarly, it is recommended that a Technical Advisory Unit (TAU) be established to advise NCZ, NCDP, the Extension Service and others on technical matters related to fertilizers. The Extension Service will have the added responsibility of helping to educate retailers on fertilizer use.

Under the RFMS, marketing channels would be opened to allow such new members as other parastatals, private coops, and private firms to compete with the cooperative union. It is envisioned that ZCF would continue to be a principal downstream marketing organization, utilizing its extensive distribution network. However, present voids in the system would be filled by the other marketing channel members. In this way, increased competition would provide farmers with increased access to fertilizers and services. Farmers would have a choice of places to purchase fertilizers. The retailer that offers the best service will ultimately get more of the farmer's business and, through volume, can reduce prices.

Further, there is a strong business justification for providing farmers access to fertilizer at the same time and place where they procure other agricultural inputs. Private cooperatives and such organizations as NIEC Stores, LINTCO, ICI, etc. can fill these roles.

A pricing policy to support the recommended fertilizer marketing system needs to be designed. The pricing procedure should be based on actual costs and allow a sufficient margin for the marketing system to perform efficiently. In the short term, it is recommended that a uniform fertilizer price be established by calculating a weighted transportation and warehousing cost at each of the nine provincial warehouses. A margin to cover the cost of transportation, storage and doing business should be determined, thus producing a uniform price at the retail and farmer level. In keeping with the Fourth National Development Plan, a shift to a regional and then to a market determined pricing system is recommended when the marketing system matures. It is also recommended that the pricing policy be modified to allow for a systematic phasing out of the subsidy during a five year period, as called for in the Fourth National Development Plan. The impact of the subsidy removal would be to some extent reduced with timely product availability that will increase crop yields significantly. However, to further ease the impact of the subsidy removal, it is suggested that the credit system be fortified to meet the increased financial needs of farmers.

The RFMS, which will yield results that are consistent with the Government's Fourth National Development Plan, can only be successful if fully endorsed by the Government. This includes the assurance that foreign exchange is made available to NCZ on a timely basis for fertilizer procurement on the international market.

Moreover, it is important that the RFMS be phased in sequentially over a period of 15 months to allow sufficient time for planning and implementing. Since each component part is important and has its individual function to play, the system will not be complete without implementing it in its entirety. It is then, when all the components work together synergistically, that the Government, farmers and consumers of Zambia will truly benefit from this plan.

The potential benefits of the RFMS are very large indeed. It is conservatively estimated that the system will save Zambia up to K490 million annually when the system is fully implemented by 1992. Some of the savings that are possible include a foreign exchange saving of K130 million, yield loss reduction of K216 million, leakage reduction of K76 million, material loss reduction of K50 million, credit repayment of K30 million and working capital reduction of K10 million.

ACKNOWLEDGEMENT

The authors wish to acknowledge the excellent cooperation and assistance received during the collection of field data and verification of information presented in this report. Excellent cooperation was received from staff of those organizations visited as cited in Appendix I, Exhibit 3. Guidelines as given in the Fourth National Development Plan have been used in designing a new fertilizer marketing system specifically for Zambia. The authors expect that the new system when fully implemented will remove some of the major constraints to crop production and that more food will be produced more efficiently.



A Map of Zambia indicating neighbouring countries

ACRONYMS

DAO	District Agriculture Officer
DCU	District Cooperative Union
FAO	Food and Agriculture Organization of the United Nations
IFDC	International Fertilizer Development Center
MACO	Ministry of Agriculture and Cooperatives
MOF	Ministry of Finance
NAMBOARD	National Agricultural Marketing Board
NCDP	National Commission for Development Planning
NCZ	Nitrogen Chemicals of Zambia
NFC	National Fertilizer Committee
PAO	Provincial Agricultural Officer
PCU	Provincial Cooperative Union
TOR	Terms of Reference
USAID/ZAMBIA	United States Agency for International Development/ZAMBIA
ZCF	Zambia Cooperative Federation Ltd

TECHNICAL ABBREVIATIONS

A/N	Ammonium Nitrate
A/S	Ammonium Sulphate
BIP	Benchmark International Price
CAN	Calcium Ammonium Nitrate
CIF	Cost, Insurance and Freight
DAP	Diammonium Phosphate
ETA	Expected Time of Arrival
FOB	Free On Board
Ha	Hectare
K	Kwacha
LC	Letter of Credit
Mg	Magnesium
N	Nitrogen
Pot. Chloride	Potassium Chloride
Pot. Sulphate	Potassium Sulphate
S	Sulfur
SSP	Single Superphosphate
T	Metric Tonnes -
TSP	Triple Superphosphate
Wt. Avg.	Weighted Average

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I INTRODUCTION

The Government of the Republic of Zambia recognizes the important role that fertilizer plays in the production of food and fibre and the need for self-sufficiency. The Government has also expressed concern regarding the inefficiencies in the current supply system in making the right quantity of the appropriate fertilizers timely available to farmers in a cost effective manner; of particular concern is the supply to small scale farmers. The organizational framework required to manage the current fertilizer supply system is being challenged by the Government.

Due to the urgency and importance of these issues, the National Commission for Development Planning (NCDP) and Ministry of Agriculture and Cooperatives (MACO) commissioned a team to carry out a fertilizer sector study during the period March through May, 1989. The team was given a Terms of Reference (TOR) and mandate to develop plans of action that will, when implemented, overcome the constraints to efficient fertilizer marketing in Zambia. The constraints to efficient fertilizer marketing and recommendations to improve the system have been identified in many previous studies, (ie. Dutch 1989, MACO McPhillips 1987, FAO 1986, FAO/World Bank 1985, World Bank 1985 and MACO 1983). The study team, through field visits and interviews with organizations that are concerned with fertilizer marketing, reconfirmed the current constraints. The TOR, study team members, and organizations surveyed are cited in Appendix I.

An efficient fertilizer marketing system is essential for the continued development of Zambia's agricultural economy. More food is needed now. UNICEF reports that 60% of the infant mortality rate in Zambia can be attributed to malnutrition. The 1989 February issue of the "Economist" states that 48% of all Zambians lack access to a stable food supply. It further stated that of 433 children hospitalized in 1987 one fourth died of malnutrition. An efficient fertilizer marketing system will stimulate food production by making essential fertilizers and other inputs timely available to farmers. Not only will it provide essential inputs to increase food production it can also provide a place for the farmer to sell his surplus crop produce.

II FERTILIZER SITUATION

A. Consumption

Data related to fertilizer use in Zambia are actually estimates of NAMBOARD sales to the Provincial Cooperative Unions (PCU's) or direct to farmers. As indicated in tables 1 and 2, fertilizer use has declined 5 of the past 8 years and currently totals about 225,000 tons of product. Fertilizer nutrient use is estimated by the Ministry of Agriculture and NAMBOARD at 87,700 tonnes (T) in 1988 (table 3). The N:P2O5: K2O ratio is 1:0.4:0.15.

The most popular products sold by NAMBOARD are compounds (R, X, and D) urea, and ammonium nitrate; collectively, they account for about 90% of the total market (table 4). The product mix used by Zambia farmers is based upon official recommendations issued by the Research Department of the Ministry of Agriculture.

Maize is the principal crop planted in Zambia and accounts for about 90% of the fertilizer market. Other crops fertilized to a lesser extent include cotton, sunflower, sorghum, soybeans, groundnuts, wheat, and tobacco. Some pastureland is also fertilized.

The seasonality of fertilizer use is dictated by the cropping system and rainfall pattern. Zambia has a single cropping season with basal fertilizer applications beginning in late November and top dressing occurring in January and February. An estimated 95% of the fertilizer sales occur in November - February. The balance is used on the winter wheat crop or by vegetable gardeners.

The fertilizer market in Zambia is divided into 9 geographical regions. The most important regions in terms of fertilizer sales are the Eastern, Southern and Central provinces which account for about 65% of total sales (tables 5 and 6). The market is further segmented on the basis of small scale and commercial farmers. Small scale farmers reportedly account for about 60% of the market.

It should be noted that while NAMBOARD sales figures may be accurate, actual fertilizer use by Zambia farmers is probably significantly lower. The reasons for the variance include (1) carryover stocks held by commercial farmers and the cooperative unions are not precisely known, (2) losses, and (3) across the border sales to farmers in neighbouring countries. The extent of these factors is not known but is significant. Because of supply uncertainty and the expectation of sizeable price increases many

commercial farmers maintain an on farm inventory of one year's fertilizer requirements. The cooperative unions have only recently engaged in fertilizer marketing on a national scale and do not have an effective accounting system for fertilizers, and as such inventory levels are not known. The extent of losses after delivery to the provincial cooperative unions is estimated at 5% but may in fact be higher since the current system offers no incentive for efficiency in transport, handling, and storage. The leakage of Zambia fertilizers to neighbouring countries is significant, particularly in the case of Malawi where local prices are more than double prices in Zambia. The IFDC study team was in Malawi during October - December 1988 and observed a number of trucks and carts delivering Zambia fertilizer to Malawi farmers. The leakage to neighbouring countries is not precisely known but is estimated at 15,000 - 25,000 T per year. The net effect of all of the above factors is that NAMBOARD sales can be conservatively discounted by 15% - 20% to arrive at the quantity of fertilizer applied to Zambian soils and crops. Based upon NAMBOARD sales of 225,000 T in 1988, it is estimated that actual consumption was only about 185,000 T.

Because of the absence of reliable data on fertilizer use in Zambia, estimates of use were also made based upon estimated fertilization practices and the official fertilizer recommendations. In 1987, the total nutrient requirement (assuming all soils have a medium fertility level and all crops (soils) are fertilized at the recommended rate) was 189,800 T (table 7). An average product analysis of 39% yields a total of 486,700 T of fertilizer products. It is well known that all farmers do not fertilize at the recommended rate. Therefore, the agronomic requirement has been discounted to reflect the current fertilization practices of Zambian farmers. The following assumptions are made:

- Assumption:
- 1) 75% of land is cropped by small scale farmers
 - 2) 25% of land is cropped by commercial farmers
 - 3) 50% of small scale farmers fertilize at 60% of recommended rate
 - 4) 85% of commercial farmers fertilize at the recommended rate
 - 5) Agronomic requirement in 1987 was 486,700 T of product

Therefore: $0.75*(0.5*(0.6*486700)) + .25*(0.85*(1.0*486,700))$

$$109,507 + 103,423 = 212,930 \text{ T}$$

Based upon this analysis, fertilizer use is estimated at about 213,000 T of product.

Contrary to the concern voiced by officials in the fertilizer marketing system regarding the inefficiency of fertilizer use (ie wastage) by Zambian farmers, the study team found that fertilizers are highly valued by farmers and are basically being correctly applied. In fact, there appears to be a significant unsatisfied demand in the market place. The delayed arrival of fertilizers in 1989 only aggravated the already short supply situation.

Table 1: ZAMBIA FERTILIZER CONSUMPTION BY TYPE, 1980-88

PRODUCT/YEAR	1980	1981	1982	1983	1984	1985	1986	1987	EST. 1988
<u>TONNES OF PRODUCT</u>									
<u>COMPOUND</u>									
A(2-18-15)	58	4	18	6	6	0	34	0	0
C(6-18-12)	5429	6079	4164	2317	2498	4092	3292	6824	10000
V(4-18-15)	1509	2308	1426	748	1293	1193	802	1945	2000
R(20-20-0)	38977	41811	31762	17378	18648	22260	13460	22166	25000
X(20-10-5)	35534	29853	37853	28761	34440	26983	38173	48071	42000
D(10-20-10)	28921	35923	53366	43396	21689	57518	42388	63751	45000
OTHER(12-24-12)	0	0	0	0	724	214	47	0	0
<u>NITROGEN</u>									
A/N	24317	26458	21142	16265	11912	9375	6594	17820	18000
S/A	1294	1899	2303	261	116	972	62	0	1000
UREA	57171	64793	58764	52627	44425	76335	79389	72192	65000
NITRATE OF SODA	167	297	30	21	17	69	33	50	0
C.A.N.	0	0	0	0	1907	4786	1330	6672	6000
<u>PHOSPHATE</u>									
S/S	517	286	99	151	131	155	374	147	1000
T/S	2051	1919	622	667	336	749	1524	565	5000
<u>POTASH</u>									
P/S	78	185	64	61	167	80	7	7	100
P/C	141	105	44	110	47	64	2	14	500
MIXED T/S&S/S	0	12	86	627	0	156	0	0	0
LIME MIXTURE	0	0	0	0	441	126	10	103	0
GYPSUM & OTHERS	197	6859	6007	2403	5096	6053	3183	3497	4400
TOTALS:	196361	218791	217868	165798	143894	211180	190675	243824	225000

SOURCE: NAMBOARD

TABLE 2: FERTILIZER CONSUMPTION TRENDS IN ZAMBIA, 1980 - 88

	<u>N</u>	<u>P205</u>	<u>K20</u>	<u>Total Nutrient</u>	<u>Total Product</u>
	% Change				
1980	-	-	-	-	-
1981	8.7	7.2	9.8	8.4	8.2
1982	(6.1)	13.4	4.5	(0.5)	****
1983	(20.0)	(27.4)	(22.9)	(22.2)	(21.8)
1984	(12.7)	(18.0)	(16.7)	(14.5)	(13.3)
1985	41.3	32.6	80.0	42.2	42.7
1986	0.9	(11.8)	(17.3)	(3.9)	(6.4)
1987	15.0	44.8	47.8	24.3	27.7
1988	(9.0)	(4.6)	(14.1)	(8.5)	(7.8)

**** denotes negligible change

TABLE 3: APPARENT FERTILIZER CONSUMPTION IN ZAMBIA, 1980 - 88

	<u>N</u>	<u>P205</u>	<u>K20</u>	<u>Total Nutrient</u>	<u>Total Product</u>
	,000 TONNES				
1980	53.0	19.5	6.1	78.6	196
1981	57.6	20.9	6.7	85.2	219
1982	54.1	23.7	7.0	84.8	218
1983	43.3	17.2	5.4	66.0	166
1984	37.8	14.1	4.5	56.4	143
1985	53.4	18.7	8.1	80.2	211
1986	53.9	16.5	6.7	77.1	191
1987	62.0	23.9	9.9	95.8	244
1988	56.4	22.8	8.5	87.7	225

Source: Ministry of Agriculture and Cooperatives

TABLE 4: PRODUCT USE TRENDS IN ZAMBIA

<u>TYPE</u>	<u>1980</u>	<u>1984</u>	<u>1988</u>
	%		
"R"	19.8%	10.9%	11.1%
"X"	18.1	23.9	18.7
"D"	14.7	15.1	20.0
Urea	29.1	30.9	28.9
A/N	12.4	8.3	10.7
Other	<u>5.9</u>	<u>10.9</u>	<u>10.6</u>
TOTAL	100.00%	100.00%	100.00%
	=====	=====	=====

Source: Ministry of Agriculture and Cooperatives

TABLE 5 FERTILIZER SALES BY PROVINCE IN ZAMBIA 1986- 1987

<u>PROVINCE</u>	<u>1986</u>	<u>1987</u>
	Product Tonnes	
EASTERN	55,090	50,919
SOUTHERN	37,839	48,748
CENTRAL	53,552	55,457
NORTHERN	14,364	28,350
COPPERBELT	8,420	13,926
NORTH-WESTERN	2,537	4,116
WESTERN	6,612	6,574
LUSAKA	22,727	29,304
LUAPULA	3,849	6,422
TOTAL	204,990	243,816

Source: Ministry of Agriculture and Cooperatives

TABLE 6 FERTILIZER USE BY REGION AS A PERCENT OF TOTAL

<u>REGION</u>	<u>1986</u>	<u>1987</u>
	%	
EASTERN	27.0	20.9
SOUTHERN	18.5	20.0
CENTRAL	26.1	22.8
OTHER	28.4	36.3

Source: Ministry of Agriculture and Cooperatives

TABLE 7 AGRONOMIC REQUIREMENTS

<u>CROP</u>	<u>AREA HARVESTED, 1987</u> HECTARES	<u>NUTRIENT REQUIREMENTS PER HECTARE ASSUMING MEDIUM FERTILITY LEVEL</u>			<u>TOTAL AGRONOMIC REQUIREMENTS</u>		
		KGS			TONNES		
		<u>N</u>	<u>P205</u>	<u>K20</u>	<u>N</u>	<u>P205</u>	<u>K20</u>
MAIZE	808,000	130	50	15	105,000	40,400	12,120
CASSAVA	73,000						
COTTON	83,000	50	50	15	4,150	4,150	1,245
SUNFLOWER	40,000	50	35	15	2,000	1,400	600
SORGHUM	45,000	50	35	15	2,250	1,575	675
MILLET	43,000	50	35	15	2,150	1,505	645
GROUNDNUTS	56,000	25	50	25	1,400	1,800	1,400
RICE	13,000	55	80	15	715	1,040	195
WHEAT	4,000	120	60	25	480	240	100
SOYBEANS	20,000	13	40	25	260	800	500
					118,405	53,910	17,480

- ACTUAL USE VERSUS AGRONOMIC REQUIREMENTS -

	<u>N</u>	<u>P205</u>	<u>K20</u>
	-----	TONNES	-----
ACTUAL USE IN 1988	56.4	22.8	8.5
AGRONOMIC REQUIREMENTS:	<u>118.4</u>	<u>53.9</u>	<u>17.5</u>
ACTUAL AS A % OF REQUIREMENTS:	47.6%	42.3%	48.6%

ESTIMATED TONNAGE OF PRODUCT REQUIRED BASED UPON AGRONOMIC REQUIREMENT AND NUTRIENT CONTENT OF CURRENT PRODUCT MIX

I	AGRONOMIC REQUIREMENT (N+P205+K20)	=189,800
II	1988 AVERAGE PRODUCT ANALYSIS (N+P205+k2)	=39% NUTRIENT
III	TONNAGE IMPLIED (PRODUCT TONNES)	=486,700 TONNES
IV	ACTUAL TONNAGE USED 1988	=225,000 TONNES
V	ACTUAL USE AS A % OF AGRONOMIC REQUIREMENT	46%

B. The Economic Incentive For Farmers To Use Fertilizer

Based on information provided to the study team, there is a wide variation regarding the profitability of maize production in Zambia. For large scale farmers with heavy input costs (ie. machinery costs, working capital, etc.) maize may not be as profitable as it has been in the past and other crops are offering a better return; thus commercial farmers are shifting to such crops as seed maize, soybeans, sunflower, etc. For medium scale farmers with low input costs, maize production is still profitable. The small scale farmer with a relatively low level of investment finds maize production profitable.

Since maize accounts for 90% of the total fertilizer used and, in the small scale farmer sector virtually 100% of the fertilizer used is applied to maize, the best indicator for fertilizer profitability is on maize.

A crop production cost study carried out in 1986 by Krenz, R.D., et. al. on 52 commercial farms shows that cost of maize production on commercial farms was K76 per 90 kg bag. The variable and fixed costs were K56 and K20 per bag respectively. With maize priced at K55 per bag the farmers were not even covering their variable costs.

The following data compiled by the Farm Management Section, Department of Agriculture, in May, 1988, shows a per ha variable cost for 3 categories of farmers and the break-even maize production levels required to cover variable costs in 1988/89.

	<u>Emergent</u>	<u>Small Commercial</u>	<u>Large Commercial</u>
Variable Cost (Kwacha)	1,585	2,980	4,224
Price per Bag (Kwacha)	108	108	108
Break-even yield (Bags)	15	28	39

In this calculation, variable costs included are inputs, hired equipment cost, insurance, and labor. A fixed cost for land and working capital was not included. Assuming average maize yields of 30 bags per ha. for emergent farms who use fertilizer, and up to 90 bags per ha. for commercial farmers, maize production is now profitable.

However, the study team interviewed several commercial farmers with low input costs and they stated that their maize production cost in 1988/89 would be approximately K100 per 90 kg bag of grain delivered to NAMBOARD. (Transportation cost for maize and fertilizer represents approximately 50% of their cost.) Based on an expected yield of 85 bags per ha. a net profit of only approximately K680 per ha can be realized.

Another measure of the financial incentive farmers have for using fertilizer is the value cost ratio (VCR), (ie. the value of incremental output per kilogram of nutrient divided by value of incremental cost per kilogram of nutrient). With the exception of 1985/86, a favourable VCR of 4 to 5 has been maintained (Table 8). The VCR in 1985/86 was 8.4 and resulted from maize prices almost doubling while nutrient costs remained constant at K1.24 per kg of nutrient.

With a favourable VCR of 5.2 in 1988/89 maize production is very profitable.

TABLE 8: VALUE:COST RATIOS FOR HYBRID MAIZE 1984 - 1989

	Marginal Output (a) <u>kg</u>	Maize Price (b) <u>K/kg</u>	Value of Marginal Output (c) <u>K/50 kg</u>	Fert. Price (c) <u>K/50 kg</u>	Marginal Cost/kg Nutrients (d)	Value: Cost Ratio
1983/84	17	0.272	4.6	24.10	1.12	4.1
1984/85	17	0.315	5.4	26.75	1.24	4.4
1985/86	17	0.611	10.4	26.75	1.24	8.4
1986/87	17	0.867	14.7	72.50	3.37	4.4
1987/88	17	0.889	15.1	72.50	3.37	4.5
1988/89	17	1.200	20.4	84.64	3.94	5.2

(a) Based upon estimates by J. K. McPhillips, "The Lima" research of 10 bags maize per lima with 1 bag of compound X and 1 bag of ammonium nitrate (i.e. an increase of 8 bags of maize).

(b) Price of grade A maize based on 90 kg bag prices.

(c) Urea and Compound D used in calculation. Prices for each was K24.10 per 50 kg bag through 1985/86. An average price was used for years 1986/87 - 1988/89

(d) Determined on nutrient content since bags of fertilizers vary in percentages of nutrients.

C. Fertilizer Supply

Zambia derives its fertilizers from three sources - commercial imports, a local production facility, and donors (Table 9). In 1988, donors provided Zambia 141,371 T of fertilizer or 52% of the country's total supply.

Zambia has one fertilizer producer, Nitrogen Chemicals of Zambia (NCZ) which is a parastatal. The design capacities for the complex are as follows:

<u>Product</u>	<u>Design Capacity</u> (Tonnes of Product per Year)
Ammonia	97,680
Nitric Acid	126,000
Sulfuric Acid	60,000
Am. Nitrate	147,650
Am. Sulfate	50,000
Compounds	142,320

Raw materials for the plants include locally mined pyrites and coal and imported products (i.e. urea, DAP, potassium chloride, etc.) for the manufacture of compound fertilizers. Because of various problems, the plant's operating efficiency is less than 40%. Actual production totaled 80,543 T of product (mostly compounds) in 1988 (Table 9).

Commercial imports supplement domestic production and donor supplies. In 1988, commercial imports totaled 48,735 T of various products; urea accounted for about 70% of the total.

In looking to the future, it is expected that the NCZ plant will play an increasing role in supplying the fertilizer requirements of Zambian farmers. A plant rehabilitation program is now underway and when completed in late 1989 will increase capacity utilization to 80% of design. The expected production levels in 1990 are as follows:

<u>Product</u>	<u>Expected Production 1990</u> - Tonnes of product -
Am. Nitrate <u>1/</u>	50,000
Compounds	130,000

1/ produced as finished fertilizer.

If these production levels are realized, beginning in 1990/91 virtually all of Zambia's basal fertilizer requirements, as well as an increased share of the top dressing requirements, can be met by NCZ. However, it is expected that about 60,000-70,000 T of urea will continue to be required for top dressing. In addition the volume of raw material imports needed to sustain production at the NCZ will also increase with its improved operating rate.

TABLE 9: SOURCE OF SUPPLY FOR FERTILIZERS USED IN ZAMBIA

TYPE	<u>1986</u>				<u>1987</u>				1988			
	DONOR	LOCAL PROD.	COMM. IMPORTS	TOTAL	DONOR	LOCAL PROD.	COMM IMPORTS	TOTAL	DONOR	LOCAL PROD.	COMM. IMPORTS	TOTAL
<u>TONNES OF PRODUCT</u>												
<u>COMPOUNDS</u>												
C	4000			4000	3000				9000	9000		
V	2000			2000	1000				2200	2200		
R		4689	12000	16689		22485			28100	28100		
X	24000	24071		48071	15000	32099			15340	34408	49748	
D	10000	20775	24000	54775	29252	3247			12400	42266	1000	54666
OTHER												
<u>NITROGEN</u>												
AN		7739	5000	12739		10559			27000	3869		30869
UREA	47613		15000	62613	47581				31831		35500	67331
CAN									15500			15500
OTHER										2680	2680	
<u>PHOSPHATE</u>												
TSP												
SSP											6500	6500
OTHER					200						1300	1300
<u>POTASH</u>												
MOP												
S.P.											650	650
											130	130
OTHER										975	975	
TOTAL	87613	57274	56000	200887	96033	68390			141371	80543	48735	269469

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III CURRENT FERTILIZER MARKETING SYSTEM

A. Overview

The current fertilizer marketing system is conceptualized in figure 1. There are 14 different institutions involved in supplying the Zambian farmer fertilizers. The National Fertilizer Committee, with a representative of each of the various institutions involved in fertilizer related decision making, serves as the overall coordinating body for the fertilizer subsector. The individual institutions involved are as follows: MACO, NAMBOARD, NCZ, ZCF, PCM'S, Commercial Farmers Bureau, Mt. Makulu Research Station, National Tobacco Company, Tobacco Board of Zambia, Tobacco Association of Zambia, MINEX, MOF, Bank of Zambia and Indeco. The sequence and functions carried out by each organization can be described on the following basis.

B. Forecasting Sales

Theoretically, farmers are surveyed on fertilizer requirements for the next cropping season by the organizations that makes sales to them. Sales are made to farmers by Nitrogen Chemicals of Zambia (NCZ), National Agricultural Marketing Board (NAMBOARD), Provincial Cooperative Unions (PCU's), District Cooperative Unions (DCU's), Primary Societies, and Rural Depots. These organizations estimate the next year's sales and forward their requirements to the National Fertilizer Committee. The committee, upon receiving advice from NAMBOARD, MACO and ZCF approves the final demand forecast. In actual practice, sales forecasts appear to be based on tonnage sold during the past season(s) and adjusted to reflect a small growth rate. Estimated requirements for the 1988/89 season amounted to 344,725 T as compared to estimated sales of 225,000 T.

C. Procurement

Based upon discussions with donors and NCZ and National budget limitations on direct imports, the National Fertilizer Committee determines supply sources to meet fertilizer requirements. NCZ estimates annual production and the quantity of products it can supply. This quantity is deducted from the annual requirement. The committee then polls the donors and requests a commitment on supplies. The donor supply is then deducted from the annual requirement. The National Fertilizer Committee then adjusts and approves the quantity to be imported commercially. The annual fertilizer requirement is approved by the committee and is referred to as the allocation. The approved allocation is sent to NAMBOARD for action. NAMBOARD is responsible for procuring the short fall from commercial sources on the international market. The fertilizer supply can be illustrated as:

TOTAL ESTIMATED	=	NCZ	+	Donor	+	Commercial	+	Available
SALE		Production		Tonnage		Imports		Inventory

The Ministry of Finance (MOF) is notified regarding the fertilizer allocation and a request for foreign exchange and financing is made. After approval is obtained from the MOF, NAMBOARD notifies the Tendering Board of a forthcoming tender. NAMBOARD then prepares a tender, (i.e. product specification and quantities, bagging, shipping conditions, etc.) and gives to the Tender Board for floating a tender. Bids are then received by the Tender Board and sent to NAMBOARD for analysis and approval. The approved bids are in turn sent back to the Tender Board for awarding contracts for supply. NAMBOARD proceeds to open a Letter of Credit (LC) with the Commercial Bank to cover the cost of the fertilizer.

Commercial fertilizer imports are contracted for on a CIF Lusaka basis. Any demurrage costs resulting from delays in unloading at ports are borne by the suppliers. Zamcargo handles all port clearance activities for fertilizers arriving in Dar es Salaam. While the study team was unable to observe their performance in Tanzania, discussions with management staff in Zambia suggest only a moderate concern regarding the loss levels. The loss levels are in fact excessive and one would expect that this would be of major interest to anyone involved in the marketing system. Following port clearance, any additional costs above those contracted for transportation to Lusaka are for the account of the supplier. All imports into Zambia are by rail. See Appendix I, a map of Zambia showing Railroads, and major Highways and Cities.

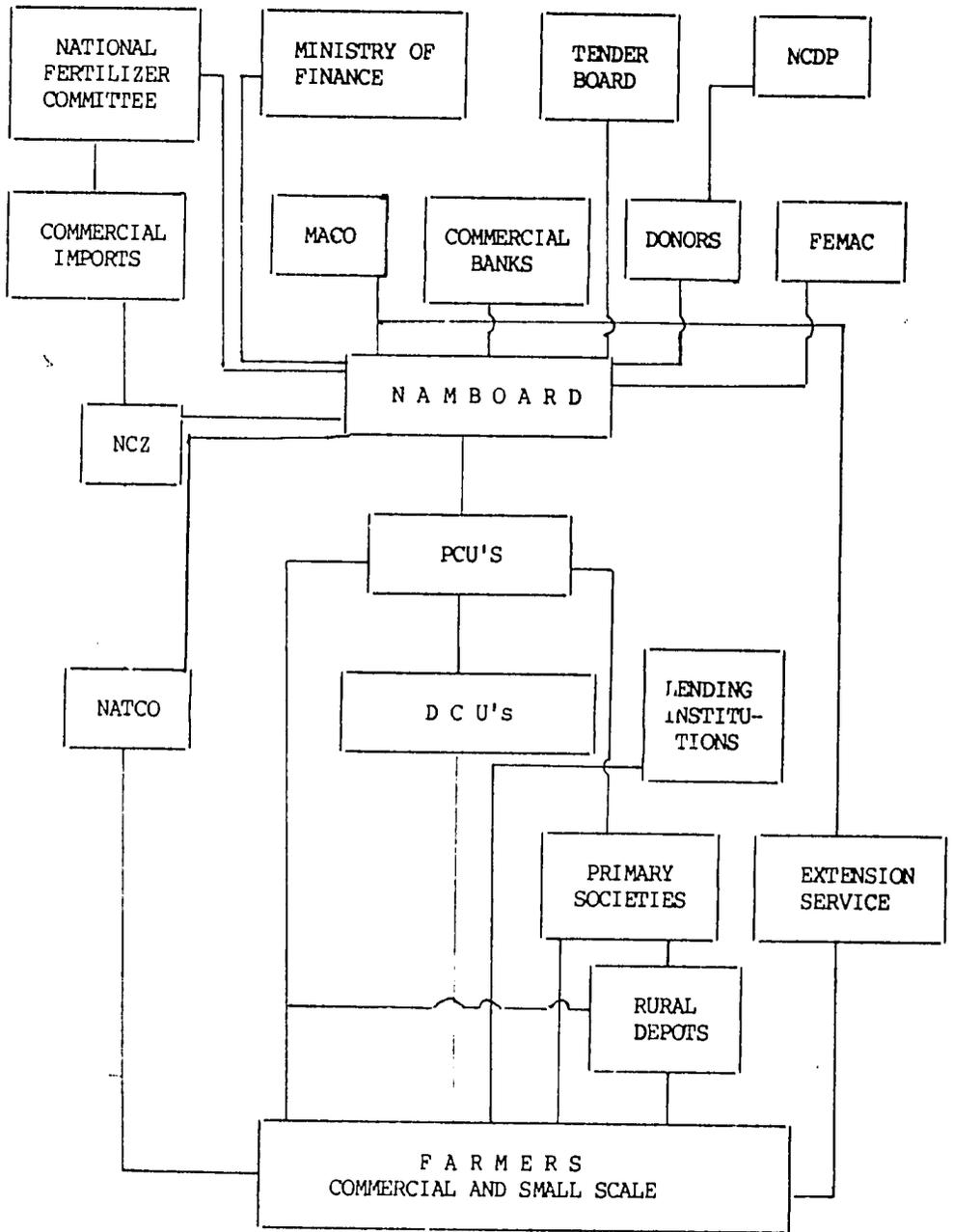


Figure 1: CURRENT FERTILIZER MARKETING SYSTEM AND INSTITUTIONAL LINKAGES

The pipeline time for sales forecasting, tendering and transporting fertilizer to farmers is estimated at 18 months.

NCZ determines its raw material requirements to meet production schedules and obtains them from either donors or through commercial imports. Financing for commercial imports is arranged with the MOF. Purchases and importation of the raw materials are handled directly by NCZ.

In 1988, about 188,000 T of fertilizers were shipped from various ports of discharge worldwide to Zambia (Table 10). With the exception of a small tonnage procured from Zimbabwe, most of the fertilizer was channeled through the port of Dar es Salaam. Of the total tonnage shipped, only 136,000 T had actually arrived in Zambia as of March 3, 1989 (Table 10). An estimated 45,000 T were considered in transit (24% of total shipped), 4,800 T were lost (2.6% of total shipped) and damaged material is estimated at 1,500 T (1.3% of total shipped).

As previously indicated, Zambia's imports are comprised of donor suppliers (75%) and commercial imports (25%). Donor supplies are usually tendered for during March - June and generally arrive in Zambia prior to November. Of the total quantity of donor fertilizer reportedly shipped for the 1988 use season, 80% had arrived by March 3, 1989. Recognized losses on donor supplied material are about 2.5% of the quantity received.

Commercial imports for the 1988 use season were expected to total 45,589 T. However only about 52% of the total had been received by March 3, 1989, and losses as a percent of arrivals are estimated 6%. The losses are excessive and the late arrivals (mostly urea) resulted in top dressing material being in short supply for the 1988/89 cropping season. Further, the late arrival of fertilizer means that the material will remain in inventory for an additional 6 months, incurring the associated storage and working capital costs.

The lapse time from the date of fertilizer shipment to arrival in Zambia varies depending upon (1) port congestion at Dar, (2) rail vehicle availability for movement to Zambia and (3) shipping contract terms. As indicated in Table 11, the shipping time from Europe to Zambia is typically 25-35 days, meaning that under normal conditions, in order for fertilizer to arrive in time for the use season it must leave the port of discharge with sufficient lead time to allow arrival in Zambia and distribution to the rural depot level by October 1. The port congestion at Dar es Salaam and limited rail wagon availability for fertilizer haulage to Zambia are major bottlenecks in the system and are not expected to improve in the near future. This further magnifies the need to complete the tendering process earlier in this year. An additional development which contributed to the late arrival of fertilizer in 1988/89 was the Government's intervention in overriding existing contracts for fertilizer haulage. The Government required that due to the emergency of moving priority cargoes, (ie maize and wheat) all movement of non essential food stuff would be temporarily halted.

TABLE 10: ZAMBIA FERTILIZER IMPORT PROGRAM FOR THE 1988/89 CROP YEAR *

	<u>Quantity Shipped</u>	<u>Quantity Received</u> - Tonnes	<u>Losses</u> of fertilizer -	<u>In Transit</u>	<u>Damaged Fertilizer</u>
Commercial Imports	142,349	113,708	3,428	24,023	1,190
Donor supplies	<u>45,590</u>	<u>23,069</u>	<u>1,414</u>	<u>20,853</u>	<u>252</u>
Total	187,939	136,777	4,842	44,876	1,442

* as of March 3, 1989

Source: NAMBOARD

TABLE 11: IN TRANSIT TIME FOR FERTILIZER SHIPPED TO ZAMBIA VIA TANZANIA

<u>Donor/Source</u>	<u>Date Shipped</u>	<u>Eta</u>	<u>Time in Transit</u> - DAYS -	<u>Tonnage</u>
Japan	3/29/88	5/10/88	43	14331
Japan/Zimbabwe	5/30/88	5/31/88	1	2240
Norway	4/27/88	6/10/88	44	9982
Netherlands/Zimbabwe	6/27/88	6/28/88	1	5000
Sweden	-	6/23/88	-	12250
Netherlands/Zimbabwe	6/16/88	6/17/88	1	2200
Norway	6/18/88	-	-	1555
Norway/Zimbabwe	6/18/88	6/19/88	1	5000
Netherlands	6/18/88	-	-	-
Netherlands	6/29/88	-	-	-
Netherlands	-	-	-	-
Norway	8/11/88	9/1/88	21	-
Netherlands	8/23/88	10/8/88	46	8000
Italy	10/3/88	10/22/88	19	6587
Italy	9/14/88	10/6/88	22	2913
Italy	9/14/88	10/6/88	22	9006
Netherlands	10/31/88	12/3/88	34	990
<u>Commercial</u>				
Norway	9/29/88	10/6/88	8	35500
Norway	-	-	-	-
Belgium	10/24/88	11/28/83	35	259
U.K.	-	-	-	1380
Belgium	10/11/88	11/17/88	37	1300

Source: NAMBOARD

D. Physical Distribution

Fertilizers are channelled through NAMBOARD as shown in figure 2. Physical distribution from NAMBOARD can be made in two ways (a) directly to farmers (normally the large and medium size commercial farmers) and (b) to the PCU'S. Because of the limited rail network in Zambia most in country movement of fertilizers is by road. The current commercial transport rates are K1.45 for distances up to 100 km and K0.80 for distances over 100 km. Because of the poor road conditions and long delays in product loading/unloading truckers are reluctant to move short hauls as the longer hauls provide a more realistic profit.

The PCU'S physically move fertilizers in two directions, (a) to other member cooperatives and (b) directly to the farmers. The DCU'S likewise have two outlets for fertilizers, (a) to primary societies and (b) directly to farmers. The primary societies also have two outlets, (a) to rural depots (sub-depots) and (b) directly to farmers. The only outlet open to the rural depot is sale to farmers.

A major consideration in fertilizer marketing is product ownership as the fertilizer moves through the marketing system. Figure 3 depicts the title flow of fertilizers in the current marketing system. This contrasts with the physical flow of fertilizer in that NAMBOARD does not have physical control of the fertilizer even though it retains product ownership and is ultimately responsible for losses.

Title to the fertilizers passes from NCZ, donors and commercial suppliers to NAMBOARD. NCZ sells some fertilizers to commercial farmers at the factory gate. Title passes to the farmers at this location. Currently NAMBOARD takes title to fertilizers F.O.B., NCZ and F.O.R., Lusaka for commercial and donor imports. Title to the fertilizer stays with NAMBOARD. The fertilizer is passed to PCU'S at the NAMBOARD warehouses. The PCU'S act as sales agents on behalf of NAMBOARD. When the PCU'S, DCU'S, and rural depots sell the fertilizer to farmers, the title actually passes from NAMBOARD to the farmers.

The retailing function is primarily performed by the ZCF through its cooperative network. However, a retail function is also carried out by NCZ and NAMBOARD with fertilizer sales direct to farmers. It is estimated that 70% of the fertilizer sold is by the cooperative union, and the remainder by NAMBOARD. Although a number of organizations which appear well suited to handling fertilizers exist in Zambia, the Government's control of the marketing system is such that they do not have the opportunity to add fertilizer to their product mix.

The 1986 FAO fertilizer study indicated that the retail network included 1,070 depots and was adequate to serve the Zambian farmers. NAMBOARD reported to the study team that presently there are 856 rural depots. The study team found areas where additional retail outlets are needed as farmers have to travel distances greater than 30 km to purchase fertilizers. Additional depots or private stockists (retailers) are needed to fill such voids in the system.

The physical distribution of fertilizers within Zambia is a major bottleneck in the marketing system. The estimated fertilizer requirements, supply and shortfalls for 1988/89 are shown in the Appendix II, Table 1. Some PCU depots receive too much fertilizer and others receive too little. For example, only Chama in the Eastern Province, Serenje in the Central Province, and Ndola in the Copperbelt Province received basal dressing fertilizers even close to their estimated requirements. For top dressing fertilizers, only Mongu in the Western Province and Kalomo and Livingstone in the Southern Province received an amount nearly equal to their estimated requirements. As a result of the late arrival of imports, the over and under supply of top dressing fertilizer appears to be more erratic than for basal fertilizer. The Lusaka Depot received an overage of 14,980 T and Mkushi in the Central Province had a shortfall of 10,814 T of product. Another area of inefficiency in the distribution system is the reshipment of fertilizers from depot to depot and province to province to meet demand. Such reshipments not only contribute to delayed product arrivals and higher costs but also result in increased physical losses.

An ARPT input supply and demand survey, November 1988 on "Input Delivery For Maize - 1987/88 Season" found that in the Northern Province 28% of the farmers had not received basal dressing fertilizers by the critical planting date of December 15. The benefit of basal fertilizer is root development from the phosphate and in promoting initial plant development. When basal fertilizers are not available for up to three weeks after planting, yields may be reduced by 5 to 10 bags per hectare. Untimely supply of top dressing fertilizer can be just as costly. A timely supply of fertilizer is absolutely necessary to realize maximum crop yields.

The total warehouse storage capacity for fertilizer in Zambia at 237,000 T is adequate; however, it is not effectively positioned throughout the country to adequately serve all provinces. Provinces where additional storage may be required are Eastern, Northern, Central, Western, and Luapula.

Table 2 in Appendix II shows warehouse storage capacity by location and fertilizer sales in 1987. NAMBOARD has retained four warehouses, as indicated in the table at Monze, Natuseko, Chisamba, and Lusaka with capacity of 96,000 T. The remaining 141,000 T of storage is controlled by the ZCF. As indicated in the 1989 Dutch study, "Logistics of Fertilizer Distribution and Maize Haulage in Zambia" outside storage at the port and moving rail wagons without tarpaulins is a major problem. Also fertilizers are stored at warehouses outside with tarpaulins as cover. The tarpaulins occasionally are not timely received or are not adequate to protect the fertilizer against the rains. Further, in most cases the fertilizer is not placed on dunnage (boards) to serve as a moisture barrier. It appeared to the study team that warehouse management of the fertilizer could be improved in stocking, inventory turn over (first-in, first-out), return of tarpaulins for covering of fertilizer, etc.

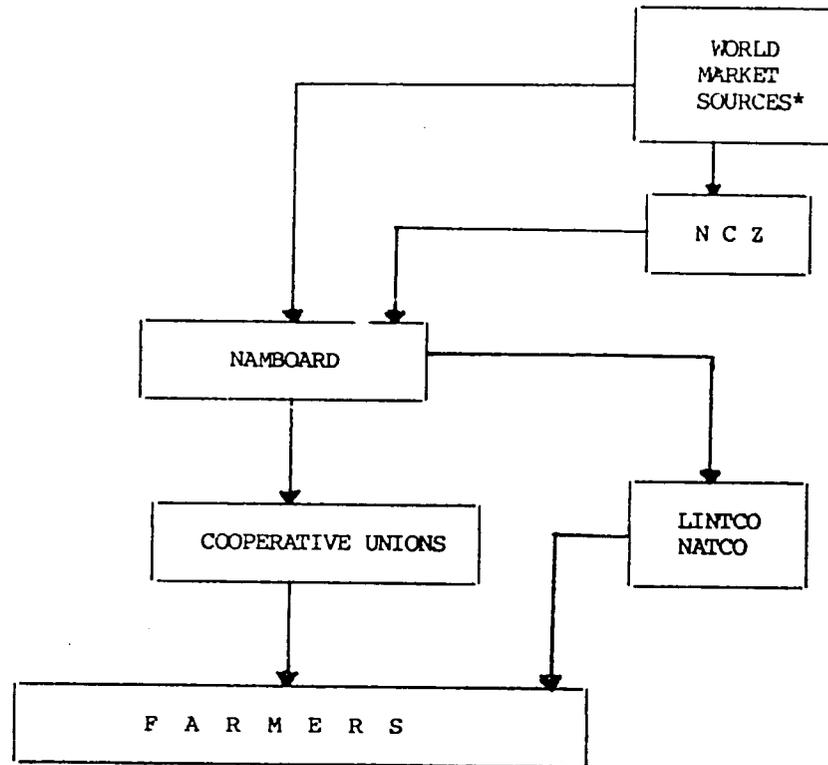


Figure 2: PRODUCT FLOW UNDER CURRENT FERTILIZER MARKETING SYSTEM

* Includes Commercial Imports and Donor Supplies

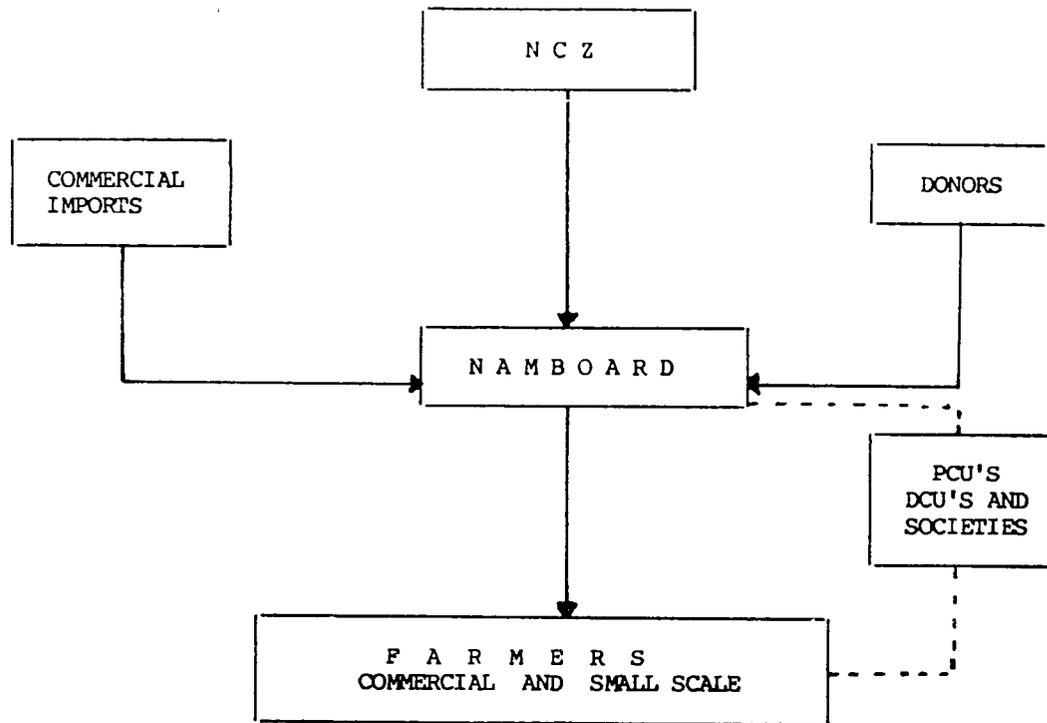


FIGURE 3: TITLE FLOW IN THE CURRENT FERTILIZER MARKETING SYSTEM

E. Pricing

The main characteristics of fertilizer prices in Zambia are (a) prices are controlled by the Government, (b) the pricing system is based upon a uniform price policy, and (c) a subsidy rate of about 50% is maintained.

The methodology used in establishing prices takes a number of factors into account and involves several steps including:

- (a) The national fertilizer requirements as estimated by the National Fertilizer Committee,
- (b) The quantities of fertilizer to be supplied by NCZ, donors, and via commercial imports,
- (c) The average cost per tonne of imported and locally produced fertilizers,
- (d) The Ministry of Finance indicates how much is available for fertilizer subsidies, and
- (e) MACO then calculates the selling price of fertilizer on the basis of what is available for subsidy.

However, the exact formula for setting prices is not known and does not appear to reflect supply and demand relationships and costs. The main considerations appear to be in keeping fertilizer prices as low as possible to farmers subject to national budget limitations. The pricing mechanism does not offer any financial incentive for market development nor does it encourage efficiency in the fertilizer marketing system.

Historically, prices have been adjusted fairly erratically as indicated in Table 12. Prices were relatively constant during 1984-86. However prices of all fertilizer products increased sharply in 1987, with the price of compounds up by 300% over 1986 level. The reasons for this sudden increase appear to be tied to the devaluation of the Kwacha and the general increase in international fertilizer prices. Further, as indicated in Table 13, the fertilizer price increase in 1987 actually resulted in an adjustment (whether planned or not) in the fertilizer: maize price relationship to that which existed in 1984 and 1985. Since 1987 the fertilizer:maize price relationship has trended in favour of farmers; (i.e. in 1987, 3.9 kg of maize was needed to purchase one kg of fertilizer nutrient). For comparative purposes, in Malawi 4.5 kg of maize is required to purchase one kg of nutrient at small holder fertilizer prices and 7 kg of maize is required to purchase one kg of nutrient at commercial farmer prices.

TABLE 12: FERTILIZER PRICES IN ZAMBIA, 1983/84 - 88/89

<u>FERTILIZER PRODUCT</u>	<u>1984</u>	<u>1985</u>	<u>1986</u>	<u>1987</u>	<u>1988</u>	<u>1989</u>
			- KWACHA PER 50 kg bag -			
"R"	24.10	26.75	26.75	80.00	80.00	92.00
"X"	24.10	26.75	26.75	80.00	80.00	94.83
"D"	24.10	26.75	26.75	80.00	80.00	98.27
Am. Nitrate	23.20	25.85	26.85	56.00	56.00	64.00
Am. Sulfate	22.55	25.20	25.20	48.00	48.00	53.00
Urea	24.10	26.75	26.75	55.00	65.00	71.00
SSP	22.50	25.15	25.15	50.00	50.00	71.50
TSP	25.80	28.45	28.45	64.00	64.00	77.00
Pot Chloride	21.10	23.75	23.75	55.00	55.00	69.50
Pot Sulphate	20.85	23.50	23.50	80.00	80.00	102.00

Since fertilizer prices are fixed at a uniform level to NAMBOARD, the ZCF, and farmers, the Government provides a allowance to partially offset the distribution costs incurred by NAMBOARD and the ZCF. Regardless of the efficiency level in minimizing costs and physical losses, the marketing channel members receive the established allowance. Both allowances are provided as a direct subsidy to the two organizations and are not reflected in the price of fertilizer.

TABLE 13: FERTILIZER AND CROP PRICE RELATIONSHIP

<u>Year</u>	<u>Maize Price</u> K per kg	<u>Fertilizer Price*</u> K per kg of nutrients	<u>Kg of Maize to Buy 1 kg of Nutrient</u>
1984	0.27	1.13	4.19
1985	0.32	1.25	3.90
1986	0.61	1.25	2.04
1987	0.87	3.40	3.90
1988	0.89	3.40	3.82
1989	1.20	4.00	3.33

* Average nutrient cost for compound D and Urea

F. Subsidy

The fertilizer sector in Zambia is heavily subsidized by the Government. The subsidy is contributing to inefficiencies in the market place, creating a major burden on the national budget, and encouraging across the border fertilizer sales to neighbouring countries.

Based upon data received from the MACO, the funds budgeted for the fertilizer subsidy in 1988/89 totaled 175,000,000 Kwacha. However, based upon information provided by NAMBOARD and ZCF the true subsidy is considerably higher. The total cost of fertilizer at the retail point of sale is estimated to range from Kwacha 2,675 per T to Kwacha 3,980 per T, depending upon the product, (Table 14). Meanwhile, after the subsidy, the retail prices paid by farmers range from Kwacha 1,060 per T to Kwacha 2,040 per T. The total cost of the subsidy is estimated at Kwacha 323,450,000 in 1988 or Kwacha 1,438 per T. The average rate of subsidy is 45%.

The subsidies are applied directly to NAMBOARD, ZCF and indirectly to farmers. All fertilizer produced by NCZ are sold to NAMBOARD at the estimated international market price (CIF Lusaka + 15%). The revenue from the sale of NCZ fertilizer is collected from NAMBOARD. Donor fertilizer, commercially imported fertilizer, and NCZ material are all transferred to ZCF on a consignment basis for sale to farmers at the official subsidized price.

NAMBOARD is reimbursed by the Government for (a) the difference between the CIF Lusaka price and the retail price (i.e. from Kwacha 650 to Kwacha 1550 per T) and (b) the handling allowance of Kwacha 400 per T. The ZCF also receives a direct reimbursement of Kwacha 200 per T from the Government for its role in distributing fertilizers. The current system places no premium on increasing efficiency in the performance of the marketing functions.

The fertilizer subsidy has resulted in retail prices being considerably below fertilizer prices in some neighbouring countries and this has contributed to a thriving market for Zambia fertilizers in the region. For example, Malawi commercial farmers pay more than double the prices paid by Zambian farmers for fertilizers (Table 15). The extent of across the border sale of Zambian fertilizer cannot be precisely known; but based upon observations at the Malawi border in November and December, 1988 it is significant. Zambia fertilizers are also being sold in Zaire and possibly Tanzania. Because of natural barriers such as the Zambezi River and long transport distances to the other bordering countries (ie Angola), it is unlikely that significant volumes are moving to the remaining neighbouring countries. The total amount of leakage is estimated at 15,000 - 25,000 T per year.

TABLE 14: ESTIMATED SUBSIDY ON FERTILIZER IN ZAMBIA - 1988/89

PRODUCT COMPOUND	ESTIMATED	NAMBOARD	ZCF	TOTAL	PRICE	SUBSIDY	TOTAL	TOTAL
	<u>COST*</u>	<u>ALLOWANCE</u>	<u>ALLOWANCE</u>	<u>COST</u>	<u>FARMER</u>		TONNES	<u>SUBSIDY</u>
	----- Kwacha per Tonne -----							(Kwacha)
C	2820	400	200	3408	1840	1568	10000	15,680,000
V	2820	400	200	3408	1800	1608	2000	3,216,000
R	2820	400	200	3408	1840	1568	25000	39,200,000
X	2820	400	200	3408	1897	1511	42000	63,462,000
D	2820	400	200	3408	1965	1433	45000	64,485,000
A/N	2075	400	200	2675	1280	1395	18000	25,110,000
S/A	2095	400	200	2695	1060	1635	1000	1,635,000
UREA	2237	400	200	2837	1420	1417	65000	92,105,000
CAN	2075	400	200	2675	1420	1255	6000	7,530,000
SSP	2200	400	200	2800	1430	1370	1000	1,370,000
TSP	2617	400	200	3217	1540	1677	5000	8,385,000
FOT. SUL.	3380	400	200	3980	2040	1940	100	194,000
FOT. CHL.	2940	400	200	3540	1390	2150	500	1,075,000
TOTAL							225,000	323,450,000

* C.I.F. Lusaka

Source: Based upon information received from ZCF, Namboard and MACO.

Table 15: COMPARISON OF RETAIL FERTILIZER PRICES IN ZAMBIA WITH PRICES IN MALAWI

<u>Product</u>	<u>Zambia price</u>	<u>Malawi Price 1/</u>	<u>Premium paid in Malawi</u>	<u>Difference 2/</u>
	-----Zambia	Kwacha per Tonne-----	-----	- % -
CAN	1420	3324	1904	134
UREA	1420	3402	1982	140
MOP	1390	3276	1886	136
SSP	1430	3097	1665	117

1/ Price paid by commercial farmers expressed in Zambian Kwacha

2/ Malawi price as a % of Zambia price

Source: Optichem Ltd. (Malawi) price list

G. Credit

Agricultural credit, whether in cash or in kind, is essential for development activities. It is a strong factor in encouraging small farmers to adopt new technologies for higher yields, and a powerful incentive to increase production and income. The smooth flow of credit is a complex process and therefore must be monitored to ensure firstly that it is reaching the intended recipients at the right price and secondly that it is rightly used, effectively recovered and sufficiently rechanneled. Too often, the credit delivery system is not viewed as a development project in itself, and hence its complexity is not fully comprehended by those responsible for its implementation, monitoring and evaluation.

Broadly, the agricultural credit system in Zambia consists of three major segments; the farmer, (borrower) the policy maker, and the institutional structure. The credit system in Zambia consists of farmers of all categories on the extreme, the policy makers (GRZ) on the other, with an institutional structure which comprises a number of private and government sponsored lending institutions in between. On a whole, the system does not flow smoothly because of a number of factors including (a) the lack of an effective link between end-users, especially small scale farmers, and credit intermediaries or primary lenders, (b) poor coordination between marketing systems and the credit system, (c) weaknesses in funding, organization, management and staffing of existing public lending institutions, and (d) lack of complementarity between lending operations and savings (except for the commercial banks).

The primary private sector lenders are the Commercial Banks (Barclays, Standard and Zambia National Commercial Bank). Commercial banks provide loans primarily for the commercial farmers. Much of this credit involves a seasonal line of credit or overdraft financing. Barclays and Zambia National Commercial Banks also have special loan programs for small farmers.

The Government sponsored and Parastatal lenders include the Zambia Cooperative Federation Limited (ZCF); The LIMA Bank; CUSA Zambia Limited; Lint Company Limited (LINPCO) and National Tobacco Company Limited NATCO).

As previously indicated, ZCF is heavily involved in downstream fertilizers marketing, including the provision of credit to qualified farmers. Credit is channelled through ZCF's subsidiary, the ZCF Finance Services. This body was created by the nine Provincial Credit Unions, with the Unions owning 45% of shares while ZCF owns 55%. The primary lending activity is seasonal loans to farmers (about 80 per cent of total loan volume) with the remainder being intermediate financing.

Credit to the Provincial Credit Union is through a Cooperative Credit Program (CCS). The CCS program involves block loans to local Unions which lend the funds to societies who in turn lend the funds to individual society members. Most funds are disbursed to small scale farmers (farm size averages about 2.5 hectares). Loans are made in kind rather than cash. Recovery rates are rather high, averaging 89%.

ZCF finance services does not meet the full fertilizer credit demand of the PCU members. Current demands, for example, are estimated at K200 million with the institution meeting less than 50% - (K92 million) for the current season. Credit is also not always provided at the right time for farmers to maximize its use. For one thing, the application to loan clearance decision-making period spans a full four months and many times longer. Even when credit is approved, the delivery of fertilizer cannot always be made due to bottlenecks in the marketing system.

ZCF's main sources of funds are: USAID, Swiss Funds, NGRAD, SIDA and GRZ. It charges 18% interest on loans of which 7% is re-invested, 4% is given to the Primary Societies, 3% to the Cooperative Unions, and 4% is retained by the Finance Services.

The Lima Bank started operations on June 1st, 1987. The Bank was incorporated under Companies Act with a minimal capital of K400 million on September 3, 1986, and it was registered as a Commercial Bank. The major objective put forward by the Government for setting up the Lima Bank was to rationalize and strengthen the provision of agricultural credit in the country. The Government also intends to make it the principal agricultural lending institution as well as being the official channel for the Government and international assistance to the agricultural and fisheries sectors. Shareholding in the bank is open to all interested investors both residents and non-residents.

Loans (short-term, and medium-term) are disbursed to all farmers (small, medium, and large scale farmers). Apportionment of loans and portfolio and farmer scale basis is as follows:

- (1) small scale farmers received an average 85% of the total allocation of funds (these are farmers who operate on 1-10 ha).
- (2) medium scale farmers receive an average 13% of the total allocation of funds.
- (3) large scale farmers receive an average 2% of the total allocation of funds (40 ha and above).

When distributing the loans in each province to the three categories of farmers, the above rates are used as percentages of the total provincial allocation of funds.

The Lima Bank took over a K285.00 million portfolio investment of which 80 per cent was in short term investment and the balance was in medium and long term investments for the season 1987. During that year, the Bank received a total of 77,258 applications valued at K815 million, of these 36,969 applications valued at K194 million were approved. In the 1988 season, 77,487 applications valued at K600.5 million were received, and only 42,121 applications valued at K260.7 million were approved. The majority of applications received and approved were from small scale farmers of which an estimated 20% was for fertilizer.

From the statistics indicated above, it is evident that the Bank has a lot to do in terms of mobilizing resources to meet the existing and potential demand for investment resources. The Lima Bank's current inability to meet the demand for credit is a result of the Government's incapacity to adequately fund the bank which is in its transitional phase.

The Credit Union, and Credit Cooperative Society, play an important role in meeting the demand for short-term and seasonal agricultural credit. CUSA came into force on March 1, 1972, under section 53 in part VII of the Cooperative Societies Act. Its objectives are:

- (1) to promote a thrift among its members and the creation of a source of credit for its members at controlled rates of interest, exclusively for provident or productive purposes.
- (2) to establish multi-purpose cooperative societies as media for the administration of agricultural credit, with funds borrowed in the first instance wholly or in part from Government lending institutions, with the possibility of gradual replenishment of such loan funds by a policy of "forced savings" on the part of borrowers, or using such societies as depositories for other savings of members as dealt with in section 33 to 38 of the Act.

CUSA has a five-year history of lending in Zambia, providing both short (seasonal) and medium/long term (3-5 years) loans to small and medium scale farmers mainly for housing, grinding mills and oxen. It is estimated that only about 15% of the loans are used to purchase fertilizer, and this is mainly by medium scale farmers. CUSA's credit recovery rate has averaged about 90% over the five-year period. The institution estimates that it is meeting only about 50% of credit demand annually.

CUSA Zambia had granted loans for short and long terms as follows:

<u>YEAR</u>	<u>SHORT-TERM</u>	<u>LONG-TERM</u>
	----- K in Million -----	
1982	6	1.0
1983	7	-
1984	8	2.0
1985	9	1.3
1986	26	3.0
1987	44	12.0

LINTCO was formed in 1978 to take over from National Agricultural Marketing Board (NAMBOARD) all functions related to seed cotton production and marketing. Recently, the company was also given the responsibility for promoting soybeans and coffee production among small scale farmers. The aims and objectives of the company are therefore:

- (1) to increase cotton, soybeans and coffee production in the country;
- (2) to provide inputs and credit to cotton, soybeans and coffee producers;
- (3) to provide a market to cotton growers and,
- (4) to provide extension services to cotton, soybeans and coffee growers.

LINTCO is a parastatal company limited by shares and is registered according to the Companies Act (Laws, Volume XII, Cap 686) of the Laws of Zambia. The Government (Ministry of Finance) holds 99% shares with 1% being held by the General Manager. The company's Board of Directors is appointed by the Government, being the majority shareholder.

Funds for credit to farmers are obtained as bank overdrafts from Barclays Bank (Zambia) Limited in the amounts of K40-50 million overdraft. At the beginning of each year, LINTCO presents to the bank its projected cashflow in order to secure an overdraft to enable the company to provide farmers with credit in the form of inputs. LINTCO extends credit to farmers in the form of seasonal loans and in kind mainly for planting, chemicals and spraying.

Fertilizer has not to date been part of LINTCO's credit package as farmers have been encouraged to produce their cotton and soybeans in rotation with maize thereby benefiting from the residual effects of fertilizer used on maize. The institution has however recently begun a pilot program in providing a few farmers in the Eastern Province interest free fertilizer loans. The Company provides fertilizer loans for coffee growers, and also for a number of soybean growers. Overall, fertilizer loans accounts for only 10% of LINTCO's total lendings. The LINTCO credit recovery rate is about 80%.

The National Tobacco Company Limited (NATCO) was formed recently to take over from The Tobacco Board of Zambia all functions related to tobacco production. It is owned 100% by the Government. The company's objectives are:

- (1) to increase tobacco production in the country;
- (2) to provide input and credit to tobacco producers; and
- (3) to provide extension services to tobacco producers.

NATCO has attracted small-scale farmers and, to some extent, emergent farmers into tobacco production in that NATCO provides seasonal credit in the form of inputs at low interest rates. Disbursements of such credit is in form of seedlings, fertilizers, tractor hire, chemicals, packing materials, etc. The current rate of recovery is between 80-85%.

In summary, there are a number of different credit sources available to farmers. However, the loan capacity of each institution is insufficient to meet demand. Further, while credit availability is extremely important for farmers to be able to purchase fertilizers, the record keeping procedures are such that the volume of credit sales versus cash sales is unknown.

H. Cost of Marketing

Fertilizer marketing costs include all costs incurred in the process of channelling fertilizer from the point of production to the retail point of sale. Since recent purchases on the international market have been on a CIF Lusaka basis, only domestic marketing costs are considered. The two fertilizer marketing organizations in Zambia are provided a marketing cost allowance by the Government to cover their fertilizer marketing costs. The allowances for NAMBOARD and ZCF are K400 and K200 per T, (Table 16) respectively. The cost allowances are based upon each organization's estimated marketing cost as approved by the MOAC. In reality, the true cost of fertilizer marketing is significantly higher than the allowance. For example, it is estimated that the real cost of in-country fertilizer marketing is about K915 per T or some 53% more than the government's allowance. The main differences in the estimated "real costs" and the government's allowance are (a) losses, (b) interest charges on working capital, and (c) high transport costs.

The physical product losses in the marketing system are substantial and constitute one of the major inefficiencies in the current fertilizer marketing system. Losses as measured by NAMBOARD amount to 3% or K35 per T. The loss figure for the ZCF is 5% or K88 per T. Together, the losses total 8% of supply or K123 per T.

Table 16: ESTIMATED COST OF MARKETING FERTILIZER IN ZAMBIA

<u>ITEM</u>	<u>AMOUNT</u>	
	Kwacha/Tonne	
C.I.F. Lusaka (Urea)	2,237.00	
NAMBOARD costs		
Handling & Transport	208.00	
Salaries & Wages	56.00	
Insurance	6.00	
rebagging	0.20	
bank charges	74.00	
Other losses	<u>35.00</u>	
Subtotal NAMBOARD Marketing cost		379.20
Cooperative Unions Cost		
Transport	358.00	
Salaries & Wages	40.00	
Overhead	50.00	
Other (losses)	<u>88.00</u>	
Subtotal Cooperatives Union Mktg cost		<u>536.00</u>
TOTAL MARKETING COST	<u>915.20</u>	
TOTAL COST OF UREA AT RETAIL OUTLET		3,152.20

Marketing cost as a % of total cost = 29%

Government allowance to NAMBOARD and PCU's to cover marketing costs.

<u>ITEM</u>	<u>AMOUNT</u>	
	Kwacha/Tonne	
Estimated total marketing cost		915.20
NAMBOARD marketing allowance	400.00	
PCU marketing allowance	<u>200.00</u>	
Subtotal, margins allowed		<u>600.00</u>
Unrecognized marketing cost		<u>315.20</u>
A. Imported Product Cost*		
<u>Product</u>	<u>K/Tonne</u>	
Urea	2237	
AN	2075	
Compound D	2895	
B. <u>NCZ Production cost*</u>		
	<u>K/Tonne</u>	
Nitrogen Products		
AN		2,000
Compounds R X and D		3,000

* For 1988/89

Source: Study Team

I. Appropriateness of Fertilizers Being Used in Zambia

1. Product Determination

Many fertilizer research programmes have been undertaken since the mid 1950's. They include investigations on crop response to different nutrient levels and liming. Experience generated from these field trials has resulted in the development of a range of fertilizer mixtures which are highly specific to the Zambian environment and a series of crop recommendations for the commonly grown crops. These fertilizers have proven to be highly effective in practice and are extremely popular in the farming community. The present range of five mixture ratio's, plus the range of straights enable a large number of combinations to be made, and in practice no problems in meeting specific soil/crop requirements have been experienced. However some changes in the mixtures are presently being studied in view of the production efficiency of the local manufacturer and the possible development of local resources.

Using the presently available fertilizers, yields levels of 8 - 9 T maize per hectare, 3 - 4 T of soybean, 7 - 8 T (irrigated) wheat and 2 T per hectare of flue cured tobacco are now no longer exceptional in the commercial sector (by the better farmers in the more favourable environments).

As a further independent assessment of the efficiency of the present recommendations, the results of the small scale farmer extension programme carried out by Global 2000, using the lima recommendations, in Copperbelt Province in the 1986 - 87 season are shown in Table 17.

TABLE 17 Management Training Plots (MTP) 1986 - 87 Season.

<u>Location x</u> <u>3 Provinces</u>	<u>Farmer Implemented Demonstration</u>	
	<u>MTP Maize Yield</u> <u>kg/ha</u>	<u>Conventional Yield</u> <u>(estimated)</u>
Ndola Rural	6294	3618
Mundwa	4576	1133
Lusaka	4503	1204

Source: Global 2000, Zambia

The results clearly illustrate that not only are high yields with good economic returns obtainable (even the lowest yield is still highly profitable) but that management and season are major factors in increasing yields, indicating not only the need for better management training but also the need for more timely supply of inputs. Further refinement of the Lima recommendations is an ongoing Research Branch exercise.

2. Dissemination of Research Findings

The extension service, through the MACO and various organizations, (i.e. Global 2000, donors, etc.) are working with farmers and the fertilizer marketing organizations for the effective transfer of fertilizer technology. The organizations distributing fertilizer (ie NAMBOARD and ZCF) do not take an active role in farmer education programs and promotional programs on improved fertilizer use as these are viewed as MACO functions.

Each province has a provincial agriculture officer (PAO) who is responsible for all agriculture activities and is supported by subject matter specialists (ie. animal husbandry, farm management agriculture engineering, youth extension, land use planning, etc). The 9 provinces are divided into 59 agricultural districts. There is a district agricultural officer (DAO) in each district with a support staff similar to that of the PAO. Each district is divided into about 20 wards, for a total of 1,197 in Zambia. There are 1,900 agricultural camps for farmer training. There are 18 research stations in Zambia providing results to the extension staff. The extension service plays a major role in farmer educational programs on fertilizer use and rates of application and it appears that most farmers are aware of benefits from the use of fertilizers.

Crop specific recommendations have been developed based on the Lima approach for small scale farmers and these have been distributed to extension workers and farmers. Radio communication, and promotional posters in the local dialect are also being effectively used to disseminate this information. Commercial producers are catered for separately by a publication more geared to the requirements of larger scale, mechanised production.

3. High Analysis

The two most commonly used high analysis fertilizers in world agriculture are the ammonium phosphates and urea, both of which are imported into Zambia. Di-ammonium phosphate is used in the manufacture of the fertilizer mixtures. Although there is a place for this fertilizer to be used directly in parts of the commercial sector, the necessary requirement to ensure a satisfactory sulphur level (of 15 - 30 kg S/Ha) makes direct application in the small scale farmer sector too high a risk factor.

Urea has been used extensively in Zambia agriculture since the early 1960's (in fact Zambia was in the vanguard in exploiting the agronomic potential of this product, well before acceptance by many developed countries). Although initially confined to the commercial sector, due to the higher risk factor of volatilization losses, in fact the erratic supply situation has resulted in the inevitable corresponding usage by many small scale farmers. Experience indicates that the small scale farmers are using urea with as high a degree of efficiency as the commercial farmer.

4. Long Term Fertilizer Use Effects

The negative effects of long term use of nitrogen fertilizers without a corresponding liming programme is well documented. Local research has confirmed the subjective experience of farmers (both large and small scale) that fertilizers poison the soil, i.e. yields decline with time. All forms of nitrogen fertilizer, both organic and inorganic, lead to the development of soil acidity (The exceptions are certain low analysis nitrogen fertilizers such as calcium nitrate and potassium nitrate which are too expensive to import). A widely expressed belief that calcium ammonium nitrate is a better fertilizer for use in halting the decline in yields caused by acidity development needs correction. CAN, as presently manufactured, has a nitrogen analysis of 26% N which makes it a potentially acidifying agent. It is true that the potential for acidification of CAN is less than that of urea or ammonium nitrate but this will only delay the onset of acidity. It will not cure acidity which is already present. In practice, the delay is very short term as evidenced by a long term trial in the Northern Province of Zambia, where calcium ammonium nitrate was used as the nitrogen source. The soil PH fell from 5.2 to 4.2 over a period of six years. During the same period maize yields fell from over 6 tonnes per hectare to under 2 tonnes. This trial was conducted in 1964. (Figure 4)

There is well documented evidence that the lack of an adequate supply of agricultural lime is creating a form of cultural practice which can best be described in local terms as a form of fertilizer chitemene. In the traditional chitemene slash and burn system, the land is abandoned after 4-5 years cropping and left to regenerate. In the fertilizer chitemene system, the land is similarly abandoned but not before even higher levels of fertilizer are required to correct declining yields. (A commonly observed practice among all levels of farmer). It is unlikely that land abandoned because of extreme acidity will recover a productive capacity by mere regeneration alone. Coupled with this is the abandonment of the fertility build up due to residual effects of phosphorus and potassium applications. The development of already identified and well researched, abundant, local deposits of suitable limestone is long overdue. Unless lime is introduced into the farming systems the present level of maize production cannot be sustained on a continuous basis. This statement cannot be stressed too strongly.

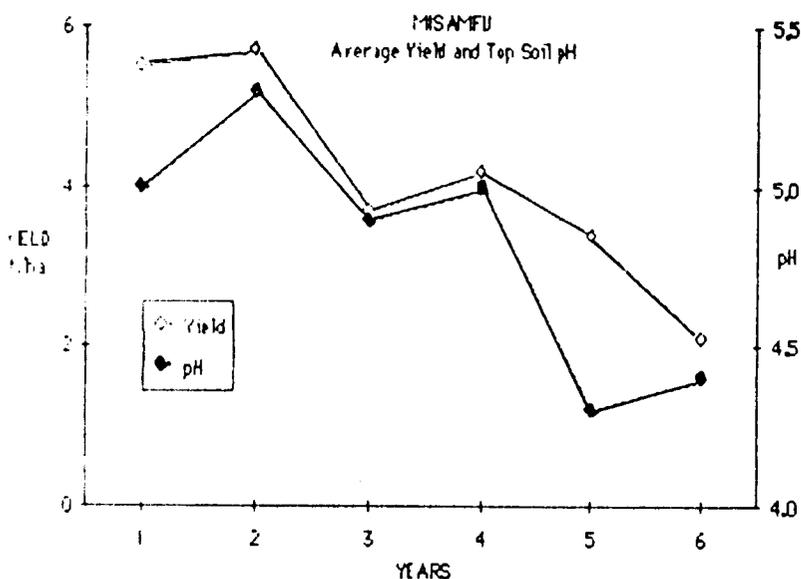


Figure 4: MAIZE YIELD AND SOIL ACIDITY RELATIONSHIPS
(Average Yield and Top Soil pH)

Source: MACO/J.K. McPhillips

As an illustration of the amount of lime required, even the most conservative estimate using the Association of Official Agricultural Chemists (AOAC) puts the level of lime required to counteract nitrogen acidity development at 1.8 kg of chemically pure lime for each 100kg of nitrogen. As farmers in Zambia require between 100 - 160 kg N per hectare for good maize yields this will require 200 - 300 kg per hectare of commercial lime, each time maize is grown to counteract the residual acidity caused by the use of either urea or ammonium nitrate. Since between 60 - 70 percent of the maize is produced by the small scale farmers who have no access to lime, the conclusion must be drawn that the present success in production is in serious jeopardy. There is, however, ample local evidence to conclude that continuous use of land for agricultural purposes is possible by the use of a properly balanced fertilizer programme, combined with arable/key rotations on the lighter textured soils, and cereal/legume rotations on other soils, as is currently recommended. The evidence from commercial farmer experience, as well as trial evidence, bears out this contention.

5. Organic Farming

Organic fertilizers have an important role to play in increasing the nutrient reserves of soils. In addition they improve soil structure and water infiltration, and increase resistance to erosion. They are also an important source of slow nutrient release material which can be of particular benefit on sandier soils. A great deal of research on organic farming has already been carried out in Zambia. This includes the use of animal manures, green manures, the role of legumes, mulching etc., and recommendations exist for the integration of such practices in Zambian agriculture. However, the effect of organic inputs should be seen as supplementary to that of commercial fertilizers. It should be appreciated that the amount and quality of the organic matter is correspondingly low. Under local conditions additions of phosphorus and sulphur particularly, as well as potassium, calcium and magnesium, need to be applied for optimum production of organic matter. It should also be appreciated that the quality, and amount, of animal manure produced will depend on the quality of the pastures. It does not appear to be fully appreciated that organic residues are extremely bulky and can pose considerable problems in handling particularly for small scale farmers. As many as ten tonnes of animal manure may be required to achieve the same results as one (50 kg) bag of commercial fertilizer. Also, the management of green manures does present a greatly increased labour requirement. These matters are receiving research attention. Much of the success claimed for organic farming, (and the claims are not disputed) is due in large measure to either high natural soil fertility or, residual fertility built up by previous applications of commercial fertilizers. There is no way Zambia can sustain the level of production required to feed itself by the use of organic fertilizers alone.

IV INDIGENOUS AGRO-MINERALS

A. Overview

Zambia being a land-locked country with long supply lines naturally pays a high cost for imported fertilizers. The development of available indigenous agro-minerals for crop production appears to be a viable solution for reducing the foreign exchange cost of importing fertilizers. According to ZIMCO the full potential for agro-minerals in Zambia has not been determined. The indigenous minerals which may be used for agricultural production in Zambia at present are (a) phosphate bearing rocks, (b) sulfur bearing rocks, (c) limestone (Ca and Mg bearing rocks), (d) peat, and (e) other soil conditioners (zerolites, smectite clays). ZIMCO has confirmed the following phosphate deposits in Zambia:

1. The Chilembwe deposit located 450 km east of Lusaka. The calculated proven reserves for two major ore-bodies are 1.69 million T at 11.8% P₂O₅ grade, at the cut off grade 6% P₂O₅. There are three minor ore bodies in the immediate vicinity which are too small to warrant commercial exploitation.
2. The Mumbwa North deposit is located about 180 km west of Lusaka. Two major bodies have been located there. The Sugar Loaf NE orebody is estimated to contain 0.21 million T of proven reserves with 12% P₂O₅ grade, utilising 5% cut off grade. The Sugar Loaf occurrence is believed to comprise 0.5 million T of inferred reserves at 8 - 12% P₂O₅ grade, utilising 5% cut off grade. Few smaller occurrences located in the vicinity are too small to be exploited commercially. Total proven and inferred reserves of Mumbwa North area may therefore be estimated as approximately 0.7 million T of 11% P₂O₅ grade.
3. The Kalawe carbonatite is located about 200 km west-south of Lusaka, in a rugged area. Total reserves have been estimated as 207 million T at 2.5% P₂O₅ utilising 0.5% P₂O₅ cut off grade. The low grade renders the deposit uneconomic. However, weathered soils derived from the main body contain higher grades. These soils are estimated to total 6.6 million T at 5.1% P₂O₅.

An evaluation of selected parts of these soils, which may contain even higher grades, is in progress.

4. Nkombwa Hill carbonatite is located in north-eastern Zambia about 25km south-east of the Isoka township. The total reserves are estimated to be 220 million T of rock with 4.6% P_2O_5 . The selected richer zone is calculated to contain 130 million T at 7.3% P_2O_5 . The weathered soils concentrated in the northern part of the foothill may yield 1.8 million Tonnes with 6.5% P_2O_5 using 4% P_2O_5 cut off. The research work is still in progress. The aim is to find the optimal method of ore treatment, to locate the best part of the deposit and to understand in detail the complicated composition of the ore. Additional targets are to establish some valuable by-products, mainly rare earths. Future exploitation of this deposit may be envisaged as the multimineral extraction process.

At the moment, only the Chilembwe and Mumbwa North, deposits (if its size will be considered economic for mining) are ready to be exploited.

ZIMCO and Minex have plans for additional exploration in within or in the immediate vicinity of the known phosphate bodies.

In the Sinda area, some terrain adjacent to the surveyed Chilembwe block is to be examined by new geophysical and geochemical tests and, if positive results are achieved, will be further searched by detailed geological survey.

An additional brief survey of phosphate rich soils in the Kaluwe area will be carried out to determine if any mineable reserves can be located.

A survey of Nkombwa Hill, including drilling, will be carried out. A comprehensive programme aimed at multimineral targets (phosphate, niobium, rare earths) will be forthcoming.

Sulphur is produced from pyrites exploited at Nampundwe Mine nearby Lusaka and from smelter or roaster gases generated during treatment of copper ores in the Copperbelt. Additional reserves of sulphur are known and no new exploration is planned. There are plans to commence production of nickel from Munali deposit; in such a case some sulphur would be recovered as a by product.

Numerous limestone deposits are known from Central and North-Western Zambia. Small scale mining of limestones to provide the local farming communities is being promoted in the country. With the exception of North-eastern and Southern-most Zambia, resources of lime are available locally. Geological assistance to new producers is being planned.

A survey of possible peat deposits to be used, inter alia, as soil conditioner is planned in Central and Northern Zambia. Some recent experimental work indicates that the addition of peat to ground rock phosphate will naturally acidulate and considerably increase its solubility in the soil. The mix of peat and ground rock phosphate should therefore produce a cheap local source phosphate fertilizer substitute. Such a process has been shown to be successful elsewhere in the world, notably Sri Lanka. Field trials are currently being undertaken to test this hypothesis using only Zambian raw materials. While field trials are being conducted, Minex has initiated an investigation of Zambia's peat potential.

Research and preliminary surveys aimed at locating and utilising deposits of zeolites and smectite clays as kation exchange media and absorbing agents in soil conditioning has been initiated, but the results are not expected in the near future.

V CONSTRAINTS IN THE CURRENT FERTILIZER SYSTEM

A. Marketing System

1. Incomplete System - Zambia does not have a complete fertilizer marketing system. Rather, there are a number of institutions involved in the marketing process with a questionable interest in satisfying farms and customers. For example, the cooperatives under the ZCF are the critical final link with the farmer in the marketing chain. However, ZCF views its role as that of an agent for NAMBCARD and takes no apparent initiative regarding fertilizer promotion (i.e. to complement the extension service in advising farmers on the appropriate types of fertilizer, recommended fertilizer management practices, etc) and improved fertilizer marketing efficiency.
2. Institutional Linkages - Too many institutions are involved in the fertilizer marketing system in Zambia. This contributes to (a) inefficiencies in communications and the coordination of marketing activities and (b) an unnecessarily cumbersome and time consuming decision making process because of procedural bureaucracy.
3. Accountability - There appears to be little emphasis on accountability in the current marketing system and little incentive for increased efficiency in marketing.

B. Marketing Information

Lack of information - Information needed for effective marketing planning and analysis is not available. Data on actual fertilizer use (not sales) by product and by region are not known. Stock levels are not known on a timely basis. The financial incentive for Zambian farmers to use fertilizers is not monitored on a continuous basis.

C. Procurement

Timing - Delays in the tendering process, caused in part by foreign exchange limitations, but also by the general bureaucratic procedural requirements, contribute to the late arrivals of fertilizer.

D. Distribution

1. Storage facilities in Dar es Salaam - Covered, secure storage capacity for fertilizers in transit to Zambia are inadequate.
2. Vehicle availability - Vehicle availability for the transport of fertilizers from Dar es Salaam to Zambia and for subsequent distribution within Zambia are limited and contribute to late arrival.
3. Logistics planning - Estimated fertilizer requirements by province are unrealistic relative to supply availability and as a result contribute to site specific shortages or surpluses.
4. Late arrivals - The late arrival of imports contributes to inefficiency in the distribution system by removing the flexibility in vehicle scheduling to arrange for backhauling.
5. Storage practices - Inefficient storage practices are contributing to poor product quality.
6. Title flow - Product title rests with NAMBOARD and ZCF merely serves as a distribution agent for NAMBOARD. As a result of this system, ZCF has no incentive for improved marketing efficiency.
7. Road conditions - The roads in Zambia are very poorly maintained and since they are virtually impassable during the November - April period necessitate fertilizer deliveries to the provincial and rural depot levels during May - October.
8. Licensing system - The current system for obtaining a license to sell fertilizer discourages private retailers.
9. Transport rates - The current transport rate structure does not adequately compensate truckers, given the poor road quality in Zambia and encourages long distance transport at the expense of short hauls.
10. Government Intervention - The Government's ill-timed decision that all vehicles were to be used solely to transport priority commodities (ie not fertilizer), at which time fertilizers were in the Port of Dar es Salaam, contributed to the delayed arrival of fertilizers in Zambia.

E. Pricing

1. Fixed Uniform Prices - The current pricing policy offers no financial incentive for private traders to engage in fertilizer marketing and reflects neither costs nor supply and demand relationships.
2. Subsidy - The fertilizer subsidy is encouraging the leakage of Zambian fertilizers to neighbouring countries. The method by which the subsidy is applied to NAMBOARD and ZCF (ie allowance per ton sold) provides no incentive for improved efficiency of operations.

F. Marketing Cost

The total cost of fertilizer marketing is not known, albeit NAMBOARD and ZCF do provide the Government an estimate of their distribution costs for computation of the marketing allowance.

G. Credit

1. Limited availability - Credit availability for fertilizer procurement is limited.
2. Timeliness - As a result of administrative requirements involved in securing credit and the general procedural delays in making funds available for loans, credit is often unavailable for farmers to purchase fertilizers prior to the cropping season.

VI RECOMMENDATIONS TO IMPROVE THE PERFORMANCE OF THE FERTILIZER SUBSECTOR

A. Need For Change

As indicated in previous sections of this report, the current fertilizer subsector operations are inefficient and costly. The marketing system suffers from deficiencies in terms of institutional linkages, fertilizer related policies, general operations, and overall coordination of the performance of such marketing functions as planning, procurement, distribution, and promotion. The principal shortcomings in the current system are (1) a lack of basic market information for effective market analyses and planning, (2) an excessive number of institutions are involved in the marketing system, thereby impeding timely decision making, (3) delays in government funding for imports contribute to the late arrival of fertilizers, (4) inadequate foreign exchange allocations limit supply availability, (5) inefficiencies in the distribution system, including improper warehouse management practices and excessive handling, contribute to excessive loss levels and late arrivals at the rural depot level, (6) the transportation infrastructure, in terms of vehicle availability and road conditions, is a significant constraint to the distribution of fertilizer, (7) the pricing policy is directed to satisfying social objectives rather than economic objectives and has resulted in a sizeable fertilizer subsidy and a vibrant market for Zambian fertilizers in neighbouring countries, and (8) accountability for performance within the marketing system appears to be of little significance. It is conservatively estimated that the above deficiencies in the marketing system will cost the Government K490 million in 1989.

As a result of numerous previous studies of the Zambian fertilizer subsector, the Government is well aware of the deficiencies in the current marketing system. As implied in the Fourth National Development Plan the Government is interested in developing a system which will provide farmers with a timely supply and adequate quantities of the appropriate types of fertilizers on a cost efficient basis.

Fertilizer marketing systems vary from country to country depending upon such marketing environments as the government, demographic, economic, technological, etc. as well as market size. However, the principal goal of all fertilizer marketing systems is to satisfy farmer customers in the most cost efficient manner. In order to achieve this goal, the decision-making process must be handled in a business like manner. Decisions can ill afford to be made without a complete knowledge of the market, including an accurate assessment of fertilizer demand by product type and geographical region.

Fertilizer is a bulky, hygroscopic commodity, and requires certain care in handling, storage, and transport. The pipeline time required in importing fertilizers into Zambia and distributing the material to the farm level is unusually long due to Zambia being landlocked and transport infrastructure limitations. Therefore, the procurement process and the arrival of product in Zambia cannot be delayed if the system is to perform as intended. No marketing system can perform efficiently if the fertilizers fail to arrive in Zambia on a timely basis. Unless foreign exchange is made available for fertilizer imports on a timely basis, the system will continue to malfunction.

B. RECOMMENDATIONS

1. Reorganization of The Current Fertilizer Marketing System.

It is recommended that a "business like" approach to fertilizer marketing be adopted. The present integrating of social objectives and fertilizer distribution are incompatible in the long run for maximum agricultural development and efficiency. The social obligations of the Recommended Fertilizer Marketing System (RFMS) can be paid through efficiency of operation to increase food crop yields

It is recommended that a centrally managed autonomous organization having authority, responsibility, and accountability for its operation be established. Basically, the existing fertilizer distribution networks can be reorganized and utilized in the RFMS. The cooperative unions have a major role to play in the RFMS.

Several marketing systems could be used in Zambia. They differ by virtue of the various relationships that could be established among the members or institutions that constitute a particular marketing channel. For purposes of this Study, the marketing channel refers to the course taken in the transfer of title of fertilizers as they flow from manufacturer (supply) to the farmer. A vertical marketing system consisting of a two-level channel will serve Zambia best at the present time. As the agriculture economy matures the channels can be modified as the situation demands. The merchant wholesalers can play an important role with their agent network.

The Recommended Fertilizer Marketing System (RFMS) for Zambia is diagrammed in Figure 5. The RFMS calls for the following organizational structure and functions when fully implemented.

a) Apex organization - Nitrogen Chemicals of Zambia Ltd. (NCZ).

Since the fertilizer business in Zambia is relatively small it is recommended that a single organization continue to be the sole source of fertilizers; it can be considered the "apex" institution. Since NCZ is the only manufacturer of fertilizers and will continue to import raw materials, the economy of scale favors NCZ to be the apex organization. Since NCZ is exclusively in the fertilizer business, they will not have divided interests and can develop personnel for a specific function. Since NCZ will be producing fertilizers continuously, they will need to clear the fertilizers on a routine basis. Due to a fixed schedule of fertilizer shipment, NCZ should be more efficient in distributing fertilizers to the provincial level.

NCZ will replace NAMBOARD and be solely responsible for manufacturing and importing fertilizers. They will deal with international markets and donors. The donor contact to calculate supplies will be in cooperation with the NCDP. The Fertilizer Information Unit (FIU) will assist NCZ in determining fertilizer demand by regions and crops. NCZ will be responsible for maintaining warehouses and delivering product in the nine provinces. From these locations the marketing channel members will purchase the fertilizers required in their sales programs.

- b) The four categories from which marketing channel members to serve farmers may be selected include:
- (i) Cooperative Union - PCU's, DCU's, Societies and Rural Depots. The Unions will be the largest supplier of fertilizers to farmers and will have a major role in satisfying the farmers demand for fertilizers.
 - (ii) Parastatals - LINTCO, NATCO, ZAMSEED, National Import and Export Corporation Ltd., NIEC Stores, NCBC, Mwaiseni Stores, etc. Parastatals that can serve the farmers in rural areas and in areas where they are needed to fill voids in the marketing system and provide competition, may be selected by the NCZ marketing staff.
 - (iii) Private organizations - Chemical dealers, (ie Shell, ICI, Coopers, etc) 91 ZAMSEED agents, farm implement dealers, private businesses, etc. The study team found many potentially good retailers who have the skills and business acumen to become fertilizer retailers.
 - (iv) Private cooperatives - Midland, Borders, Chipata, Solwezi, Kabompo, Lundazi, Mazabuka etc (See Appendix IV, Exhibit 1 for list of 19 recommended associations). The farmer associations appear eager to become fertilizer retailers provided there is an incentive.

c) NCZ Marketing Staff

The NCZ has already started to build a Marketing Department with a recent addition of two staff members. Recommendations for staffing by activities are shown in Figure 6. The Department should consist of the following:

- (i) Marketing Manager. In cooperation with the Managing Director and other NCZ staff members, the Marketing Manager will be responsible for helping to establish and carry out the marketing policies. The Marketing Manager should develop a rolling five year marketing plan with targets, and goals of NCZ. See Appendix III, Exhibit 1 for example of a marketing plan. The Marketing Manager is responsible for planning, organization, operation, and control of product pricing, sales, and wholesale/retailer selection.
- (ii) Area Marketing Managers. It is recommended that three Area Marketing Managers be employed. There could be one Area Manager for a combination of provinces; for example, Eastern, Northern and Luapula; Lusaka, Southern and Western; and Central, Copperbelt and North Western. As the marketing system matures and sales increase additional territories can be added as needed to serve the marketing channel members. The Area Marketing Managers will be responsible for selecting retailers required to serve the territory, help retailers in selling, forecasting, inventory control, management practices, product knowledge and the transfer of technology on fertilizer use.
- iii) Technical Service Advisors. The advisors should include two area agronomists and one data analyst. There should be one agronomist each for the Eastern and Western regions. The agronomist will coordinate with the Technical Advisory Committee (national level), research organizations, University and other educational organizations in carrying out promotional activities to educate NCZ staff, retailers and farmers on product knowledge and proper use of fertilizers. Such educational activities may include demonstrations, soil testing, meetings, leaflets and advertising materials.

The Data Analyst will be responsible for collecting and analysing fertilizer consumption by crops and regions, monitoring international prices and reporting information in a usable form. He will coordinate his activities with the FIU in the MACO.

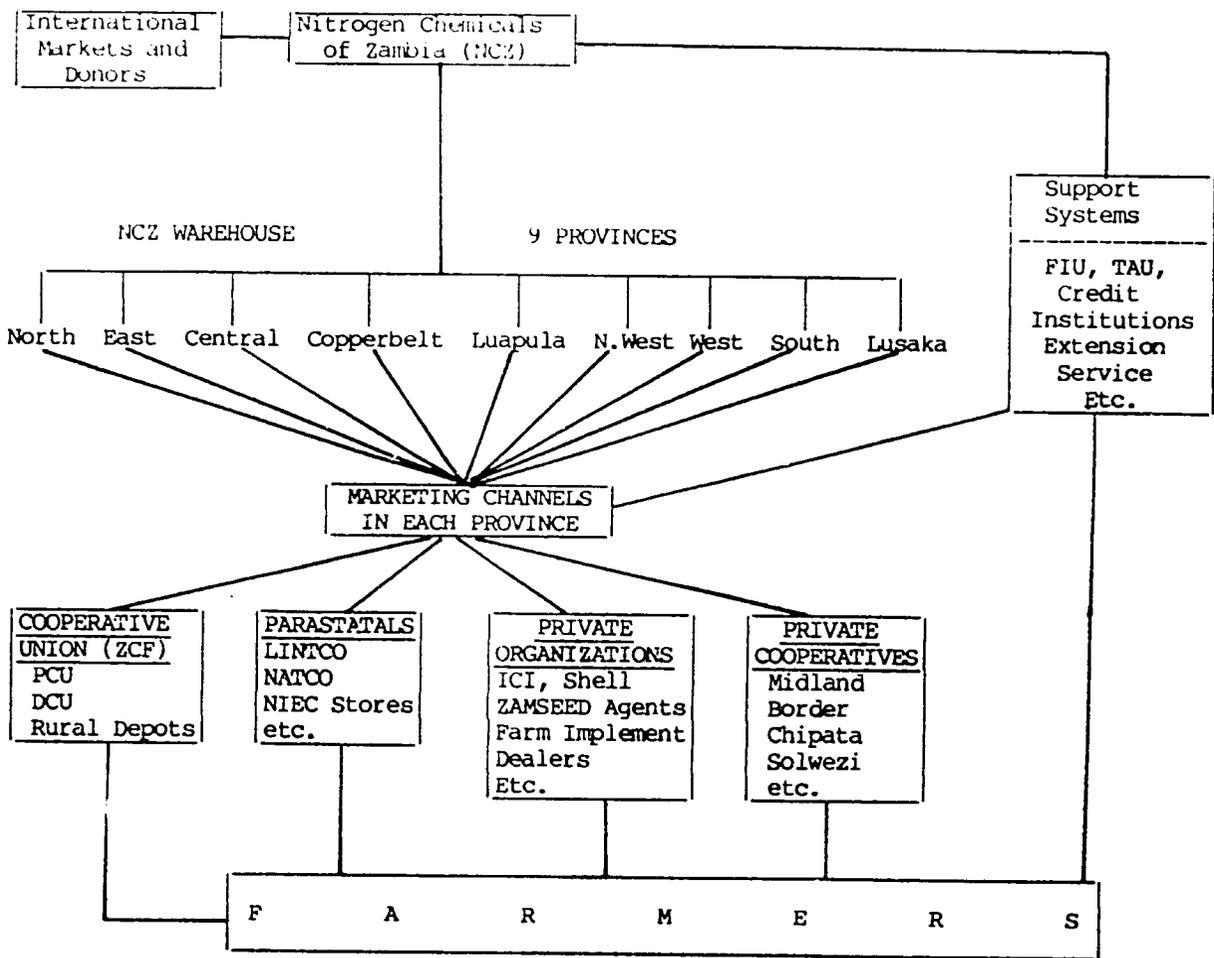
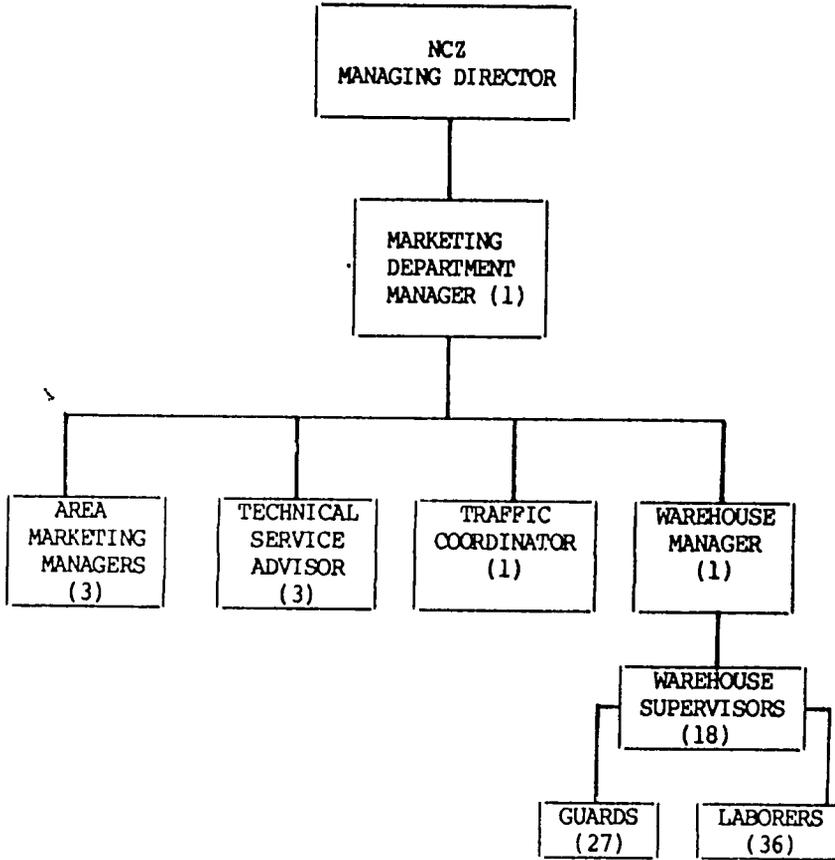


Figure 5: DIAGRAM OF THE RECOMMENDED FERTILIZER MARKETING SYSTEM



Total Staff - 90

Figure 6: ORGANIZATION STRUCTURE FOR THE NCZ MARKETING DEPARTMENT

iv) Traffic Coordinator. The Marketing Department will require the services of one traffic coordinator. He should be responsible for procurement of all transportation services. The NCZ factory, when back on stream, will produce fertilizers about 330 days per year. Trucks must be routinely scheduled to the nine provincial warehouses. For timely delivery of fertilizers, the arrival of imports will require coordination. Assistance in back hauling for economical freights can be provided.

v) Warehouse Supervisors. The nine provincial warehouses will each require a supervisor, an assistant supervisor and about four permanent laborers. Additional part time labor can be hired as needed. The supervisor will be responsible for receiving, inventorying and shipping all fertilizers. The supervisors will report to a Warehouse Manager who is responsible for site selection, renting/leasing of properties, physical management policies, records and inventory control in the provincial warehouses.

A job description for the Marketing Manager outlining specific areas of activities and responsibilities should be prepared by the NCZ Managing Director. When hired, the Marketing Manager should prepare job descriptions for the remaining Marketing Department staff. An example of a job description is shown in Appendix III, Exhibit 2. Each year the Marketing Department employees performance should be evaluated against stated objectives and new objectives should be set. The job descriptions are an excellent management tool for use in monitoring the performance of the RFMS and individual employees.

As indicated earlier, the title flow (ownership) is an important principle in a fertilizer marketing system. A necessary ingredient in a successful fertilizer marketing system is for responsibility, authority and title to be integrated into a single marketing channel. Title flow and physical flow of product do not necessarily follow the same course. Figure 7 shows the title flow in the RFMS. Title for the fertilizers rests with NCZ until such time as it is sold to a marketing channel member. The product and title are transferred at that time. The product and title rest with the marketing channel member (cooperative union, private retailer or private cooperative) until such time as it is sold to the farmer. In the case of Parastatals title may pass from NCZ → merchant wholesaler → retailer (NIEC Stores etc) → farmers. Where the parastatals have agents, (ie ZAMSEED), the title flow would include them as diagramed in Figure 7.

The physical flow of product in the RFMS is shown in Figure 8. Physical flow and title flow follow the same course from NCZ to the provincial warehouses. After the cooperative unions buy fertilizers, the product may physically be passed from PCU's to DCU's to rural depots to farmers or in some combination, where, as the title to the product rests with the union until transferred to the farmer. In the case of the parastatal member, the physical flow will be from NCZ → parastatals (LINTCO, NATCO, NIEC Stores etc) → farmers. Where parastatal agents are involved, it will be NCZ → parastatal agents → farmers. In management of the RFMS it will be important to recognize the different flows of title, product and also information.

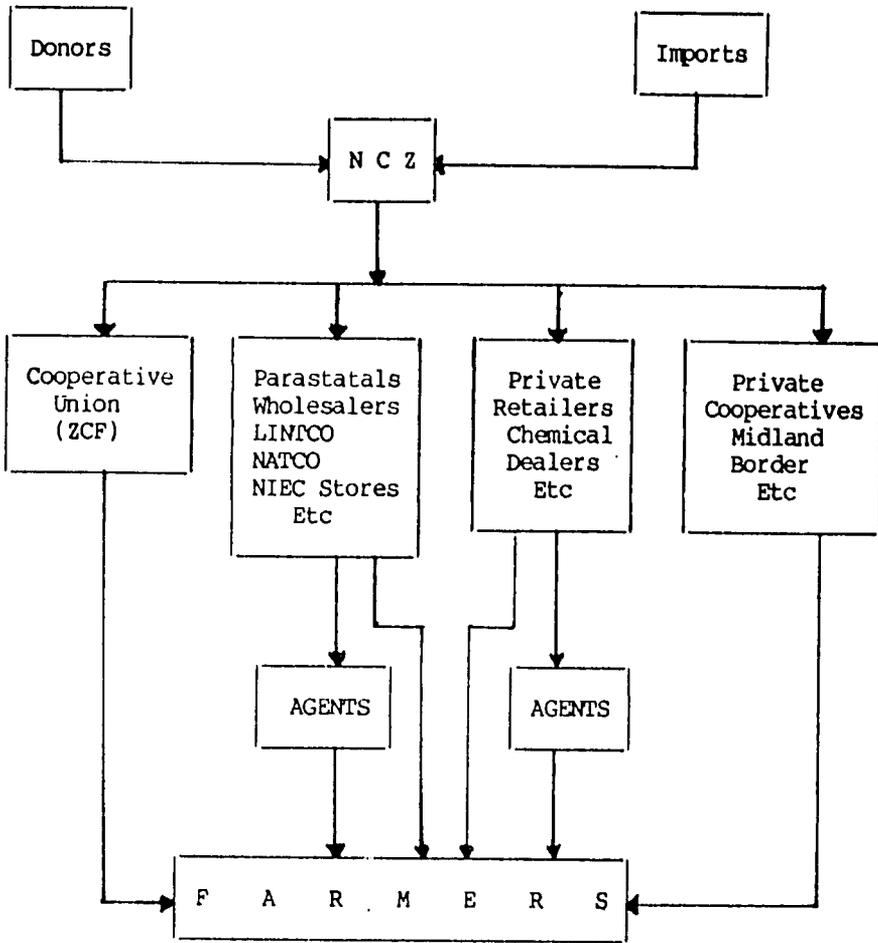


Figure 7: TITLE FLOW IN RECOMMENDED FERTILIZER MARKETING SYSTEM

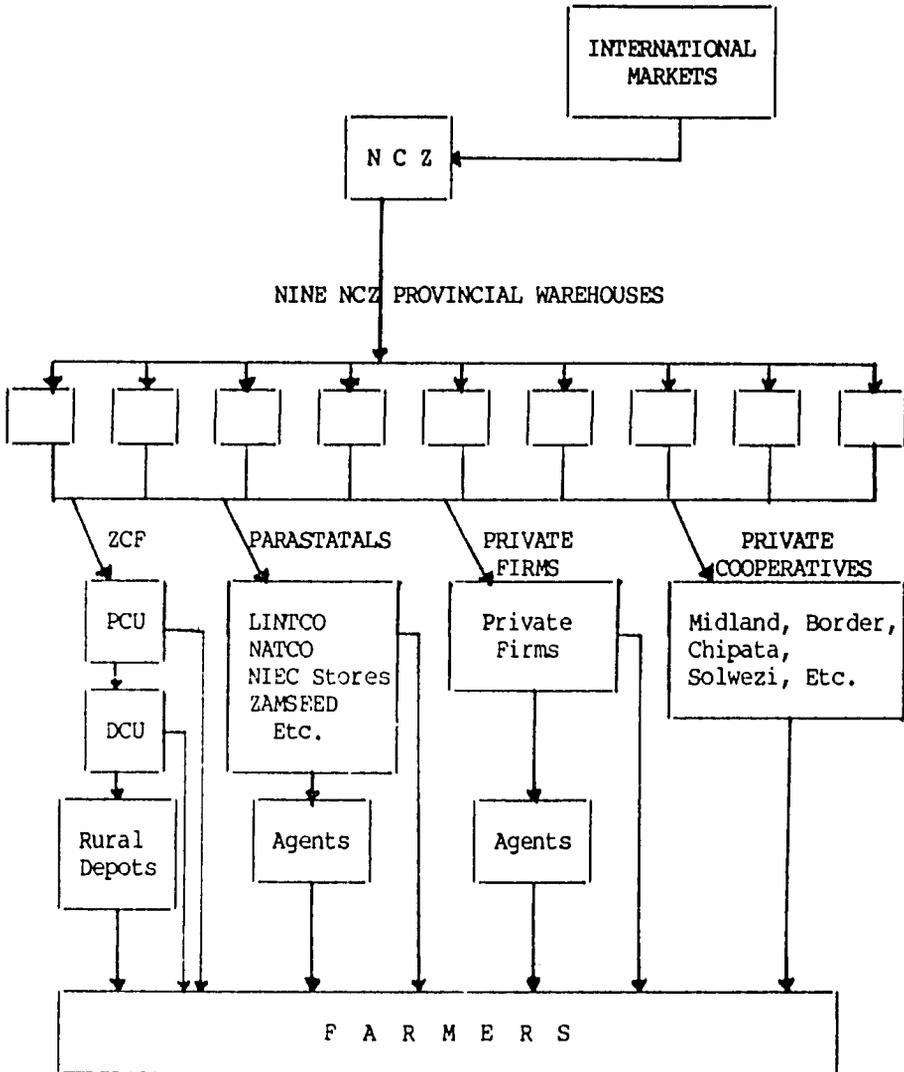


Figure 8: PHYSICAL FLOW IN RECOMMENDED FERTILIZER MARKETING SYSTEM

2. Institutional Linkages

For the RFMS to operate as efficiently as possible, support is needed from several different organizations. This support will not automatically happen nor can the marketing organization afford for it to develop in an unorganized manner. It should be developed according to a plan. The plan should be developed as a part of the NCZ marketing plan.

Figure 9 indicates the organizations that will be expected to support the RFMS with specific actions. It does not show inter-relationships between organizations, ie Research Institutes to MACO, etc.

(a) NCZ will be responsible for the manufacture of fertilizer products, importation of all fertilizers into Zambia and management of the Marketing Department to serve the greatest number of farmers in the most cost effective manner. Tendering for fertilizer supplies will be handled directly by NCZ.

(b) World Markets - NCZ will purchase fertilizers from the international market as required to supplement local production and donor supplies. Close contact with the international market is advantageous for developing the most economical purchases of products.

(c) Ministry of Agriculture and Cooperatives - The MACO and the fertilizer marketing organization can complement each other in many activities while benefiting the farmers. This is especially so in educational activities relating to product use. The extension service will have an expanded role in the RFMS. The extension service will help to educate all of the marketing channel members on fertilizer use as well as continue to carry out farmer educational programs. Principle activities to be coordinated with the MACO and FIU include:

- (i) Fertilizer trials and research;
- (ii) Extension activities;
- (iii) Fertilizer recommendations for product use;
- (iv) Quality control and weights and measures;
- (v) Demand forecasting;
- (vi) Fertilizer pricing, subsidies and VCR's;
- (vii) Data on the use of fertilizer by crop and area, monitor prices and assist with demand forecasting.

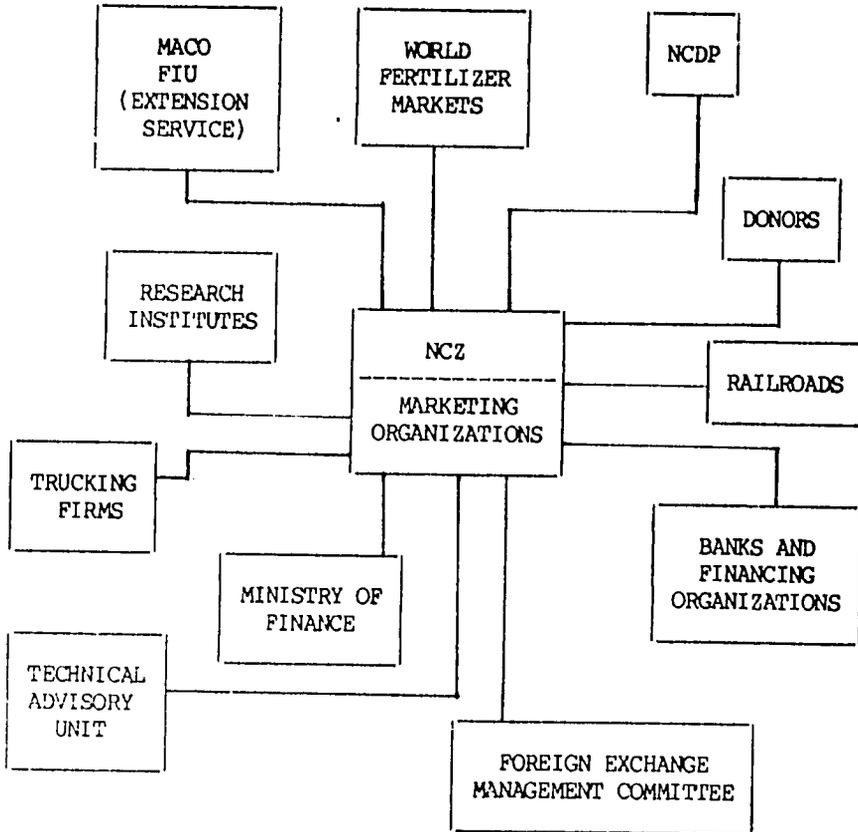


Figure 9: INSTITUTIONAL LINKAGES AND SUPPORT RELATIONSHIPS REQUIRED FOR THE RECOMMENDED FERTILIZER MARKETING SYSTEM

- (d) Research Institutes - Research findings relating to fertilizer use will be sought from national and international research institutes.
- (e) Technical Advisory Unit (TAU) - Advice will be solicited from the TAU pertaining to what fertilizer products are required to meet the agronomic crop needs and best methods of use. The TAU will work with the MACO in developing educational materials. They will carry out educational programs with the extensio service staff. The TAU will interact with the Research Institutions in determining fertilizer research and in interpreting data. The TAU will interact with MINEX on determining suitability of indigenous agro-minerals.
- (f) Bank of Zambia and Ministry of Finance - The Bank of Zambia working with the Ministry of Finance will supply needed foreign exchange to cover fertilizer imports.
- (g) Bank and Finance Institutes - NCZ will work with financial organizations in obtaining financing support at all levels of marketing.
- (h) Trucking Firms - Contracts will be negotiated with trucking firms to deliver product to warehouses. Assistance will be given to wholesalers and retailers for trucking requirements.
- (i) Railroads - Fertilizers will be delivered by railroad when feasible. The marketing department will liaison with the TAZARA railroad for delivery.
- (j) Donors - NCZ through NCDP will work with donors in arranging for donor supplies to reach Zambia on a timely basis. NCZ through cooperation with the Technical Advisory Unit will work with the donors to supply appropriate fertilizers.
- (k) National Commission for Development Planning - Will be the principle contact with the donors for a timely supply of appropriate fertilizers as defined by the Technical Advisory Committee.
- (l) Foreign Exchange Management Allocation Committee (FEMAC) - Will be responsible for making the required foreign exchange available to NCZ for purchasing materials and finished fertilizers as required. NCZ will work with FEMAC in forecasting financial requirements and giving notice of requirements according to a lead time plan so that a timely supply of fertilizers are available.

3. Role of the Private Sector

The Fourth National Development Plan calls for the involvement of the private sector in fertilizer marketing. The private sector and the associated business-like approach has an important, if not essential, role to play in re-establishing an effective fertilizer system in Zambia. The current system does not employ a business like approach and accountability and responsibility are often divided. As described earlier in the current marketing section, the cost of marketing has not been determined. The RFMS calls for responsibility and accountability (profit and loss centers) to be assigned to each segment of the marketing system.

It is recommended that NCZ continue as a centrally managed autonomous organization, centrally managed having profit and loss (P & L) responsibilities. (This is a private sector concept for managing a business.)

The private sector retailer will also be autonomous with P & L responsibility. It is recommended that the private sector marketing channel members be included in Phase II of the implementation schedule. Private retailers, if provided an adequate incentive program, will become pace-setters for the fertilizer sector. They will provide competition, efficiency of operations and a means of complementing the extension service and disseminating information to farmers on fertilizer use. Other marketing channel members will be forced to attain the same level of performance in fertilizer marketing or see their market share deteriorate.

Private retailers can provide a one-stop store concept. Farmers will be able to purchase seed, plant protection chemicals, fertilizers and obtain product use information in one store; Thus they will not have to waste time and money searching for these essential inputs.

As private retailers are phased in, there may be only 10-15 selected in each of the three sales territories in the first year. They can be selected to cover voids in the marketing areas where additional coverage is needed.

The private retailers have played a major role in developing agriculture in all countries that have a so-called mature agriculture. It is recommended that they be given a chance to help produce more food more efficiently in Zambia.

4. Policy Issues

A number of the Government's current fertilizer related policies act as serious impediments to implementation of the proposed fertilizer marketing system. The most serious of these policies are: (1) the licensing system for selling fertilizers, (2) the pricing policy, (3) the foreign exchange allocation and release policy, (4) the subsidy policy and (5) the fertilizer distribution policy, including transfer of title in the marketing process. In order for the proposed fertilizer marketing system to be implemented and have an opportunity to operate efficiently on a sustainable basis, the Government's current policies in the above mentioned areas will need to be modified. A stable fertilizer market environment with full Government support is critical to the success of the proposed system.

(a) Licensing System

The existing Government policy is to license a select few parastatals as legal fertilizer marketing organizations. Under the proposed marketing system, it is envisioned that a number of additional organizations will engage in fertilizer marketing. However, in order for this to occur, the existing licensing policy will need to be liberalized. It is recommended that the Government encourage additional entrants in the fertilizer market with a minimum level of administrative requirements to secure a renewable biannual license to market fertilizers.

(b) Pricing

Improved performance of the marketing system requires a pricing policy which (a) accurately reflects the cost of doing business, (b) provides an adequate financial incentive for additional organizations to engage in fertilizer marketing and (c) encourages efficiency of operations. The current pricing policy does not fulfill these roles.

In keeping with Government interests as indicated in the Fourth National Development Plan, a uniform pricing policy may be continued in the short term (ie up to two years). However, the pricing policy should be changed to reflect the costs involved in fertilizer marketing and to provide a reasonable financial incentive for private sector businesses to enter the market. It appears that these two goals can best be accomplished through the following:

- (i) All fertilizers will be sold to downstream marketing organizations on an NCZ ex-provincial warehouse basis;
- (ii) The pricing methodology for each product would be based on a realistic estimate of costs and include a reasonable margin.

It is recommended that fertilizer prices be liberalized over a five year period. During the first two years of the RFMS implementation schedule, a uniform pricing policy (based upon a recognition of total costs and weighted average transport costs) may be continued. However, beginning in year three of the implementation phase prices should be set on a provincial basis reflecting the transport costs involved in moving fertilizers to each province. In year 5 of the implementation phase and after the subsidy is completely removed, prices would be liberalized.

The following pricing model demonstrates the two proposed alternatives which may be followed in the price calculation (Figure 10).

WHOLESALE PRICE

Add: (a) Average CIF Kafue cost 1/
 (b) Bank charges for LC 2/
 (c) Cost of working capital on fertilizer inventory 3/
 (d) Handling and storage charges
 (e) Losses incurred in storage and transit to provincial warehouses (1% max.)
 (f) Transport costs (wt. avg.) to NCZ provincial warehouses 4/
 (g) Insurance
 (h) Margin to NCZ (10%) 5/

Equals: Total Cost at NCZ Provincial Warehouse

Less: Wholesale Price 6/

Equals: Subsidy paid direct to NCZ

RETAIL PRICE

Add: (a) Wholesale Price
 (b) Retail Margin (12%)

Equals: Retail Price Ceiling

1/ Average CIF Kafue costs would be based upon the average cost of commercially imported products or possibly an average of actual production costs for NCZ produced compounds and ammonium nitrate. Donor supplied fertilizers would be costed on the assumption of what the products would have cost if procured commercially on the international market; hence, a benchmark International Price (BIP) concept.

2/ About 1-1/2% of CIF value.

3/ About 22% per annum and assume an average loan term of 6 months.

4/ After year 3 of the implementation schedule the policy of using weighted average transport costs should be modified to allow for estimated transport costs to each province; hence a provincial pricing concept.

5/ The precise margin level which should be available to NCZ may vary. In fact the margin may be omitted as a specific line item in which case NCZ would have to improve its operational efficiency to the point where its costs are lower than the calculated price based upon the BIP concept. The difference between the BIP based price and NCZ's costs would in effect be the margin. This "sink or swim" philosophy certainly has some merit particularly in so far as encouraging efficiency of operations.

6/ After the full cost of fertilizers plus marketing costs to the provincial level are calculated, the Government may desire to have a lower wholesale price than one based upon full cost recovery. Should this be the case, the Government would subsidize NCZ directly for any difference.

Figure 10: PRICING MODEL

Under the alternative pricing method referred to as the benchmark international price (BIP) concept the estimated BIP and subsequent pricing calculations would be developed by NCZ and submitted to the MACO for concurrence. Fertilizer prices on the international market tend to fluctuate considerably depending upon (a) the level of activity in the market (b) quantity purchased (c) terms of contract (ie FOB vs CIF, bulk vs bagged purchases, etc). Therefore if the BIP alternative is adopted, it is of paramount importance that consideration be given to the types of tenders that would normally be let by Zambia and estimate the BIP based upon comparable contract quantities, condition, shipping time, payment, etc.

Initially prices may be set one time per year and remain valid for a full year. The price announcements should be made in June at the latest.

It should be noted that uniform (ie either country wide or provincial) pricing policies encourage fertilizer sales in the proximity of the supply points (ie near the NCZ provincial warehouses) and tend to discourage sales in remote areas where transport costs consume a major share of the allowed margin. Therefore, it is suggested that until prices are liberalized the pricing policy be on a ceiling price basis with actual prices free to fluctuate in accordance with supply and demand. Such a pricing policy will need to be closely monitored with appropriate adjustments made if the desired objective of widespread fertilizer availability is to be achieved.

It is critical that prices be established based upon actual (estimated) costs with a reasonable margin. The subsidy issue should not impact the pricing system.

(c) Foreign Exchange Allocation

The timely allocation of foreign exchange is critical to the success of the marketing system. In order for NCZ to be successful in: (a) taking advantage of favorable buying opportunities on the international market and (b) ensuring that adequate supplies of fertilizers are available prior to planting, foreign exchange should be made available within two weeks of the date of request. NCZ can help the Government plan its foreign exchange requirements by submitting an annual estimate of the amounts and timing of the foreign exchange requirements. However, NCZ would need the flexibility to modify the timing of its foreign exchange needs to take advantage of temporary weaknesses in international market prices.

(d) Subsidy

The negative factors associated with the fertilizer subsidy have been identified and warrant the withdrawal of the subsidy. Removal of the subsidy is also consistent with the Government's Fourth National Development Plan. Therefore, it is recommended that the subsidy be withdrawn in an orderly fashion over a five-year period beginning in the first year of implementation of the RFMS. The initial reduction, about 25%, would occur in year 1. Subsequent annual reductions would be in equal amounts over the next four years until wholesale and retail prices are on the basis of full costs plus a reasonable margin; hence, the pricing system would be liberalized. One of the requirements of a successful marketing system, in which prices are maintained at a realistic level, is supply availability. The Zambian market will need to be adequately supplied with fertilizers and served by a number of different organizations in order to prevent black market activities.

5. Operational Performance

The operational performance of the Zambia fertilizer marketing system will be directed to providing farmer customers with relatively convenient access to an adequate quantity of the appropriate types of fertilizers when they demand the products and on a cost efficient basis. That is, in order for the system to succeed, fertilizers will need to be available for sale at the rural depot level throughout the country by October 1 for basal fertilizers and by November 1 for top dressing materials. In addition to these dates being consistent with the normal fertilizer use pattern, most of the roads reaching the rural depots become impassable after the rains begin in November and remain so until April of the following year. Hence, the marketing system will need to deliver an entire year's supply of fertilizers to all retail points of sale during May - October.

(a) Demand Forecasting

In accordance with its increased role in the fertilizer marketing system, NCZ will be responsible for developing a realistic national fertilizer demand forecast. Initially, the demand forecasting methodology employed by NCZ should be based upon the current approach, (ie. derived from MACO estimates at the ward, district, and provincial levels and the Commercial Farmers Bureau's estimates of use by commercial farmers). Appropriate adjustments should then be made to reflect planned purchases by the various channel members (ie. initially ZCF and possibly others in year 3 of the implementation phase). As the NCZ marketing staff improves its analytical capabilities, and as the FIU establishes its capabilities in terms of providing timely and reliable information on the fertilizer market, alternative forecasting techniques may be employed.

A preliminary national fertilizer demand forecast, by product, should be prepared by the end of December of each year (Figure 11). This preliminary forecast should be adequate when dealing with donors on fertilizer aid. However, following completion of the top dressing season and improved estimates of actual fertilizer use are available, the demand forecast should be revised (ie. by the end of January). The revised demand forecast would serve as the basis for developing a logistics schedule and in determining commercial imports needed to cover the gap between supply availability from NCZ and donors, and projected demand. With the passage of time and improved historical consumption data, demand forecasting should become more accurate.

It is recommended that a rolling five-year fertilizer demand forecast also be made by NCZ for long term planning purposes (ie to aid in forecasting foreign exchange requirements, vehicle scheduling needs, warehousing requirements, donor fertilizer aid planning, etc.)

In addition to NCZ's marketing research activities, the Government, through a FIU, would independently develop a forecast of fertilizer demand. The NCZ and FIU fertilizer demand forecasts should be evaluated and major discrepancies resolved.

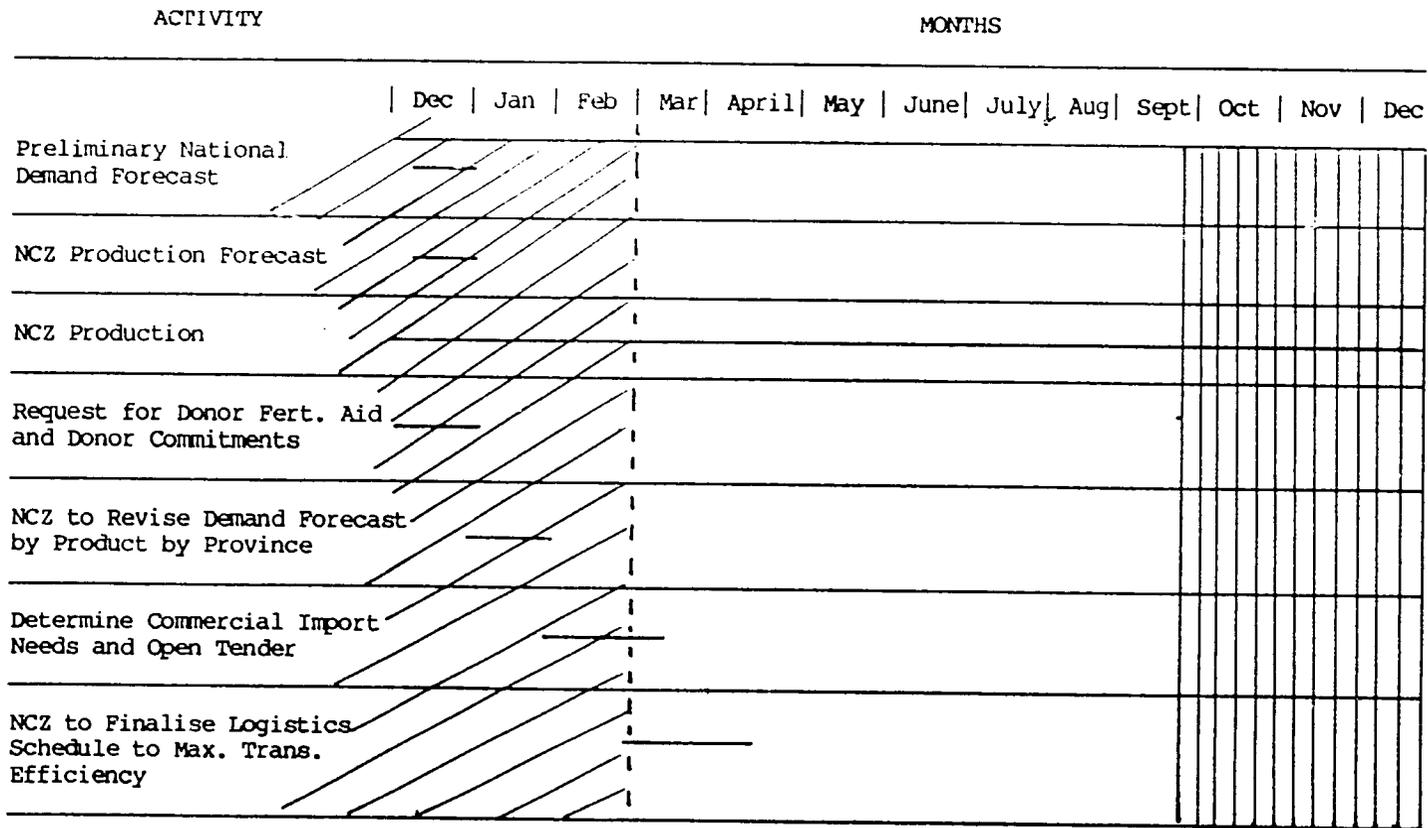
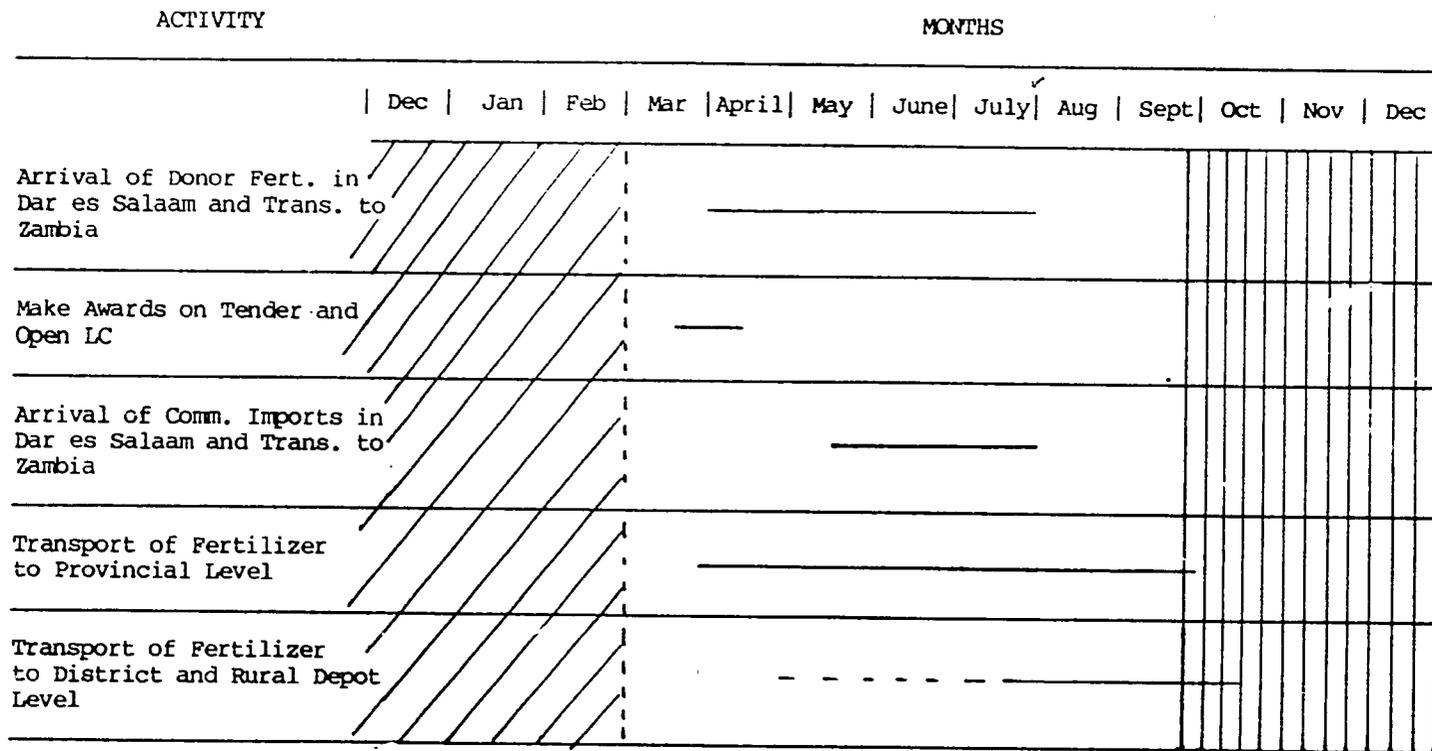
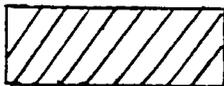


Figure 11: SCHEDULE FOR FERTILIZER SUPPLY AND DISTRIBUTION

Figure 11 Continued



Denotes time of Basal Application



Denotes time of Top Dressing

(b) Fertilizer Supply and Procurement

Despite relatively high production costs, it is recommended that Zambia should maximize its supply of fertilizers from the NCZ production facility. The justifications for this are: (i) a major plant rehabilitation program is in progress and will double capacity utilization to about 85% of design, (ii) use of the facility will allow movement of product to the provincial level on a consistent basis from mid March - October, (iii) foreign exchange expenditures on fertilizers will be minimized, (iv) losses associated with imports via Dar es Salaam will be minimized, and (v) Zambia will maintain a basic industry which is capable of producing the specific fertilizer grades required for Zambia. It appears that beginning in 1990, NCZ will be able to supply 100% of Zambia's basal fertilizer needs. Thus, imports will be required for only raw materials (ie urea, DAP, potassium chloride, etc) and top dressing fertilizers.

NCZ will be in a position to provide NCDP an estimate of raw material and top dressing requirements by the end of December of each year. NCDP and NCZ would in turn use the estimated import requirements as a basis for negotiations with donors. It is recommended that all donor commitments be guaranteed by the end of December of each year and the arrival of donor fertilizers in Dar es Salaam begin in mid April and be concluded by mid July. Donor supplied fertilizer raw materials for the NCZ plant may arrive as needed to support the plant's production schedule and to achieve efficiencies in transport from Dar es Salaam and on site storage in Kafue. Again, NCZ would be in the best position to advise NCDP on these requirements.

In order to streamline the procurement process, it is suggested that the procurement of fertilizers on the international market be a function of NCZ and not involve the Tender Board. NCZ would tender for the fertilizers directly. The tender document should stipulate that offers be on the basis of (i) F.O.B. vessel, supplier's port, (ii) C.I.F. Dar es Salaam (liner out) or other appropriate African ports and (iii) C.I.F. Lusaka. As indicated in Figure 11, the commercial tender would be opened in late January and close by March 1. The awards would be made by mid March.

(c) Distribution

The physical distribution of fertilizers involves the physical movement of product through the marketing channels (including handling and storage functions) and associated planning, scheduling, and monitoring of imports, stocks, and product movement. It is suggested that NCZ post a technical fertilizer transport specialist in the port of Dar Es Salaam for the period

April - July to: (i) monitor the off loading of fertilizers, (ii) insure their proper temporary storage, if required, and (iii) improve the operations associated with reloading of the material for rail shipment to Zambia. It is also recommended that NCZ evaluate the performance of Zamcargo and take any appropriate measures to reduce losses at the port.

NCZ, and specifically the supply manager, will be responsible for development of a logistics plan for fertilizer distribution to the provincial level. Ideally the movement of product to the provincial level would occur from mid March through October so as to minimize the pressure on the transport system caused by crisis deliveries and to alleviate pressure on the storage facilities at Kafue and the major warehouse in Lusaka. It is recommended that the use of rail transport be maximized to achieve cost efficiency, while at the same time ensuring the fertilizers arrive on a timely basis. Because of the limited vehicle availability for moving fertilizer and very poor road conditions, it is essential to coordinate fertilizer deliveries with backhauls of other commodities. Under the RFMS, NCZ's physical distribution activities will extend to the provincial warehouse level, thereby assuring that fertilizers are timely available in a central location in each province. NCZ's marketing staff will be expected to liaise closely with ZCF to coordinate their respective logistics schedules and backhauling of farm produce.

Warehouse management practices for fertilizers in Zambia vary significantly by organization (ie NAMBOARD and the ZCF) and by individual warehouse. Since there is such a diversity of standards, it is recommended that the following practices be adopted:

- (i) The physical movement of inventories should be on first in first out basis;
- (ii) A perpetual inventory system should be implemented for each NCZ warehouse and inventory levels reported on a monthly basis to NCZ headquarters.
- (iii) Fertilizer in storage should be on pallets (dunnage);
- (iv) Co-mingling of fertilizer types should be avoided;
- (v) Covered storage (either through the use of tarpaulins or covered storage sheds) should be provided for all fertilizers;
- (vi) Damaged (torn) bags should be separated from good stocks and the bags should be repaired/replaced promptly;

- (vii) The current practice of having a maximum stock height of 22 bags should be continued; and,
- (viii) Once off loaded from vehicles, relocation of fertilizers within the warehouse (ie. excessive handling) should be avoided unless absolutely essential.

During the second year and in preparation for the third crop year of the implementation phase of the RFMS, it is expected that additional organizations such as Lintco, Natco, Niec Stores, private co-ops, and private retailers will seek to engage in fertilizer marketing. NCZ will be expected to supply any market entrants with fertilizer as is the case with ZCP. However, to ensure that the network develops on an orderly basis it is suggested that NCZ consider the following criteria as conditions which would be satisfied by all new fertilizer marketing organizations:

- (i) Be an established and well respected retailing organization;
- (ii) Maintain physical facilities from which to carry out retail sales;
- (iii) Have access to adequate financial resources to carry the desired level of fertilizer inventory;
- (iv) Agree to follow national pricing guide lines; and,
- (v) Be willing to attend periodic training programs conducted by NCZ on fertilizer - related topics and cooperate with NCZ to a reasonable extent on promotional programs.
- (vi) Be willing to adhere to established warehousing and operational procedures.

The physical loss of product in the fertilizer marketing system must be reduced from the current level of about 12%. This can only be realized through improved awareness and implementation of efficient distribution practices. A key to achieving reduced losses is to introduce a reasonable degree of accountability in the distribution system. This would best be accomplished by transferring title (ie ownership) of the fertilizers to the various channel members as it moves through the distribution system. Only by transferring title to the individual channel members and making each accountable for the product they market will the necessary incentive for improved operational efficiency and reduced losses materialize.

(d) Product Determination

The current practice relative to fertilizer product determination in Zambia should be continued. The principal factors now being considered are all valid. They are:

- (i) Crop and soil specific fertilizer recommendations from MACO;
- (ii) Farmer demand; and
- (iii) Use of high analysis fertilizers to the extent possible after full absorption of NCZ produced fertilizers.

Current research indicates that urea is agronomically well suited as a top dressing material in Zambia. Further, urea is the most economical nitrogen fertilizer source suitable to Zambia and it should be considered as the sole import to supplement the nitrogen shortfall not being met by NCZ.

There is also an urgent need to develop a liming program in Zambia to correct soil acidity problems. The crop production levels of recent years cannot be maintained unless such a program is implemented. The lime deposits have been identified and should be developed. Because of the low financial value of lime relative to transport costs, it is recommended that a number of quarries be established to serve local market areas. Further, by having several quarries in market specific areas, as opposed to one centrally located quarry, these will be considerably less burden on the transport system. Agricultural lime should be made available to farmers through the fertilizer marketing system.

(e) Institutional Support

The marketing system proposed for Zambia is designed to provide farmers with an adequate supply of the appropriate types of fertilizers on a timely basis. Cost efficiencies will be realized through improved efficiency in performance of the marketing functions (ie warehouse management, implementation of the logistic schedule, more accurate demand forecasting, etc.). However, institutional support will be required to support the marketing system in the following areas:

- (i) Agronomic Research - The MACO through the National Research Institute will continue to conduct research directed to yield crop specific fertilizer recommendations by agro-ecological zone and report their findings to NCZ, the Commercial Farmers Bureau, and MACO extension staff.

The MACO extension staff would continue to perform in its role of advising farmers on proper crop management and fertilization practices.

There is a need to continuously appraise programs that will contribute to the efficient use of fertilizers. Such programs include the use of crop rotations, alley cropping, etc. Such programs may impact the future use of fertilizers.

- (ii) Credit Facilities. - In order to ease the burden of the subsidy withdrawal, the credit system should be modified to provide additional funds for fertilizer purchases.
- (iii) Donor Coordination - It is expected that Zambia will continue to receive donor fertilizers and it is recommended that all donor material be channeled through NCZ. The Government, through the NCDP, should continue to hold periodic meetings with donors to discuss fertilizer related issues and encourage donors to make their aid commitments (and to plan the fertilizer arrivals) in accordance with the fertilizer procurement and distribution schedule presented in figure 11.

6. Training Programs

There is a pressing need to provide ongoing educational programs for the marketing staff of the Zambian organizations involved in fertilizer marketing, the extension staff, and MACO staff assigned to the FIU. The educational programs would focus on: (i) fertilizer marketing, (ii) data collection and analysis, and (iii) dissemination of research findings, relative to fertilizer use, to extension staff of the MACO.

(a) Training in Fertilizer Marketing

Fertilizer marketing training programs would be directed to increasing the participants knowledge in such areas as demand forecasting, tendering practices, promotion, distribution (including warehouse management), pricing, product determination, packaging, etc. It is recommended that a three week marketing course be conducted in Zambia for selected NCZ, ZCF and MACO staff and include the following topics:

- (i) components of marketing
- (ii) fertilizer demand analysis
- (iii) procuring fertilizers on the international market
- (iv) distribution
- (v) product knowledge
- (vi) fertilizer promotion
- (vii) fertilizer pricing
- (viii) marketing research techniques
- (ix) marketing controls
- (x) etc.

The program should involve a three day study trip to Kenya to observe the operations of a multi channel marketing system and discuss the marketing strategies which exist in such organizations as Muranga Cooperative, Kenya Grain Growers Cooperative, Safina Stores, etc. An estimated budget is shown in Appendix V, Exhibit 1.

(b) Training In Data Collection and Analysis

The FIU staff and the marketing research staff of the NCZ will need immediate assistance in organizing their programs and in establishing procedures for carrying out their functions. Because of the limited number of staff that would be involved in such activities, it is suggested that selected individuals attend a training program conducted by IFDC in the U.S. Each year, as part of its ongoing program IFDC conducts a 3 week training program on data collection and analysis. The course agenda includes discussions on:

- (i) survey techniques and design
- (ii) questionnaire design
- (iii) data analysis techniques
- (iv) forecasting methodology
- (v) the role of computers in data storage and analysis
- (vi) etc.

Further, the program involves class room lectures at IFDC headquarters and field visits to state agricultural statistics offices and selected institutions in Washington. An estimated budget is shown in Appendix V, Exhibit 2.

(c) Training on Dissemination of Fertilizer Research Findings

There is an ongoing need to strengthen the knowledge of the extension staff on the technical aspects of fertilizer use. This could best be accomplished through a series of one week seminars conducted by staff of the Mt. Makulu Research Station and the University of Zambia, School of Agricultural Science. The programs should include such topics as follows:

- (i) The role of fertilizers in crop production;
- (ii) Fertilizer products;
- (iii) Fertilizer handling and application practices;
- (iv) The importance of lime in sustaining crop production;
- (v) The role and importance of crop rotation, green manures, use of organic fertilizers.

The programs could be conducted at the University of Zambia and/or the Mt. Makulu Research Station.

7. Data Collection and Analysis

It is recommended that the Government strengthen its position on: (a) monitoring the performance and development of the fertilizer subsector and (b) providing pertinent market information for planning purposes. This could best be accomplished through the establishment of a fertilizer information unit (FIU) within the Planning Division of MACO to collect and analyze market information on an ongoing basis. The organization and staffing, objectives, data requirements, and needed analytical reports are as follows:

(a) Organization

It is recommended that the FIU be headed for the first year by an expatriate market analyst, experienced in fertilizer market analysis in developing countries and knowledgeable in data base design and maintenance. Two Zambian market analysts/economists experienced in fertilizer market analysis would be assigned to the FIU on a full time basis. Local support staff would include a minimum of two research assistants

It is suggested that the FIU be established as a unit within the Planning Division of MACO and be allocated sufficient office space for efficient operation. It is expected that the FIU will function as an autonomous market intelligence unit within MACO. However it is expected that the FIU will liaise closely with NCZ, ZCF, and other agricultural input marketing organizations for data collection and analysis purposes. Further in order to achieve cost efficiency the FIU should, to the extent possible, utilize the current data collection services of other Government institutions such as the Bureau of Statistics.

(b) Objectives

The overall goal of the FIU would be to maintain a current ongoing awareness of the fertilizer market in Zambia and the international market and to convey the analyses to the relevant government institutions and fertilizer marketing organizations on a timely basis. Specifically, the three principal objectives of the FIU would be as follows:

- (i) To develop and maintain an effective management information system relative to the domestic fertilizer market;
- (ii) To maintain a current awareness of the international fertilizer market situation and outlook; and,
- (iii) To provide Government officials with timely, accurate analyses of the Zambian fertilizer market.

(c) Data Requirements

The initial data requirements needed to satisfy the domestic and international fertilizer market information objectives of the FIU are as follows:

(i) Domestic market information -

- . Fertilizer use by product type (annual)
- . Fertilizer use by province and by district (annual)
- . Fertilizer use by product type by crop
- . Fertilizer product inventory levels by province (semi annual)
- . Fertilizer storage capacity by province and by district and classified by type of facility (ie fully enclosed structure, thatched roof, open shed, tarpaulins, etc.) (annual)
- . Number of retail outlets by type and by province and district (annual)
- . Fertilizer supply sources by product type (ie, donor, NCZ and commercial imports) (annual)
- . Fertilizer losses by marketing organization and by channel member.
- . Fertilizer prices by product (annual)
- . Output prices by crop at farm level (annual)
- . Fertilizer marketing costs by marketing organization (annual)

(ii) International Market Information -

- . International fertilizer market prices for relevant products used in Zambia (monthly)
- . World fertilizer supply - demand relationships for relevant products (on - going)
- . Freight rates for ocean going cargoes (monthly)
- . Technological developments relative to the Zambian fertilizer market. (on - going)
- . Prices of comparable products in neighbouring countries

It is apparent that the FIU's data needs will change as the fertilizer market in Zambia evolves and as the analytical capabilities of the FIU staff develop.

(d) Analytical Reports

The FIU will be expected to produce the following analytical and/or statistical reports on an ongoing basis.

<u>Report Type</u>	<u>Frequency</u>
(i) Domestic Supply	semi annual
(ii) Stock levels by product	monthly
(iii) Consumption by product by provinces	annual
(iv) Fert. Situation Bulletin	monthly
a. status of imports	
b. off take pattern	
c. losses	
d. etc.	
(v) Crop-fertilizer price relationship	annual
(vi) International fertilizer market situation	annual
(vii) International market prices	monthly

Both primary and secondary data will be required to support the FIU's management information system. The secondary data will be derived from IFDC and such commercial marketing research organizations as British Sulphur, FERTECON, Greenmarkets, etc. and will comprise information on the international fertilizer market. Primary data will be limited to domestic market data and will be collected through surveys designed and implemented by the FIU and through surveying activities of other Government institutions.

(e) Financial Requirements

The financial requirements to establish and maintain the FIU include both foreign exchange and local currency. The estimated foreign exchange requirement in years 1 and 2 are \$208,000 and \$15,000 respectively. The local currency cost for years 1 and 2 are K248,000 and K285,000 respectively. (Appendix V, Exhibit 3.)

C. Impact of Recommended Fertilizer Marketing System.

Base data for comparing costs and benefits of the current fertilizer distribution system with the RFMS are not available. For this reason, only general benefits of the recommended system have been estimated. Each component of the system as phased in will contribute benefits; however, when fully implemented, a synergistic effect will create benefits larger than the sum of benefits created by the individual components. An objective of the Fourth National Development Plan is to achieve self-sufficiency in basic staple food crops. To accomplish this objective an efficient fertilizer marketing system is urgently needed. The recommended fertilizer marketing system is designed to efficiently serve farmers and the national economy. The following benefits are possible.

1. Material Losses

It is estimated that fertilizer product losses through theft and spillage are costing Zambia about K70 million per year.

Estimates of fertilizer material losses include: 4% from the port operation in Dar es Salaam and en route to Lusaka; NAMBOARD losses of 5% from the time the fertilizers are received until they are passed to the Cooperative Union; and ZCF losses of 3% in its operation. This is a total loss of 12%. Based upon an average CIF Lusaka price of US\$250 the losses on imports of about 200,000 tons in 1988 would be about US\$6,000,000 or K60,000,000. Further, losses by NAMBOARD and ZCF on material produced by NCZ are estimated at K10,000,000.

The recommended fertilizer marketing system should reduce total system losses to a maximum of 2%. Based on 1988/9 prices and a projected demand in 1990/91 of 250,000 tons, a savings versus the current system of at least K50 million per year can be realized.

2. Reduced Freight and Handling

In the current system most of the fertilizer is handled in the NAMBOARD warehouses.

There is also considerable reshipment of fertilizers from Province to Province and District to District due to over and under supply. The recommended fertilizer marketing system will reduce the NAMBOARD Warehousing cost and the reshipment costs by an estimated K1,460,000*.

* Reshipment 5% x 269,000T
13,450T x 75Km @ K1.45 km = K1.46 million.

3. Reduced Working Capital

The recommended fertilizer marketing system will recognize the necessary pipe-line time to make fertilizers timely available to farmers. In 1988/89 fertilizers are reaching farmers too late to be used. This is causing a large carry-over to next year although commercial farmers are buying up supplies for the 1989/90 cropping season. It is estimated by the fertilizer study team that approximately 50,000 to 70,000T of fertilizer will be carried over to the 1989/90 season. On average, the team estimates that normal carryover stocks should be approximately 20,000 T annually. Thus, excessive year end stocks this year will total about 40,000 T. Considering that fertilizers should be purchased in July for in-country delivery in August-September the extra carry-over will only be for four months. The cost of additional working capital caused by late arrivals is estimated at K10.6 million*.

The recommended fertilizer marketing system should correct the excessive stock situation by timely purchasing and result in an interest saving of K10.6 million.

4. Reduced Overhead

It is recommended that NAMBOARD be eliminated. The functions presently carried out by NAMBOARD are duplicated by NCZ and the Cooperative Union. NAMBOARD does not calculate and overhead for their fertilizer operation. The NAMBOARD staff spending some time on the fertilizer operation at present is 990. If the employees spend 50% of the time on fertilizers a cost could be as high as K5.9 million, i.e. 495 x average salary of K12,000 = K5.9 million. This does not include transportation, office space and other costs that are normally included in overhead calculations. The estimated savings of K5.9 million on overhead is a very conservative figure.

5. Leakage Across Border

There is a considerable amount of fertilizer that moves across the border and is sold in Malawi. It is also reported to the study team that some tonnage is sold to Zaire. During a recent fertilizer study in Malawi it was estimated that as much as 15,000 - 20,000 tons of product was moving into Malawi from Zambia. This leakage takes place because of the cheaper subsidized fertilizer price in Zambia.

*40,000 tons @ K3800
@ 21% interest for 4 months = K10.6 million.

Non-subsidized prices in Malawi are about 135% higher than those in Zambia. The recommended fertilizer marketing system advocates the removal of the fertilizer subsidy in Zambia over a 5 year period. A parity price with Malawi will virtually eliminate the border leakages. Not including the loss in food production, a saving of K76.0 million can be realized. 1/

6. Reduced Yields

Potential crop yields are being lost because fertilizers are not reaching farmers in time for best use. In some provinces the basal dressing fertilizer did not reach until January/February - long after plants are up and in an advanced stage. In some sections, the top dressing fertilizers at time of the study were just arriving. The Zambia Sugar Company Limited at Mazabuka estimates that sugar production will be reduced by 40% because the top dressing fertilizers reached the plantation too late for best yields. With a normal yield of 150,000 tons of sugar annually, a 30% reduction amounts to 45,000 tons of sugar that is lost to the system.

An even larger loss to farmers and the country is the loss in reduced maize yields due to the late arrival of fertilizers. Based upon visits with the large and small scale farmers the loss in yields this year range from 5 to 10 bags of grain per hectare. Assuming that 50% of the farmers fertilize, a loss of K216 on maize alone is expected to occur. 2/

This represents a K216 million loss in income to farmers and the country.

1/ 20,000 tons @ K3800 = K76.0 million.

2/ 800,000 ha in country
 x .50%
 400,000 ha
 x 5 bags

2,000,000 million bags x K108 = K216 million.

Based upon MACO estimates, in 1988/89, 47,800 T of wheat would be imported. The estimated cost of importing this amount of wheat is K130 million. Zambia has the ecological conditions necessary to grow most food crops. A business like and efficient fertilizer marketing system is needed to make the appropriate fertilizers timely available to farmers so that Zambia can be self-sufficient in the production of the basic food crops. The recommended fertilizer marketing when fully implemented can save the K130.0 million now being used to import wheat.

7. Human Resources

A stable food supply is necessary for a healthy population. A healthy population is necessary for a sound and expanding economy. An inadequate food supply causes malnutrition, diseases and medical expenses plus loss of life. People are spending time in search of food that could be utilized on more productive work. A cost for the loss of human resources can not be estimated; however, it is huge. An efficient fertilizer marketing system is one of the essential infra structure requirements necessary to overcome this loss in Zambia.

8. Increased Yields

There are many farmers who do not use fertilizer and as a result produce only about 1.0 ton of maize or less per hectare. They know about fertilizers but do not purchase and apply it simply because it is hard to find at the right time. The recommended fertilizer marketing system, by making fertilizers available to farms 365 days per year, can assist in encouraging farmers to use fertilizers and increase yields. As indicated in table 1 consumption has been as high as 243,924 tons in 1987. The study team estimates consumption to be only 185,000 tons in 1988/89 due to non availability, leakages, etc. The recommended fertilizer marketing system when implemented can easily increase consumption by 8% per year for the next 5 years. Based upon this assumption, in the first year under the new system fertilizer use would increase by at least 15,000 T. An additional 15,000 T of fertilizer used under proper crop management practices should yield an additional 98,000 T of maize. At present prices this represents a net savings to foreign exchange of K269 million should this quantity of grain be imported.

9. Net Impact

As previously mentioned, the recommended fertilizer marketing system is but one component of the total package of infrastructure required to attain self sufficiency in Zambia. Self sufficiency in food production can not be realized without a system to provide inputs efficiently to farmers and a structural market for their output. An efficient fertilizer marketing system can easily contribute to savings of K490 million per year as indicated below:

<u>ITEM</u>	<u>K - SAVINGS</u> (in millions)
Material loss	50.0
\ Reduced freight	1.5
Credit repayment	30.0
Working Capital	10.6
Overhead	5.9
Leakage	76.0
Yield loss	216.0
Foreign Exchange (Wheat)	130.0
Total	K490.0

D. Fertilizer Consumption Forecast

As indicated in previous sections of this Report, data on actual fertilizer use in Zambia are unavailable and all institutions involved in the fertilizer subsector treat NAMBOARD sales estimates as apparent consumption. The time series data on NAMBOARD sales for 1980-88 (Table 1) indicate considerable instability in the sales pattern. (The reasons for which are not fully known but appear to be linked to: (a) supply shortages and (b) pricing developments.) A trend analysis based upon these data would be insignificant. The compound growth rate in fertilizer sales for the past eight years has been less than 2%. This is extremely low for an agriculturally oriented economy where the fertilizer market should be in the growth phase of market development. Based upon experience in similar markets, fertilizer use in Zambia should easily increase by 8%-10% per year over the next five years, given adequate supply availability and a continuation of the existing fertilizer:crop price relationship. Hence, fertilizer use in 1994 would total about 330,000 tonnes of product or 129,000 tonnes of nutrient (Table 18).

Table 22: Forecast of Apparent Fertilizer Consumption in Zambia

	<u>Est.</u> <u>1988</u>	<u>1989</u>	<u>1990</u>	<u>1991</u>	<u>1992</u>	<u>1993</u>
	----- Thousand Tonnes -----					
N	56.4	61	66	71	77	83
P ₂ O ₅	22.8	25	26	28	31	33
K ₂ O	8.5	9	11	11	11	13
Total	87.7	95	103	110	119	129
Product Tons	225	243	262	283	306	331

For comparison purposes, the most recent fertilizer demand forecast by NAMBOARD was prepared in 1988 and assumed that consumption would increase by 6.6% per annum for the next five years and total 266,000 tonnes in 1993 (Table 19). Both the assumed annual growth rate of 6.6% and NAMBOARD's estimate of apparent consumption in 1988 (ie 200,000 tonnes) appear to be conservative.

It appears that most Zambian farmers are aware of the benefits of fertilizer use and would increase their usage if the appropriate products were available on a timely basis. If the recommended fertilizer marketing system is fully implemented and functions as expected, apparent fertilizer product consumption should reach 300,000 tonnes by 1992.

Table 23: Five Year Fertilizer Demand Forecast

<u>PRODUCT/YEAR</u>	<u>1989</u>	<u>1990</u>	<u>1991</u>	<u>1992</u>	<u>1993</u>
	-----Product Tonnes-----				
<u>Nitrogen</u>					
Urea	55,000	50,000	40,000	45,000	50,000
A.N.	30,000	40 000	55,000	60,000	60,000
<u>Compounds</u>					
'D'	42,000	44,000	46,000	48 000	50,000
'X'	53,000	54,000	59,000	60,000	62,000
'R'	21,000	22,000	23,000	24,000	25,000
'C'	6,000	7,000	7, 00	8,000	8 000
'V'	4,000	5,000	5,000	6,000	6,000
Others	4,000	4,000	5,000	5,000	5,000
TOTAL	215,000	226,000	240,000	256,000	266,000

NOTE: Fertilizer year covers a period of 12 months commencing on October 1 and ending on September 30

Source: NAMBOARD

E. Indigenous Agro-Minerals

The known agro-mineral deposits in Zambia have been documented in previous section of this report. In addition to coal for hydrogen and pyrites roasted for sulfur that are used by NCZ to produce NH_3 and H_2SO_4 respectively, phosphate rock (PR) and limestone are also available, in Zambia. These essential agro minerals should be fully exploited and used to: (a) reduce the dependence on outside sources, (b) save foreign exchange and (c) increase crop yields. In keeping with the Fourth National Development Plan, ZIMCO can develop these elements as a substitute to imported materials.

The two agro-minerals that have immediate potential for use are PR and limestone. PR, although limited in quantity and quality, can be utilized. IFDC through a program to develop agro-minerals in East and South East Africa has successfully produced a partially acidulated phosphate rock (PAPR). Simply stated, the process is to react one-half the normal amount of sulfuric acid or phosphoric acid with PR (that is required to produce SSP or TSP). The product produced is a 50% PAPR. If sulfuric acid is used, the product is actually about one-half water soluble SSP and the remaining half is a slow release citrate soluble product. Trials presently being carried out by NORAD in the Northern Province, University of Zambia, School of Agricultural Science in the Lusaka Province and Mt. Makulu Research Station to determine the agronomic effectiveness appears to be positive. The field trials being carried out by NORAD are in the second year where as the other trials are in the first year. If the product proves to be agronomically effective production of PAPR could start relatively quick. NCZ produces H_2SO_4 and PR is available relatively close by.

As mentioned in the section on appropriateness of fertilizers, a liming program is essential for continued crop production in Zambia. Without a liming program crop yields per hectare will decline. Lime is needed to stabilize the soil pH in a desirable range, eliminate undesirable conditions such as iron, manganese and aluminium toxicity and to create a favorable soil condition for bacteria action (ie nodulation of legumes). Lime is also a source of the essential elements calcium and magnesium. Limestone as calcium carbonate and magnesium carbonate are available in an abundant supply in Zambia. Development of the liming industry should be given top priority.

E. IMPLEMENTATION SCHEDULE FOR RECOMMENDATIONS

The success of the recommended marketing system will depend to a large degree on the systematic implementation of the recommendations contained herein. As indicated in Table 20 and Figure 12, it is expected that implementation would begin in 1990 with the simultaneous (a) establishment of the Fertilizer Information Unit within MACO, (b) Government endorsement of NCZ as the apex organization in the fertilizer marketing system and (c) NAMBOARD implementation of the procurement schedule. Once Government actions are taken relative to (a) FIU and (b) NCZ being the apex marketing organization staffing and operational planning should begin. It is expected that it will take one year for FIU to become an effective unit and 15 months will be required for NCZ to establish an adequate marketing department, develop marketing plans, and contract for warehouse capacity at the provincial level. Effective in January 1991, NCZ would begin marketing operations including procurement of fertilizers on the international market. NAMBOARD would continue to maintain their four central warehouses until the end of the 1990/91 fertilizer year, at which time NCZ would take over all fertilizer operations from NAMBOARD.

In its initial year of fulfilling the role of the apex marketing organization (1991), NCZ would channel all fertilizers through the ZCF and a few selected private retailers. In 1992 (year two of the implementation phase), the fertilizer pricing system would be modified to more accurately reflect costs and to provide an incentive to private sector firms to engage in fertilizer marketing. Also during year two of the implementation, the licensing policy would be liberalized to allow additional organizations to engage in fertilizer marketing.

The phasing out of the fertilizer subsidy should begin with the July 1990 price announcements for the 1990/91 fertilizer year and continue until the subsidy is completely phased out in 1995.

Table 24: Implementation Schedule for Recommendations

- Phase I (Year 1) (1990)
- Create and staff the FIU within MACO
 - Obtain Government approval of NCZ as the apex within the marketing system
 - NCZ to post one technical staff at the port of Dar es Salaam to monitor imported fertilizer
 - Begin to establish a fertilizer marketing department within NCZ
 - Phasing out of subsidy to begin
 - Implement planning schedule for fertilizer procurement and distribution
 - Begin training of FIU staff
 - Establish the Technical Advisory Unit
- Phase II (Year 2) (1991)
- NAMBOARD's involvement in fertilizer related activities to cease
 - NCZ to take over all importing activities and fertilizer distribution to the provincial level
 - NCZ to establish warehouses in each province
 - Continue phasing out of subsidy
 - Co-op to continue as down stream marketing organization
 - Licensing system to be liberalized to encourage private sector marketing
 - Modify pricing structure to provide adequate incentive to marketing organizations
- Phase III (Year 3-5) (1992 - 1995)
- Begin training of marketing staff
 - NCZ to continue operations
 - Continue phasing out of subsidy
 - Continue to select retailers to cover void in marketing system
 - Begin training of marketing channel members

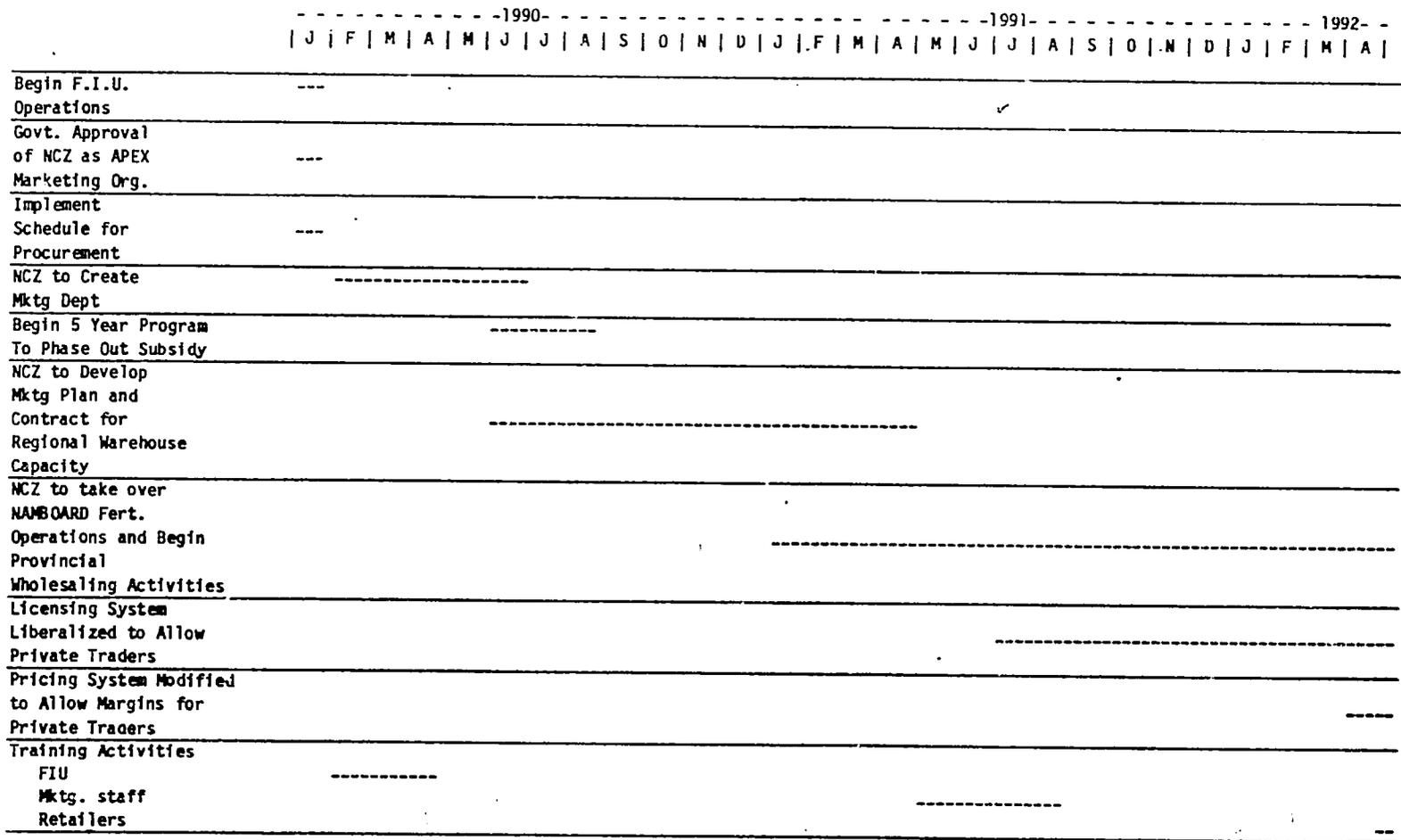


Figure 12: IMPLEMENTATION SCHEDULE FOR RECOMMENDATIONS

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Appendix I, Exhibit 1

Study Objectives and Terms of Reference

The objectives of the Zambia fertilizer subsector study are as follows:

1. To assess the effective demand for fertilizer in Zambia.
2. To evaluate the operational efficiency and cost effectiveness of the existing fertilizer marketing system in satisfying the fertilizer related needs of Zambian farmers and in fostering efficient fertilizer market development.
3. To assess the role of each of the entities involved in the Zambian fertilizer subsector.
4. To recommend immediate and long term strategies for Zambia to achieve improved performance and increased cost effectiveness in meeting its fertilizer needs and in assuring that farmers have the appropriate type of fertilizer prior to planting and at a reasonable price.
5. To evaluate the impact of the fertilizer subsidy on the economy and to recommend the most appropriate action for the Government of Zambia in dealing with the subsidy issue.
6. To assess the potential of utilizing indigenous raw materials in meeting Zambia's fertilizer requirements.
7. To develop a plan for implementation of all proposed changes in the fertilizer subsector.

Terms of Reference

In order to satisfy the study objectives, the following specific terms of reference will be performed:

1. Review the current fertilizer supply-demand situation in Zambia to include:
 - a) Nutrient use trends
 - b) Product use trends
 - c) Regional use patterns
 - d) Supply sources:
 - (i) imports
 - (ii) domestic production
 - e) Leakage to neighbouring countries
 - f) Impact of untimely arrivals on fertilizer usage.

Appendix I, Exhibit 1 Continued

2. Evaluate the current fertilizer pricing policy of the Government and the methodology used in determining prices which will include:
 - a) Product prices
 - b) Nutrient prices
 - c) International price trends and their relationship to Zambian prices
 - d) Subsidy determination and the impact of the subsidy on the economy

3. Identify the following costs involved in fertilizer marketing in Zambia:
 - a) Import costs
 - b) NCZ production costs and ex-factory pricing policies
 - c) In-country marketing costs (NAMBOARD) - overhead costs - direct costs
 - d) In-country marketing costs (Cooperatives), distribution (including storage, selling, etc.)
 - e) Losses

4. Evaluate the economic incentive to farmers for using fertilizer.

5. Examine the organization, responsibilities and authority of each of the various actors within the fertilizer subsector in meeting the subsector objectives (ie demand forecasting, production, procurement, pricing and subsidy administration, distribution, research, extension, etc.) and make recommendations on the future function and operations of the various actors involved. Suggestions regarding possible alternative institutional arrangements to improve the efficiency and cost effectiveness of performing these functions within the fertilizer subsector will also be made. The following entities will be examined:
 - a) NAMBOARD
 - b) Provincial Cooperative Union
 - c) Ministry of Agriculture and Cooperatives
 - d) Commercial Farmers
 - e) Central Supply and Tender Board
 - f) National Fertilizer Committee
 - g) Nitrogen Chemicals of Zambia
 - h) Farmer Cooperative Societies
 - i) Lima Bank
 - j) International Organizations
 - k) Zambia Cooperative Federation/Finance Services
 - l) Donors
 - m) Ministry of Finance
 - n) Others (e.g. Contingency Planning, Minex)

Appendix I, Exhibit 1 Continued

6. Appraise the operational efficiency of the fertilizer distribution system including:
 - a) Import practices and timing of arrivals
 - b) Logistic Planning
 - c) Modes of transportation used (vehicle availability)
 - d) Adequacy of retail points of sale in serving Zambian farmers
 - e) Adequacy of storage facilities and stock management procedures
 - f) Losses - spillage, leakage and disappearance
7. Assess the appropriateness of the fertilizers currently being used in Zambia in terms of:
 - a) Fertilizer research programs and findings
 - b) Dissemination of technical information to the actors in the fertilizer subsector as well as to farmers
 - c) The role of high analysis fertilizers
 - d) The impact of long-term fertilizer use on soil characteristics and crop production
8. Assess the adequacy of the credit system as related to fertilizer sales.
9. Determine the staff training needs of all of the actors involved in the fertilizer subsector.
10. Develop a five year demand forecast for fertilizer use by product in Zambia.

Appendix I, Exhibit 2

THE STUDY TEAM

1. L.B. Williams, African Coordinator, International Fertilizer Development Centre, Muscle Shoals, Alabama, U.S.A.
2. A. Mwanambo, Principal Economist, Planning Division, Ministry of Agriculture and Cooperatives, Lusaka, Zambia
3. V.R.N. Chinene, Dean, School of Agriculture University of Zambia
4. F. Chenoweth, Production and Marketing Advisor, Zambia Agricultural Training, Planning and Institutional Development Project II (ZATPID II), Planning Division, Ministry of Agriculture and Cooperatives, Lusaka, Zambia
5. J.K. McPhillips, Soils and Crops Advisory Officer, Mount Makulu Research Station, Department of Agriculture, Ministry of Agriculture and Cooperatives, Lusaka, Zambia
6. J.H. Allgood, Market Analyst, International Fertilizer Development Centre, Muscle Shoals, Alabama, U.S.A.

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Appendix I, Exhibit 3

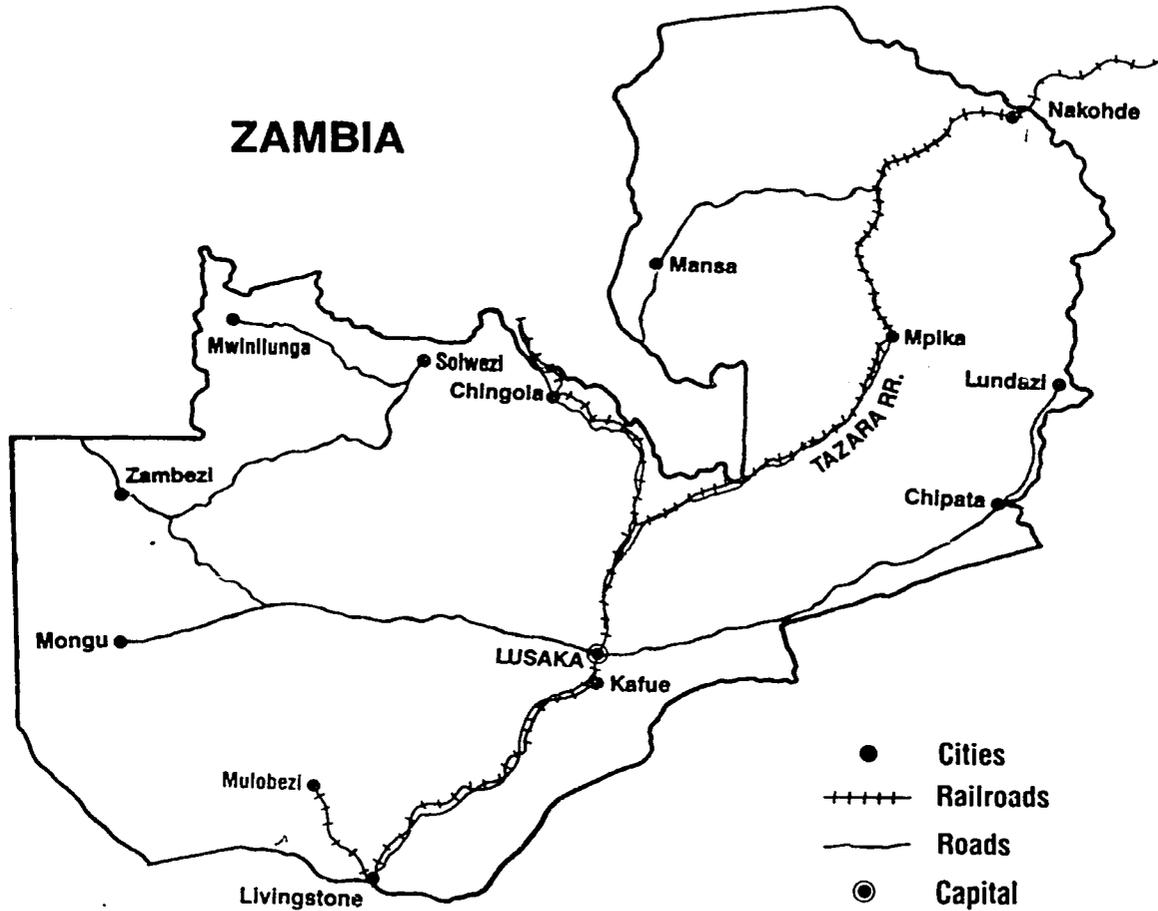
ORGANIZATIONS VISITED

1.	MACO (Headquarters)	Lusaka
2.	NCDP - CSO	Lusaka
3.	USAID	Lusaka
4.	NAMBOARD	Lusaka
5.	ZCF (Headquarters)	Lusaka
6.	ZCF/FS	Lusaka
7.	NCZ	Kafue
8.	VTAZ	Lusaka
9.	NAMBOARD Warehouse	Lusaka
10.	ZIMCO	Lusaka
11.	LINTCO	Lusaka
12.	NATCO	Lusaka
13.	Midland Cooperative	Lusaka
14.	TAZARA	Lusaka
15.	NAMBOARD	Chisamba
16.	Commercial Farmers Bureau	Lusaka
17.	ZAMCARGO	Lusaka
18.	ZAMSEED	Lusaka
19.	National Wholesale and Marketing Cooperation	Lusaka
20.	Global 2000	Lusaka
21.	NGDC Training Centre Library	Kafue
22.	FAO	Lusaka
23.	The World Bank	Lusaka
24.	CIMMYT	Lusaka
25.	Zambia Sugar Company Ltd	Mazabuka
26.	National Milling Company	Lusaka
27.	DOA	Lusaka
28.	DOA	Livingstone
29.	PAO's Office	Choma
30.	ZATCO	Choma

Appendix 1, Exhibit 3 Continued

31.	IECI Store	Senkobo
32.	NATCO	Mazoko
33.	SPCMU	Mazabuka
34.	Woodland Cooperative Society	Lusaka
35.	NIEC	Lusaka
36.	UNZA - School of Mines	Lusaka
37.	NAMBOARD Warehouse	Monze
38.	Rural Cooperative Depot	Chongwe
39.	Landless Farm and Other Random Sampled Farmers in Central Province	
40.	Ian Bruce Miller Farm	Choma
41.	Lima Bank	Lusaka
42.	CUSA (Z) Ltd	Lusaka
43.	Mumbwa District Council	Mumbwa
44.	DOA	Mumbwa
45.	DCU	Mumbwa
46.	Moono Rural Cooperative Depot	Mumbwa
47.	Lubale Rural Depot	Mumbwa
48.	'Junction' Rural Depot	Mumbwa
49.	MCC's Office	Chipata
50.	PAO's Office	Chipata
51.	DAO's Office	Chipata North
52.	ECU	Chipata
53.	ECU - Alimi Depot	Chipata North
54.	ECU - Chipata South Depot	Chipata South
55.	ECU - Sanjika Depot	Chipata
56.	ECU - Feni Depot	Chipata
57.	FDC	Chipata
58.	University of Zambia	Lusaka
59.	Tobacco Development Company	Chipata
60.	Multi Purpose Co-op	Chingong
61.	ICI Zambia Ltd.	Lusaka
62.	Shell Chemical Co.	Lusaka

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Appendix 1: A Map of Zambia showing Railroads, Major Highways and Cities

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Appendix II, Table 1: Fertilizer Distribution to Branches as per Requirement
from April 1 1988 to February 3 1989 (Tonnes)

<u>FERTILIZER</u>	<u>BASAL FERTILIZER</u>			<u>TOP DRESSING</u>			
	<u>PROVINCE/ DEPOT</u>	<u>ESTIMATED REQUIREMENT</u>	<u>SUPPLIED</u>	<u>SHORTFALL</u>	<u>REQUIREMENT</u>	<u>ESTIMATED SUPPLIED</u>	<u>DEPOT SHORTFALL</u>
			Tonnes of Product				
<u>EASTERN</u>							
Ntilizi	1,668.55	1,046.00	- 2,267.75	2,267.55	697.55	- 1,570.20	
Petauke	1,318.40	2,304.90	+ 989.50	1,671.55	694.50	- 977.05	
Sinda	1,736.10	899.60	- 936.50	1,700.00	1,169.70	- 530.30	
Katete	4,068.25	4,487.25	+ 424.00	4,000.00	211.00	- 3,789.00	
Chadiza	12,382.65	4,503.25	+ 7,879.40	12,028.95	1,983.75	-10,045.20	
Chipata	9,922.05	12,673.10	+ 2,751.05	17,789.60	2,164.40	-15,624.60	
Lundazi	8,352.55	10,924.50	+ 2,561.95	13,843.60	2,064.85	-11,778.75	
Chama	841.85	552.00	+ 90.15	215.30	140.00	- 75.30	
Sub Total	39,915.40	37,390.60	- 2,524.80	53,516.15	9,125.75	-44,390.40	
<u>SOUTHERN</u>							
Monze	16,588.80	11,530.45	- 5,058.35	20,909.55	3,374.10	-17,535.45	
Mazabuka	4,500.00	4,977.80	+ 477.80	1,370.00	1,485.00	+ 115.90	
Choma	4,000.00	9,276.40	+ 5,276.40	2,903.50	3,921.55	+ 1,018.05	
Kalomo	4,975.00	3,067.50	- 1,907.50	778.50	778.50	NIL	
L/sTe	825.00	4,164.20	+ 3,339.20	845.05	845.05	NIL	
Gweribe	350.00	-	- 350.00	275.00	-	275.00	
Namwala	1,250.00	-	- 1,250.00	600.00	-	600.00	
Sub Total	32,488.80	33,016.35	+ 527.55	27,681.60	10,405.10	-17,276.50	

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Appendix II, Table 1 Continued

<u>PROVINCE/ DEPOT</u>	<u>ESTIMATED REQUIREMENT</u>	<u>SUPPLIED</u>		<u>SHORTFALL</u>	<u>ESTIMATED REQUIREMENT</u>	<u>SUPPLIED</u>	<u>SHORTFALL</u>
<u>C/BELT</u>							
Ndola	12,425.00	12,472.00	+	47.45	11,360.00	545.40	-10,814.80
Kitwe	2,350.00	2,003.40	-	346.60	2,350.00	18.00	2,332.00
Sub Total	14,775.00	14,475.95	-	299.05	13,710.00	563.40	-13,146.60
<u>NORTH WESTERN</u>							
Solwezi	2,916.05	3,240.28	+	324.23	2,323.70	1,718.75	- 604.95
<u>WESTERN</u>							
Mongu	500.00	2,676.45	+	2,176.45	500.00	496.55	3.45
Kaoma	2,815.00	2,112.00	-	703.00	2,440.00	147.50	- 2,292.50
Sub Total	3,315.00	4,788.45	+	1,473.45	2,940.00	644.05	- 2,295.95

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Appendix II, Table 1 Continued

<u>PROVINCE/ DEPOT</u>	<u>ESTIMATED REQUIREMENT</u>	<u>SUPPLIED</u>	<u>SHORTFALL</u>	<u>ESTIMATED REQUIREMENT</u>	<u>SUPPLIED</u>	<u>SHORTFALL</u>
<u>NORTHERN</u>						
Kasama	12,150.00	17,020.50	+ 4,870.00	9,350.00	17,977.90	+ 8,627.90
Mwanzo	2,700.00	1,231.25	- 1,468.75	2,700.00	1,278.95	- 1,421.05
Mpika	5,600.00	5,013.05	- 586.95	5,000.00	4,433.70	- 566.30
Muyombe	1,650.00	1,548.65	- 101.35	1,650.00	672.10	- 977.90
Thendere	1,650.00	1,249.55	- 400.00	1,650.00	823.35	- 826.65
Sub Total	23,750.00	26,063.00	+ 2,313.45	20,350.00	25,186.00	+ 4,836.00
<u>CENTRAL</u>						
Kabwe	11,765.60	16,655.35	+ 4,889.75	11,403.15	8,671.85	- 2,731.30
Serenje	3,106.45	3,098.15	- 8.30	3,446.80	205.75	- 3,241.05
K/Mposhi	4,925.00	1,650.50	- 3,274.50	4,520.00	1,366.05	- 3,153.95
Chisamba	5,250.00	7,933.85	+ 2,683.85	4,600.00	6,491.25	+ 1,891.25
Mkushi	6,656.20	8,619.60	+ 1,953.40	10,831.45	1,206.05	- 9,625.40
Mumbwa	5,007.05	1,941.00	- 3,006.05	4,799.05	.85	- 4,798.20
Sub Total	36,720.30	39,898.45	+ 3,178.15	39,600.45	17,941.80	-21,658.65

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Appendix II, Table 1 Continued

<u>PROVINCE/ DEPOT</u>	<u>ESTIMATED REQUIREMENT</u>	<u>SUPPLIED</u>	<u>SHORTFALL</u>	<u>ESTIMATED REQUIREMENT</u>	<u>SUPPLIED</u>	<u>SHORTFALL</u>
<u>LUSAKA</u>						
P.C.U.	2,550.00	3,764.20	+ 1,214.20	3,000.00	1,391.95	- 2,408.05
Lusaka	13,627.00	16,708.25	+ 3,081.25	5,489.00	19,878.03	+14,389.03
Sub Total	16,177.00	20,472.45	+ 4,295.45	9,289.00	21,269.98	+11,980.98
<u>LUAPULA</u>						
Mansa	3,036.80	5,613.95	+ 2,577.15	2,219.65	4,380.60	+ 2,160.9

SUMMARY

Total Basal Dressing Fertilizer required	173,094.35
Total Basal Dressing Fertilizer supplied	184,959.48
Total Basal Dressing Fertilizer average	+ 11,865.13
Total Top Dressing Fertilizer required	171,680.55
Total Top Dressing Fertilizer supplied	91,235.43
Total Top Dressing Fertilizer shortfall	- 80,395.12

Source: NAMBOARD, February 7, 1989

Appendix II, Table 2: Fertilizer Storage Capacities in Existing Sheds and CIDA Sheds

(INCLUDING PHASE-III)

AND FERTILIZER SALES 1987

<u>PROVINCE</u>	<u>DEPOT</u>	<u>EXISTING</u>	<u>CIDA</u>	<u>TOTAL</u>	<u>ACTUAL SALES</u> <u>1987</u>
		<u>SHEDS</u>	<u>SHEDS</u>	<u>SHEDS</u>	
		<u>TONNES OF PRODUCT</u>			
SOUTHERN	LIVINGSTONE	3,500	-	3,500	
	CHOMA	-	17,500	17,500	
	MONZE	6,500	14,000	20,500	
	KALEYA	-	8,750	8,750	
	MAZABUKA	-	7,000	7,000	
	TOTAL	10,000	47,250	57,250	48,748
LUSAKA	FERT. BRANCH	60,000	-	60,000	29,304
CENTRAL	CHISAMBA	5,000	-	5,000	
	NATUSEKO	3,500	7,000	10,500	
	K/MPOSHI	3,000	-	3,000	
	MUMBWA	3,500	3,500	7,000	
	MKUSHI	-	17,500	17,500	
	Sub Total	15,000	28,000	43,000	55,000

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Appendix II, Table 2 Continued

<u>PROVINCE</u>	<u>DEPOT</u>	<u>EXISTING SHEDS</u>	<u>CIDA SHEDS</u>	<u>TOTAL SHEDS</u>	<u>FERTILIZER SALES 1987</u>
COPPERBELT	NDOLA	18,000	-	18 000	
	KITWE	2,500	-	2,500	
	TOTAL	20,500	-	20,500	13,900
EASTERN	CHIPATA	4,500	7,000	11,500	
	KATETE	-	7,000	7,000	
	LUNDAZI	-	7,000	7,000	
	PETAUKE	-	3,500	3,500	
	TOTAL	4,500	24,500	29,000	50,919
NORTHERN	KASAMA	800	3,500	4,300	
	MPIKA	-	3,500	3,500	
	MBALA	-	3,500	3,500	
	MWENZO (ISOKA)	-	3,500	3,500	3,500
	Sub Total	800	14,000	14,800	28,300
WESTERN	KAOMA	3,500	-	3,500	
	MONGU	1,000	-	1,000	
	Sub Total	4,500	-	4,500	6,574
LUAPULA	MANSA	500	3,500	4,000	6,422
NORTH WESTERN	SOLWEZI	700	3,500	4,200	4,116
GRAND-TOTAL		116,500	120,750	237,250	243,816

Source: NAMBOARD

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Appendix III, Exhibit 1

EXAMPLE OF A FERTILIZER MARKETING PLAN

Marketing Plan

Immediately following the selection and hiring of principal staff to manage the NCZ Marketing Department a survey of the market should be initiated and a detailed marketing plan developed. The marketing plan will have seven component parts, a situation analysis and NCZ objectives; a personnel plan; a product, supply and distribution plan; a finance plan; a sales plan; a technical service (promotion) plan; and a marketing audit plan.

An essential portion of the marketing plan is a comprehensive statement of the NCZ objectives and a situation analysis. The situation analysis should fully define the existing market, potential marketing opportunities, and various uncontrollable factors which may influence NCZ operations. Each individual plan will complement the overall objectives. The contents of each plan should include: (a) a summary of main goals and recommendations and how they complement the overall marketing objective; (b) a current market situation; (c) environment (threats and opportunities); (d) objectives; (e) marketing strategies, ie, targets, marketing mix, etc.; and (f) action programs and budget and controls. Since the NCZ Marketing Department is a small organization the personnel function will be performed by the Marketing Manager. The personnel plan will be made in cooperation with the NCZ Managing Director and will include:

1. Survey plans for determining type skills available and salary ranges.
2. Number of staff to be hired by time periods.
3. Training programs and schedules.
4. Management techniques and mechanisms for personnel development.
5. Policy guidelines on employment, ie, benefits, compensation, probation, dismissal and promotion procedures, work periods, etc.
6. A schedule of technical publications and trade information required for each employee.
7. Preparation of job description for each position.

The Product, supply and distribution plan will be the responsibility of the NCZ Purchasing Manager but in cooperation with the Marketing Manager and other staff members. A study of the different transportation modes is needed. The product, supply, and distribution plan will include the following:

Appendix III, Exhibit 1 Continued

1. Tendering procedures.
2. Pipeline time required for all activities from forecasting/tendering to time of purchase by farmers.
3. Products needed by zones.
4. Bagging requirements by zones and marketing channels.
5. Source of supply by products, ie, NCZ production, donors and internation markets.
6. A logistic schedule for moving products to customers in each zone, ie, warehousing, direct to customers, and by modes of transportation.
7. International fertilizer price trends.
8. Estimated funding required for purchase of supplies.

The finance plan will be the responsibility of the NCZ Managing Director and the Finance Manager in cooperation with the other staff members. Having a timely supply of low cost working capital is essential for any business. The original loan to start the NEZ operation is an essential element. The loan may be generated from donors or as a commercial loan with Government guarantee. The finance plan should include the following:

1. The amount of money required by time frames, by products, by zones, and total.
2. Procedures for obtaining funds.
3. Sources of funds.
4. Repayment schedules.
5. Terms of sales by customers.
6. Payment collection procedures.
7. Procedures for accounting and analysis of the entire operation.

A detailed sales plan is another key component of the organization's annual marketing plan. The sales plan is the responsibility of the marketing manager in cooperation with the other staff. Each Area Marketing Manager will also prepare an annual sales plan. These plans will form the basis for the organization's sales plan. A five-year sales plan should be developed and maintained. Each year at the end of the fertilizer

Appendix III, Exhibit 1 continued

season in March/April and with data showing performance of the current season, the next year's annual sales plan should be updated to reflect a more current situation. At that time the fifth year is added to the plan. Data needed for sales forecasting that are prepared by the customers and Area Marketing Managers and reviewed and modified by the Marketing Manager include area under cultivation by crops, soil fertility for major soils, crop prices, fertilizer VCR by crops, fertilizer recommendations, number of farmers, available credit, agriculture development programs, and historical sales. As data are accumulated, the sales forecasting and sales plan will become more accurate. The sales plan should include the following items.

1. Sales targets for each product for each account and for each zone by time periods.
2. Administrative procedures for ordering and shipping fertilizers and for collecting revenue from fertilizer sales.
3. Communication and management procedures, ie, invoicing, shipping instructions, training, reports, accounting, sales information, etc.
4. Strategy for complementary institutional linkages.
5. Schedule of training and educational meetings for wholesalers, retailers, and support staff.

In the NCZ Marketing Department the Area Marketing Manager is considered a professional occupation. The Area Marketing Manager is responsible for all activities in the assigned territory. With assistance from the Marketing Manager and headquarters staff, the Area Marketing Manager can add and cancel wholesale and retail accounts as required to give adequate distribution. The Area Marketing Manager takes orders; assists with payments; participates in promotion activities; develops the skills of the wholesaler and retailer staff in business principles, forecasting, ordering, selling procedures, storage, and ways to serve the farmer.

The Technical Service Plan is the responsibility of the two agronomist and Data Analyst in cooperation with the Marketing - Manager and the Area Marketing Managers.

The plan covers the promotional strategy for the Marketing Department. It forms the most important element of marketing communications. In Phase I heavy emphasis is placed on the direct fact-to-face personal selling techniques. As the marketing system matures, more emphasis can be placed on indirect selling methods. The technical service plan should include the following:

Appendix III, Exhibit 1 continued

1. National advertising plans by media, ie, radio, poster boards, newspapers, etc.
2. Give-away items, ie, pencils, planting guides, booklets, etc.
3. Fertilizer research projects and support activities by research stations, farmer fields, and by locations.
4. Fertilizer demonstrations in cooperation with specified retailers by crops and by location.
5. Farmer field days by location.
6. Farmer educational meeting by retailers, by location, and by subject matter.
7. Crop production contest, ie, for smallholders, tobacco, etc.
8. Procedures for soil tests and returning of results.
9. Testimonial campaigns.
10. A detailed plan for soliciting and utilizing the national extension staff in NCZ Marketing Department educational efforts.
11. Training programs by types and period for NCZ marketing staff.

Controls

The Marketing Manager and NCZ management is responsible for planning, organizing, operating, and controlling the products, prices, promotion, and placement functions. The Marketing Manager is responsible for market research data for planning and evaluating results. The Marketing Manager will use controls (1) to standardize performance, (2) to safeguard assets, (3) to measure on-the-job performance, (4) to motivate individuals, (5) to monitor planning and forecasting operations, and to limit authority. Marketing controls are critical to the successful operation of NCZ. It is recommended that the NCZ use four general types of controls: (1) annual plan control, (2) profitability control, (3) efficiency control, and (4) strategic control.

The heart of the annual control plan is management by objectives. In the annual plan all levels of the NCZ Marketing Department set goals to be achieved within specific time periods. The marketplace is monitored to determine deviations from these objectives. Corrective adjustments are taken to close gaps between the targets and the accomplishments. The Marketing Department will use sales analysis, expense-to-sales ratios, financial analysis, and farmer-attitude tracking in determining performance.

Appendix III, Exhibit 1 continued

Marketing-profitability analysis will be used by the NCZ. The following procedures will be used to make the analysis: (1) assign natural accounts such as salary, rent, or supplies to marketing functional accounts, ie, selling, distribution, or administration; (2) assign each functional expense to each zone; and (3) prepare a profit-and-loss statement for each zone.

If the management of the NCZ finds that it is earning inadequate returns in some zones on certain products, it must determine if there are more efficient ways to manage the function. Several key indicators of marketing force efficiency are average number of marketing calls per Area Marketing Managers per day, average revenue per marketing call, average cost per call, number of new customers per period, and number of lost customers per period. Likewise, the cost of nonpersonal marketing promotion can be measured as cost per 10 buyers for each medium or form of promotion.

From time to time the management of the NCZ will undertake a critical review of its overall effectiveness. The managers will use strategic control to determine whether the NCZ is pursuing its best opportunities with respect to markets, products, and channels.

Marketing controls are a natural sequel to marketing planning, organization and implementation.

Appendix III, Exhibit 2

EXAMPLE OF A JOB DESCRIPTION

Manager of Marketing

General Functions

The Manager of Marketing is responsible for planning, organizing, operating, and control of product selection, pricing, distribution, and promotion. He establishes marketing policies and goals to support the objectives of NCZ. He coordinates with Manager of Production, Finance, and Personnel to ensure maximum sales to the greatest possible number of customers through the most efficient channels of distribution. The Managers of Marketing is responsible for developing and supporting a suitable organizational structure to meet marketing objectives.

Organizational Relationship

The Manager of Marketing is selected by the Managing Director and is directly responsible to him. The following positions are directly responsible to the Manager of Marketing: Sales Manager, Marketing Services Manager, and Distribution Manager.

Specific Duties and Responsibilities

1. Assists the Managing Director in developing long-range marketing objectives of the company and informs the Executive Committee of the objectives.
2. Develops marketing objectives and publishes a complete marketing plan.
3. Determines target markets, channels of sales, and distribution.
4. Selects, hires, and supervises Managers of Sales, Marketing Services, and Distribution.
5. Determines organization for marketing functions to ensure customer and product service, the delivery of the right product at the right time at the right price, the development of the market for the products by adequate advertising and sales promotion.
6. Personally performs a field study of the marketing area to get an overview of the following:

Appendix III, Exhibit 2 continued

- (a) What facts are available on the response of crops to various rates of application of this product? Can other agricultural inputs be marketed simultaneously?
- (b) Are other plant foods necessary for crop growth?
- (c) What factors limit agricultural production?
- (d) What prices do farmers receive for their various crops? What is the cost:benefit ratio between this product and the added income from its use? Does government have a floor price on crops? Does it fix retail prices of fertilizer?
- (e) Are the press and electronic media available for use in the marketing mix?
- (f) Is the railroad equipment and trackage being replaced or repaired? Roads and vehicular equipment?
- (g) Is there an adequate storage and distribution system available for the farmers' produce?
- (h) Is credit available to farmers locally at reasonable rates?
- (i) What is the ratio of field agricultural extension workers to farmers?
- (j) In a controlled economy, is an adequate monetary margin allowed in fertilizer pricing to encourage the firm to meet the needs of customers for both goods and services?
- (k) Who makes the decisions for buying the fertilizers? (Who does not?)
- (l) What makes the farmer buy? (Or not buy?)
- (m) What are their needs? (Physical, psychological, social, or cultural?)
- (n) Where are the farmers located?
- (o) Who influences their decisions?
- (p) How can they be instructed?
- (q) What types of products do they need?

Appendix III, Exhibit 2 continued

7. Develops data on the overall market to include:
 - (a) Volume of each fertilizer sold by area within the market.
 - (b) Distribution channels employed. Amounts sold through each channel by month, by crop use.
 - (c) Historical market growth.
 - (d) Market potential by year, by product, and by crop.
 - (e) Competitive activity and the company's share of the market.
 - (f) Limiting factors to market development.
 - (g) Packaging needs.
 - (h) Communication channels available.
 - (i) Educational needs.
 - (j) Research needs.
8. Establishes retailer selection criteria.
9. Causes annual and five-year plans to be developed for the following functions:
 - (a) Sales administration.
 - (b) Forecast of volume of sales by product, by sales territory, and by month.
 - (c) Field organization management.
 - (d) Market growth.
 - (e) Advertising and sales promotion.
 - (f) Agronomic research and services.
 - (g) Transportation modes and scheduling.
 - (h) Warehousing operations.
 - (i) Cost and performance analysis of marketing functions.
 - (j) Product technical services.

Appendix III, Exhibit 2 continued

- (k) Liaison with the Production and Supply and Financial Divisions.
 - (l) Development of marketing personnel by on-the-job and assembled instruction.
 - (m) Analysis of market for new products.
 - (n) Communication systems and procedures.
10. Maintains coordination with organizations which influence market development.
11. Determines product line, brand names, and packaging and monitors product quality.

Appendix IV, Exhibit 1: FARMERS ASSOCIATIONS AND PRIVATE ORGANIZATIONS THAT COULD POSSIBLY BECOME FERTILIZER RETAILERS *

1. Misundu Agriculture Supplies Company in Ndola
2. Midlands Farmers Co-operative in Lusaka
3. Border Farmers Co-operative in Kitwe
4. Zambia Agricultural Trading Cop in Choma
5. Chipata Farmers Association in Chipata
6. Solwezi Farmers Association in Solwezi
7. Kabompo Farmers Association in Kabompo
8. Lundazi Farmers Association in Lundazi
9. Mazabuka Farmers Association in Mazabuka
10. Katete Farmers Association in Katete
11. Kasempa Farmers Association in Kasempa
12. Kasama Farmers Association in Kasama
13. Livingstone/Zimba Farmers Association in Livingstone
14. Kabwe Farmers Association in Mkushi
15. Mkushi Farmers Association in Mkushi
16. Kaoma Farmers Association in Kaoma
17. Petauke Farmers Association in Petauke
18. Mumbwa Farmers Association in Mumbwa

* Source: Commercial Farmers Bureau

Appendix V, Exhibit 1

A current estimated budget for a three week marketing course in Zambia.

<u>ITEM</u>	<u>AMOUNT</u> <u>US\$</u>
Three expatriate Staff - 5 weeks each	41,000
Air tickets - 3 RT from U.S. or Europe to Zambia	10,000
Per Diem - 3 @ 21 days @ \$123/day	7,750
Materials and excess baggage	5,000
Miscellaneous	6,000
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TOTAL	\$69,750

Additional local funds would be required to cover the round trip transport costs for all participants from Lusaka to Nairobi and their per diem for three nights in Kenya. Experience indicates a maximum of 20 participants should be involved in the program.

Appendix V, Exhibit 2

An estimated budget for one person to attend an IFDC course.

<u>ITEM</u>	<u>AMOUNT</u> <u>US\$</u>
Course Fee	1,200
Air tickets - RT from Lusaka to U.S.	3,300
Per diem - Alabama 14 days @ \$75/day	1,050
Washington 7 days @ \$125/day	875
Incidental Expenses - visa, en route expenses, etc.	750
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TOTAL	\$7,175