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Assessment of Nigerian Government Fertilizer Policy and Suggested Alternative Market-Friendly Policies

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Acronyms and Abbreviations

ADP	Agricultural Development Projects
AFAMIN	African Agricultural Market Information Network
ALFAAN	All Farmers Apex Association of Nigeria
ANCC	Agro Nutrients and Chemicals Company Ltd.
APMEU	Agricultural Project Monitoring and Evaluation Unit
CBN	Central Bank of Nigeria
CPI	Consumer Price Index
DAI	Development Alternatives Inc.
DAIMINA	Developing Agri-Input Markets in Nigeria Project
FAO	Food and Agricultural Organization of the United Nations
FFD	Federal Fertilizer Department
FGN	Federal Government of Nigeria
FMARD	Federal Ministry of Agriculture and Rural Development
FOS	Federal Office of Statistics
FPDD	Fertilizer Procurement Distribution Division
FSFC	Federal Superphosphate Fertilizer Company Ltd.
GROFAN	Groundnut Farmers' Association of Nigeria
IARC	International Agricultural Research Center
ICRISAT	International Crops Research Institute for Semi-Arid Tropics
IFDC	International Fertilizer Development Center
	(An International Center for Soil Fertility and Agricultural Development)
IITA	International Institute of Tropical Agriculture
KASCO	Kano Agricultural Supply Company
KNARDA	Kano State Agricultural and Rural Development Authority
MIS	Market Information System
MTL	Masdar Technologies Ltd.
NACRB	Nigerian Agricultural Cooperative and Rural Bank
NAFCON	National Fertilizer Company of Nigeria
NSS	National Seed Service of the FMARD

OYSAISCO	Oyo State Agricultural Inputs Supply Company Ltd.
PAC	Project Advisory Committee
PCU	Projects Coordinating Unit
SSP	single superphosphate
tpd	tons per day
USAID	United States Agency for International Development
USD	United States dollar
VEA	Village Extension Agent
WARDA	West African Rice Development Association
WTO	World Trade Organization

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Executive Summary

The focus of this report is twofold. The report first examines the impact of past Nigerian fertilizer policies on economic efficiency, equity and food security. Issues such as the cost to the treasury and transparency of policies and programs are also examined. An attempt is made to identify some of the costs to the Nigerian economy from pursuing past fertilizer policies. Second, the report outlines the main policy options that the Nigerian government can take and again examines the policies in terms of economic efficiency, equity and food security, budget aspects and transparency. It is hoped that the report can be a basis for dialogue to identify market-friendly policies for the Nigerian fertilizer sector. Information was gathered by interviewing stakeholder representatives from the fertilizer sector including farmers. Previous studies were also consulted and available fertilizer and related data were analyzed.

Agriculture is and will remain an important and vital sector of the economy in Nigeria. The agriculture sector in the future will be called upon to supply more food to a growing and more prosperous population and to be a foreign exchange earner. At current growth rates, the population will double from 120 million to 240 million by 2030, thereby at least doubling food demand. Currently, Nigeria imports food. In 2000, ₦164 billion was spent on food imports, which accounts for about 13% of the total value of imports. Food imports since 1990 increased at an average rate of 13% per annum.

On the supply side, Nigerian agriculture has experienced growth in production of primary cereal and tuber crops. However, the growth in yield since 1990 has been either very low or negative. This means that most of the increase in production is coming from increases in land area sown to crops and not from yield increases. Nigeria has not embraced science-based agriculture and the use of fertilizer, improved seeds, and crop protection products. Land expansion is limited and without science-based agricultural inputs, agricultural production will decline. Nigeria, therefore, needs policies that encourage an agriculture sector that has a high investment/high growth rate. A key element of this strategy is an efficient and well functioning agricultural inputs market making use of the complementarities among fertilizer, improved seeds, and crop protection products.

A conceptual framework for assessing alternative fertilizer policies and how effectively they deliver fertilizer to the farmer is presented in this report. Two fertilizer delivery systems are identified. The first is a high-cost inefficient delivery system characterized by government intervention and subsidy. The second is a low-cost efficient system based on private sector participation and the market economy. The conceptual framework shows how a subsidy can be used to increase fertilizer use versus the strategy of increasing fertilizer use by lowering the cost structure of the fertilizer sector. It is hypothesized that Nigeria would more effectively deliver fertilizer to the farmer at a lower cost by transforming from a high cost structure industry with government intervention to a market-driven, low cost structure fertilizer industry.

A historical review of Nigerian fertilizer policies indicates an inconsistency of government fertilizer policy over the years. Policies kept changing almost year by year to try to answer problems of availability, leakage and arbitrage. None of the policy changes succeeded. The FGN monopoly on pre-1996 fertilizer procurement and the subsidy policy stymied the private sector. The FGN did not properly follow through on the liberalization process started in 1997 by ensuring that the preconditions for a transition to a privatized fertilizer sector were implemented. The FGN opted for a full withdrawal from fertilizer procurement and subsidy, leaving the industry stranded. The private sector did respond, but the ad hoc procurement/ subsidy policies of the FGN in 1999, 2001 and 2002 were damaging to the growth of the private sector. Annual fertilizer use fell by about 50% in the post-1996 as compared with the pre-1996 period.

The main constraints to fertilizer use are seen as high prices, low fertilizer quality and nonavailability of fertilizer at the time required. The government's stated reason for fertilizer subsidies is that farmers cannot afford a free market fertilizer price. However, most stakeholders and farm-level surveys indicated that quality and availability are the main constraints. While farmers will use more fertilizer if prices are lowered, farmers would use much more fertilizer at prevailing market prices if the quality was good and if fertilizer was available when needed. Empirical evidence from farm budgets and fertilizer response studies indicate that fertilizer application does have a payoff at unsubsidized fertilizer price levels for most crops. It is true that

for a certain number of small resource-poor farmers, affordability is a significant problem. However, when asked, most stakeholders indicated that little of the subsidized fertilizer was reaching the resource-poor farmers under the post-1997 subsidy programs. The critical question is thus one of how to transform the fertilizer system to deliver improved quality fertilizer at the amounts demanded at the time demanded and not one of price subsidy.

It can be argued that the amount of fertilizer procurement under the government monopoly era was based on the port, transport, warehousing, and blending capacity along with budgetary considerations and not on a free market demand. The dysfunctional dual private-public market system after the government monopoly era also shorted the market. If the total amount of fertilizer had been based on the economic optimum amount that the market demanded, farmers in the country would have used much more fertilizer. This was the consensus of most stakeholders. A calculation of the economic optimum amount of fertilizer that would have been used was made. The economic optimum fertilizer amount was four times the actual amount used in 1989/90 and about nine times the actual amount in 1999/2000. An increase in fertilizer use of this magnitude would have had an enormous impact on economic efficiency, equity and food security. A calculation was made of the loss to Nigeria of not using an economic optimum amount of fertilizer on maize in the year 2000. The calculation indicated that the loss in net revenue to the nation was in the order of ₦15.5 to ₦31.0 billion and a loss in maize production of between 1.5 and 3.0 million tonnes. This calculation is only for one year and for one crop. The magnitude of the production increases would have significantly altered imports and exports of agricultural products and foreign exchange earnings and costs.

Government fertilizer policies also had an effect on national, state, and local government budgets. Between 1990 and 1996, the fertilizer subsidy cost as a percentage of the national budget ranged from 16.8% in 1991 to a high of 42.7% in 1992. Money spent on subsidy programs is money that cannot be spent on more worthwhile programs or on programs that support the farmer through decreasing the transactions costs of the fertilizer delivery system.

Government fertilizer policy also failed to capture the benefits of using the considerable resources available in Nigeria to produce fertilizer for in-country use and for export to the rest of

Africa. Nigeria, like many developing countries, established fertilizer plants. Today, Indonesia has the capacity to produce 9,229,000 tonnes of urea. The National Fertilizer Company of Nigeria (NAFCON) had the capacity to produce 1,488,000 tonnes of urea but after 1992 never reached its capacity and ceased to function in 1999. The lost revenues from not producing fertilizer for in-country use and the lost revenues from foreign exchange earnings, when calculated, would be immense.

The main policy options for the fertilizer sector include: (1) the market economy approach that allows the private sector to operate in a competitive environment, (2) the market economy approach with a government-supported voucher scheme to help resource-poor farmers, and (3) variations of a government fertilizer procurement and subsidy approach. Each of these policy alternatives has a different effect on economic efficiency, equity, food security and the cost to the treasury. Each policy also has unique transparency issues.

The preconditions for the market economy approach are a strong competitive private sector and strong government enforcement of regulations. The approach is likely to use resources in the most efficient manner and does not compromise economic efficiency, equity, and food security goals. Once in place, the cost to the treasury is not an issue. In the case of Nigeria, moving from a high-cost fertilizer delivery system with government intervention to a market economy approach requires a strategy with a new set of preconditions. These preconditions include: (1) creation of a conducive macropolicy environment, (2) declaration and adherence to a consistent input marketing policy, (3) increasing human capital for market development, (4) improving access to finance, (5) developing and implementing regulatory frameworks, (6) promotion of market transparency through market information systems, (7) promotion of technology transfer activities, and (8) strengthening research capacity for promoting the private seed industry.

Nigeria failed to take the preconditions into consideration when the liberalization of the fertilizer sector occurred in 1997. Some steps have recently been taken to address some of the preconditions. The IFDC Developing Agri-Input Markets in Nigeria (DAIMINA) project addresses building human capital and agribusiness training of the fertilizer, seed, and crop

protection wholesalers and retailers. However, the other preconditions have not been met, especially the declaration and adherence to a consistent fertilizer policy.

A liberalized Nigerian fertilizer sector that follows a market economy approach will over time bring down fertilizer prices and improve fertilizer quality and availability. There may be a role for government support to very resource-poor farmers. A fertilizer and seed "voucher scheme" along the lines of the Food Stamp program in the U.S.A. could be instituted. Farmers would be given vouchers for a specified amount of fertilizer and seed at a specified subsidized price that would be purchased from dealers in the open market. Dealers would redeem the vouchers from a Federal Government of Nigeria (FGN)-approved bank and thus be paid the full market price. The scheme would be market friendly in that there would be little distortion of the fertilizer sector or of crop production and prices. Both the equity and food security goals would be satisfied. The main preconditions are the proper identification of the targeted farmers and strict monitoring and information gathering for administrative purposes.

Nigeria has an opportunity to experiment and transform the current subsidy program into a voucher scheme that would be more market friendly. Much of the work of identifying target farmers has already been done by the states and local governments under the current subsidy program. If the same amount of fertilizer was targeted to poor farmers under the voucher scheme as the current subsidy program (165,000 tonnes) and the targeted farmers paid 75% of the fertilizer cost, the total voucher scheme cost would be about ₦1.25 billion. This is equivalent to what the cost would be under the original 25% subsidy scheme. However, the preconditions for a successful transition to a market economy fertilizer distribution system must still be adhered to.

Government intervention can include: (1) government monopoly procurement and subsidy on the final product, (2) government partial procurement and subsidy on the government-procured final product only, (3) subsidy at source, and (4) subsidy at source including transportation subsidy to delivery points. The first two have been past policies of the FGN and the subject of the impact study in this report. The FGN has indicated that it plans to introduce and implement a subsidy-at-source policy. A subsidy is given to fertilizer importers and in-country fertilizer producers, and they sell the fertilizer to wholesalers and retailers at the

subsidized price. The wholesalers and retailers operate in a competitive market economy. The preconditions are strong competition, government consistency with the policy, strong regulatory adherence, and not compromising transparency when setting the source fertilizer prices. The total amount of fertilizer use must be subsidized, or the problems of a dual public-private market will persist. If all the preconditions are met, there will still be distortions to the market. If the scheme is working properly, more fertilizer would be used than would be at the economic optimum at non-subsidized prices. Equity considerations would be compromised if the full subsidy is not transmitted to the farmers, which would likely be the case. The costs to the treasury could be very high depending on the level of subsidy and the success of the transition. Policy makers must ask if a subsidy is really required in the face of information that indicates that there are returns to fertilizer use at market-price levels. If employed, the subsidy-at-source policy should only be used as a tool for the transition of the fertilizer system from where it is now to a market-economy approach.

The blueprints are available for a transition from a high-cost fertilizer delivery system with government intervention to that of a low-cost fertilizer delivery system predicated on the workings of the market economy. Market-friendly options are available from within this framework for poverty alleviation of the extreme poor. What is required is a strong commitment by FGN, consistent policies, and a willingness to pursue transparency throughout the fertilizer delivery system.

Assessment of Nigerian Government Fertilizer Policy and Suggested Alternative Market-Friendly Policies

I. Introduction

1.1. Agricultural Production Demand and Supply

Agriculture remains an important and vital sector of Nigeria's economy in spite of being overshadowed by the oil and gas industry. There are three basic sources of demand for Nigeria's agricultural output. The first source is for food and fiber for Nigeria's 120 million population, which is growing at a rate of 3% per annum. Although population growth rate may decrease to 2.5%/year, Nigeria's population could reach 240 million by the year 2030 and 360 million by 2040.

A second source of future demand for Nigeria's agricultural output is moderately raising disposable incomes. Tastes and preferences change with rising incomes that often lead to increased demand for edible oils and livestock products. A third source of demand is for exports and the resulting foreign exchange earnings. These future sources of demand will define Nigeria's agricultural production and trade patterns.

Can Nigeria's agricultural sector output keep pace with future demands? Nigeria's food import bill for 2000 was ₦164 billion (2001 constant Naira) or 13.3% of the total value of imports (**Table 1**). Food imports as a percentage of total imports was as high as 14.7% in 1996 and have been increasing since 1990 at an annual average growth rate of 13.3%. Foreign exchange earnings from non-oil exports, which include all agricultural exports, is low relative to total exports. Only 1.6% of total exports in 1999 were derived from non-oil exports. Since 1992, non-oil exports have not covered the cost of food imports—non-oil imports paid for only 17% of food imports in 1999.

On the supply side, Nigeria has experienced growth in agricultural production. With the exception of maize, which has a –2.8% production growth rate, all of the other selected crops in **Table 2** show positive production growth rates. However, the growth rates come mainly from

increases in area planted and not from increases in yield. With the exception of maize and cotton, the area planted growth rates are positive, but the yield growth rates are either small or negative. Cotton is the only crop showing a significant yield growth rate. Production cannot be continually increased by increasing area planted—there will be a time in the not-too-distant future when Nigeria will run out of productive farm land. The low and negative yield growth rates mean that Nigeria has failed to adopt science-based agriculture (improved seeds, fertilizer, and crop protection products) at a rate that can keep pace with the demand for agricultural output.

Table 1. Imports and Exports, Nigeria, (in 2001 constant Naira)

Year	Total Imports	Food Imports[a]	Food Imports as % of Total	Total Exports	Non-Oil Exports	Non-Oil Exports as % of Total	Non-Oil Exports as % of Food Imports
	(₦ Billion)			(₦ Billion)			
1990	598.357	48.465	8.1	1,438.187	42.667	3.0	88
1991	1,014.126	38.540	3.8	1,416.362	54.506	3.8	141
1992	1,160.580	113.735	9.8	1,648.599	31.601	1.9	28
1993	836.737	76.979	9.2	1,102.065	25.142	2.3	33
1994	558.674	51.955	9.3	707.172	18.357	2.6	35
1995	1,508.647	193.106	12.8	1,899.296	46.143	2.4	24
1996	862.130	126.733	14.7	2,006.652	35.746	1.8	28
1997	1,190.269	158.345	13.3	1,747.526	41.044	2.3	26
1998	1,108.829	147.702	13.3	995.536	45.112	4.5	31
1999	1,130.831	151.299	13.4	1,558.904	25.564	1.6	17
2000	1,232.757	163.959	13.3	n.a.	n.a.	n.a.	n.a.
Growth Rate[b]	4.6%	13.3%	-	0.8%	-1.6%	-	-

a. Food imports include: food and live animals, animal and vegetable oils and fats (food imports do not include beverages and tobacco).

b. Growth rates calculated using a semi-log function regressing the natural log of the variable in question on time.

Source: Federal Office of Statistics/Central Bank of Nigeria (CBN) (1999). Exports and imports have been adjusted for inflation using the consumer price index (CPI) and are in 2001 constant Naira using the CPI in Table A2, Appendix II. Current import and export figures can be seen in Table A1 in Appendix II.

Table 2. Average Area, Production and Yield and Growth Rates of Selected Crops, Nigeria

Crop	Area		Production		Yield	
	Thousand Hectares	% Growth Rate	Thousand Tonnes	% Growth Rate	Tonnes/ha	% Growth Rate
Maize	4,672	-3.3	5,649	-2.8	1,212	0.5
Millet	5,228	2.6	5,317	2.9	1,016	0.3
Sorghum	6,046	3.6	6,576	4.3	1,084	0.7
Rice	1,846	4.5	3,064	0.9	1,692	-3.6
Cassava	2,809	4.1	30,019	3.2	10,798	-0.9
Yam	2,174	6.5	22,363	4.8	10,416	-1.7
Cotton	502	-0.9	314	4.0	630	4.9
Groundnut	1,926	11.5	1,993	9.9	1,063	-1.6

Source: Average of 1990 to 2001 data for area, production, and yield. Yearly data are from the Federal Ministry of Agriculture. Growth rates calculated from 1990 to 2001 data series found in **Tables A3, 4, 5 & 6, Appendix II**. *Growth rates calculated using a semi-log function regressing the natural log of the variable in question on time.*

What happens in 2030 or 2040 with increased population if agricultural output fails to keep pace? To keep pace, Nigeria requires a high-investment/high growth rate policy for the agricultural sector. Investments need to be made in agricultural research, extension, education, transportation and rural infrastructure all guided by appropriate input and product price and trade policies that will give rise to a substantial increase in agricultural productivity growth and production.[1] A key element in a high-investment/high growth rate agricultural strategy is an efficiently functioning fertilizer subsector. To function at peak efficiency, the fertilizer subsector requires that complementary inputs such as modern seed and plant protection products be widely used.

1.2. Objectives and Approach

The two specific objectives of the study are as follows:

1. Assess the impact of Government interventions, particularly the procurement and distribution of fertilizers, through state agencies at subsidized rates, on the availability, timeliness of supply and delivered prices to farmers. Also assess the impact on the growth of the fertilizer private sector and the annual budgetary costs.

[1] It must be stressed that a policy of agricultural self-sufficiency is not being advocated. Nigeria must develop an agricultural policy based on self-reliance using the benefits of trade and comparative advantage. Self-reliance is a policy that promotes Nigerian agriculture to produce what it produces most efficiently while trading the excess for those products that are produced more efficiently in other countries.

2. Examine practical alternative market-friendly interventions that may be considered, which would promote the private sector participation and more directly benefit small farmers.

Impact Assessment—The impact assessment was undertaken of past FGN and selected state fertilizer input policies since 1990. The period since 1990 can be divided into two distinct policy eras. The 1990-1995/96 period was when the FGN had a virtual monopoly on fertilizer procurement. The second period was the post-1995/96 liberalization period, which saw the reintroduction of FGN procurement and subsidy policy in 1999, 2001 and 2002 on an ad hoc basis. The information from the impact assessment may be useful to understand how effective Nigeria's past fertilizer policies have been and how they have helped or hindered the agriculture sector and Nigeria's economy in general. The impact assessment documented the experience of stakeholders. Representatives of fertilizer supply-side stakeholders were interviewed (a list of the stakeholders is presented in **Appendix I**) The stakeholders included FGN officials, state government officials of Oyo and Kano, donors, fertilizer importers, fertilizer producers, blenders, and those who distribute fertilizers (wholesale and retail agricultural enterprises) and both commercial and subsistence farmer representatives. An attempt was also made to analyze available fertilizer and fertilizer-related relevant data for the period 1990 to 2001 that showed how the fertilizer policies impacted the fertilizer sector, the agriculture sector, and the Nigerian economy in general.

Examine Alternative Market-Friendly Interventions—Broad-based and specific alternatives have already been outlined in the strategic framework for African agricultural input supply **[IFDC, 2001a]** and also in the document on the assessment and strategy for agricultural input markets for Nigeria **[IFDC, 2001b]**. A previous study **[IFDC, 1994]** examined the liberalization of the Nigerian fertilizer sector and presented a detailed framework and action plan. Other valuable studies that describe the fertilizer industry situation, problems, and possible alternative interventions include **IFDC [1981]**, **Ingawa and Kwa [1998]**, and **Ogunfowora [2000]**. The literature review by **Dimithe et al. [1998]** of input supply systems for sub-Saharan Africa is also useful.

The main objective of this part of the report was to explore alternative market-friendly interventions that will ensure that fertilizer reaches all farmers on a timely basis and at an

affordable price. The approach taken was to assess several possible fertilizer policies, including some that the FGN has already tried, within a policy framework that examines the impact of various fertilizer policies on economic efficiency, equity, and food security issues and their practicability, transparency and effect on the treasury. Stakeholders were also consulted as to alternative interventions and the direction of future fertilizer policy.

1.3. Organization of the Report

Chapter 2 outlines the conceptual framework for assessing the impact of alternative fertilizer policies that will be used as a guide throughout the report. Chapter 3 presents a historical overview of Nigerian fertilizer policy and identifies the main industry and policy changes and the primary problems encountered. Seed policy is also discussed. Chapter 4 examines fertilizer prices, subsidies and significant constraints to fertilizer use in Nigeria from both a stakeholder viewpoint and from empirical investigation. Chapter 5 presents empirical evidence and stakeholders' views on the impact of fertilizer policies on: (1) efficiency, equity, and food security, (2) agricultural imports, exports and foreign exchange earnings; (3) FGN budget aspects; and (4) the impact on the growth of the private fertilizer sector. Chapter 6 presents an assessment of various fertilizer policy scenarios in terms of economic efficiency, equity and food security, budget aspects and transparency.

II. Conceptual Framework for Assessing Alternative Policies

2.1. Fertilizer Supply-Side Efficiency

Figure 1 portrays the supply and demand situation at two levels of fertilizer supply-side efficiency (adapted from **IFDC/Development Alternatives Inc. (DAI)/Masdar Technologies Ltd. (MTL) [2000]** and **IFDC [2001b]**). The first level, demonstrated by supply curve S_1, depicts a relatively inefficient fertilizer subsector delivery system that delivers a small quantity of fertilizer (Q_1) to farmers at a relatively high price (P_1). Supply curve S_2 depicts a relatively efficient fertilizer subsector delivery system that delivers a larger quantity of fertilizer (Q_2) to farmers at a lower price (P_2). The main difference between the two fertilizer delivery systems is the difference in the overall cost structure and inefficiencies in each system or what are termed

transaction costs. This transaction cost difference between the two fertilizer delivery systems is represented by the difference between point A and point B (at the origin) in **Figure 1**.

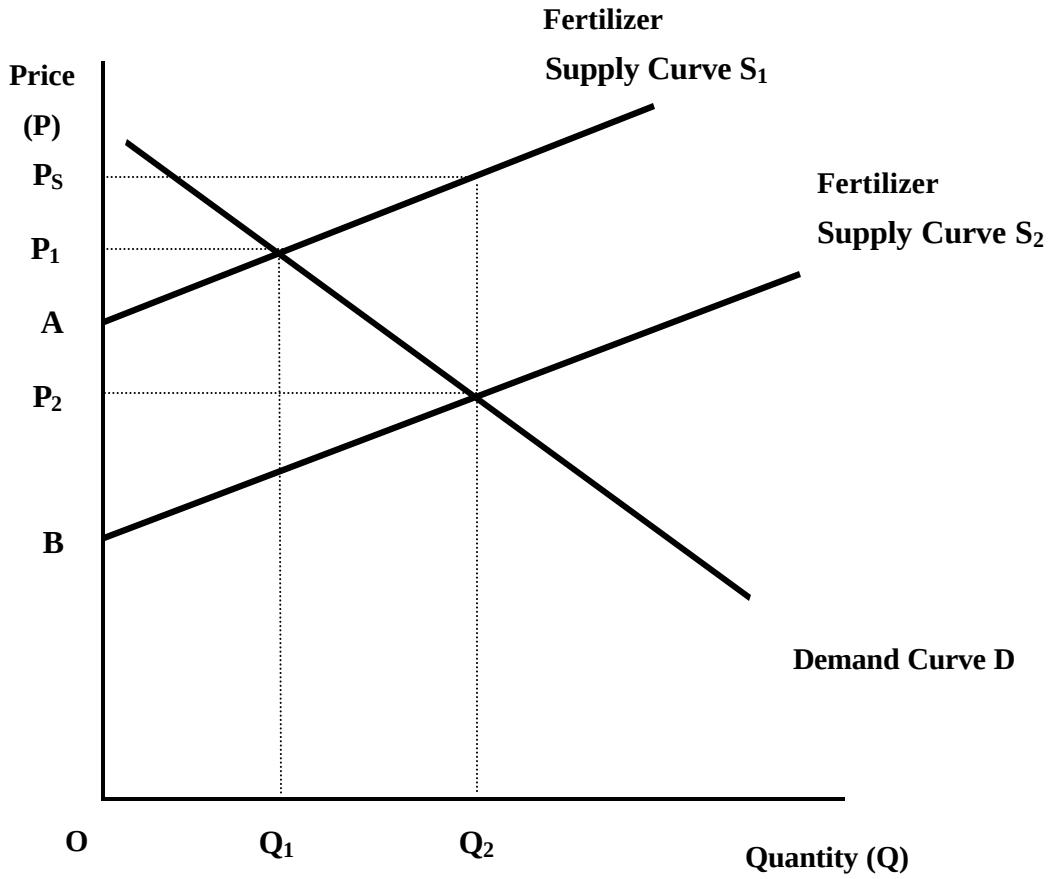

Figure 1. The Conceptual Framework—Shifting the Supply Curve to the Right

The total cost of a fertilizer supply delivery system is composed of several supply-side entities. These include: fertilizer importers, fertilizer manufacturers, fertilizer blenders and baggers, the transport system, warehousing costs at various locations, and dealers and dealer networks. These entities exist whether the system is entirely privately owned, entirely publicly owned, or are a mixture of the two. Each entity has its individual costs (and margins), which adds up to the overall total cost and the actual cost at which a bag of fertilizer can be delivered to the farmer. The difference in the transactions costs of an inefficient and efficient fertilizer delivery system (i.e., the difference between point A and B at the origin in **Figure 1**) can stem from (1) the level of bureaucratic red tape, (2) exchange rate fluctuations, (3) enforcement level of government regulations, (4) the condition and congestion of port facilities, (5) the level of tariffs and taxes, (6) the state of the transportation (road and rail) system, (7) the volume of

fertilizer throughput, (8) the amount of competition, (9) the level of human capital and available information, and (10) the consistency of government fertilizer policy and macroeconomic policy.

The Nigerian fertilizer supply system is most closely depicted by supply curve S_1.[2] There are two main policies by which the quantity of fertilizer Q_2 can be delivered to the Nigerian farmer. One policy is by a direct subsidy on fertilizer equal to the difference between the subsidy price P_S and price P_2. Farmers pay price P_2, and the total cost to the treasury of the subsidy is then $[(P_S - P_2) \times Q_2]$ (see **McCalla and Josling [1985]**, pgs. 117-119). Along with the subsidy policy, the government may also have a procurement policy where all or some portion of the fertilizer is procured and passed on to the farmer by various means (through the States, local governments, or farm organizations). Procurement problems can lead to further problems of fertilizer nonavailability and timeliness of delivery. Where the government only procures and subsidizes a proportion of the total fertilizer demand and a dual public-private market is set up, uncertainty exists as to who is to supply what amount and it is likely that less than quantity Q_2 of fertilizer in **Figure 1** would be delivered.

Dual markets, one selling subsidized fertilizer and the other selling fertilizer at a free market price, are open to arbitrage. This results in much of the subsidized fertilizer sold at the higher free market prices making the arbitragers better off while most farmers remain no better off. Arbitrage can also be responsible for the flow of fertilizer out of the country and for inter-state flows of fertilizer when State subsidies are set at different levels. Subsidizing all or a large portion of fertilizer requirements can amount to huge fertilizer subsidy costs, which may not be sustainable over time by the treasury.

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[2] **IFDC [1994]** (p. 96) indicated that fertilizer procurement under a liberalized fertilizer policy would decrease the cost of procuring fertilizer by 29% and that trucking costs could be reduced by 40%. An interesting exercise would be to identify all the current transactions costs of delivering fertilizer from the port to the farmer (c.i.f., fertilizer price, storage, handling, blending and bagging, and distribution costs). Once this was completed, the next step would be to identify where and by how much the individual costs could be decreased under various scenarios and over time. Lowering costs would include looking at production of fertilizer in Nigeria by a world-scale efficient plant, new technology that might be introduced to the industry and by competition and throughput. This would give an idea of the difference between point A and point of supply curve S_1 and supply curve S_2 in **Figure 1**.

The policy alternative to government subsidy/procurement is to develop a strategy that will, over time, decrease the transactions costs from point A to point B through market-friendly means. This includes cutting government red tape, enforcing regulations, improving port and transport facilities, development of consistent government policies, strengthening agribusiness and inputs marketing, and increasing the level of human capital through education and training.[3] This second policy has the benefit that it does not create distorted markets, there are no WTO implications, and while there will be costs to the treasury, these costs will likely be smaller than the total cost of a full fertilizer subsidy over time There will also be positive externalities to other sectors of the economy (i.e., from improved transportation and port facilities).

A policy that decreases transactions costs and encourages the private sector, when combined with government policies that support the use of complementary inputs such as improved seed and plant protection products, will increase farmer purchasing power and the demand for fertilizer (i.e., moving the demand curve upward and to the right in **Figure 1**). The policy is also sustainable over time requiring the government to keep pace with the maintenance of infrastructure and monitoring and regulatory enforcement. Opting for a fertilizer policy that cuts transactions costs and encourages the private sector may be a better mechanism with which to support Nigeria's farmers and ensure consumers of secure and stable supplies of food and fiber than through a subsidy/procurement policy.

2.2. Policy Performance Criteria

A democratic nation has three main goals: (1) economic efficiency, (2) equity, and (3) security. Each subsector within a nation must strive to meet these goals. In agriculture, economic efficiency means the optimal economic allocation of resources used to expand the capacity to produce food and fiber. The long-term goal is to increase productivity in a sustainable manner. Equity is increasing the well-being of various producer and consumer groups and sub-groups in society. Poverty alleviation is an important equity sub-goal. Security is reducing year-

[3] The DAIMINA project focuses in part on the answer for decreasing transactions costs from point A to point B (Figure 1). The DAIMINA project activities include: (1) policy dialogue on agribusiness reforms, (2) formulation of fertilizer and seed regulatory systems, (3) strengthening of agri-marketing information systems, and (4) training in agribusiness and farm advisory services.

to-year income fluctuations (income risk) and increasing national self-reliance, and in some cases, self-sufficiency. Food security is an important part of a nation's overall security goals.

In general, to move away from the economic efficiency goal towards either equity or security considerations is to move away from the optimum allocation of research resources. Fertilizer procurement and subsidy policy is only one of the instruments that can be used for social policy change and poverty alleviation. Before fertilizer procurement and subsidy policies are used to accommodate equity and security considerations, other policy instruments such as macroeconomic policy, exchange rate policy, monetary and fiscal policy, crop insurance, migration policies, infrastructure building programs, and changes in existing institutional arrangements should also be considered.

These three broad policy performance measures can be used to assess government policies—including fertilizer policy. Other policy performance criteria can be included such as: practicality, transparency, the cost to the treasury and the sustainability of a policy. These policy performance measures will be used in the following chapters to assess the impact of past fertilizer policy and future fertilizer policy scenarios.

III. Historical Perspective of Agricultural Input Policy

3.1. Fertilizer Procurement, Distribution and Subsidy Policy

The FGN, state, and local governments have all been involved in fertilizer procurement, distribution, and the subsidizing of fertilizer at various times. The fertilizer distribution system prior to 1996 operated virtually as a government monopoly. The significant industry and policy changes are summarized below:[4]

Prior to 1976—State governments procured fertilizer independently and distributed the fertilizer through sales agents and the extension system. Fertilizer was subsidized at about 95%

[4] Nigerian fertilizer procurement, distribution and subsidy policies have been aptly reviewed and critiqued by **IFDC [1994]**, **Ogunfowora [2000]**, and **Kwa [2002]**. This historical perspective draws from these three reports and from personal communication with Dr. U.A. Alkaleri, IFDC DAIMINA Project, Abuja.

but sold at different prices in different states. This was the era when extension agents were informing farmers of the benefits of fertilizer use. Primary problems included interstate arbitrage, congested ports and demurrage charges, no control over fertilizer type or quality or package quality, and poor subsidy administration and control.

1976 to 1986—Procurement and distribution of fertilizer was centralized by FGN through the Fertilizer Procurement Distribution Division (FPDD). The FGN superphosphate plant Federal Superphosphate Fertilizer Company Ltd. (FSFC) in Kaduna came onstream in 1976 with a capacity of 100,000 tonnes of SSP. FPDD procured imported fertilizer from ports and from FSFC and paid for transport and distribution costs to depots in the states. The states distributed fertilizer through agroservice centers and farm service centers. Significant problems included excessive storage and transit losses and late and at times nondelivery due to transport problems.

1987 to 1991—The physical transport from Port and FSFC became the responsibility of the states but FGN reimbursed transport costs. States that could not afford transport costs left their allocations at the port causing FGN to assume the demurrage and warehousing costs. Storage and transit losses continued. The FGN owned NAFCON when it came onstream in 1988 with a capacity to produce 1,000 tpd ammonia, 1,500 tpd urea and 1,000 tpd NPK with 586,000 tonnes blending capacity. In 1991, six fertilizer depots were created by FPDD at Minna, Gombe, Lagos, Port Harcourt, Funtua and Makurdi to enhance the efficiencies of the distribution system. This proved costly and inefficient with large handling, storage and transit losses.

1992 to 1994—The depot system was abandoned. FPDD was given responsibility to distribute imported fertilizer only while NAFCON distributed locally produced fertilizer. State agricultural ministries and/or Agricultural Development Projects (ADPs) distributed the fertilizer. This policy reduced the cost of the system but nondelivery of fertilizer, handling, storage and transit losses still persisted. This was in spite of engaging external consultants to monitor the fertilizer system for these problems. Perpetrators were identified but not charged. In 1994, the FGN experimented with distributing 80% of the fertilizer through local governments and 20% by the state governments. This program was implemented for one year and was then abandoned. The subsidy continued to be shared by FGN, the state and by local governments.

1995 to 1996: FGN stopped importing fertilizer in 1995, and fertilizer was imported by the private sector. NAFCON and blending plants became agencies for distributing locally produced fertilizer. States collected their fertilizer allocation from the fertilizer plants to be reimbursed for transport by FGN later (similar to the 1989-1991 policy). Task forces were set up to monitor distribution, but they had little impact. Similar problems persisted as in the past—some states did not have transport funds.

1997-2002—FGN discontinued the fertilizer subsidy and distribution programs in 1997 and adopted a complete privatization/liberalization of the fertilizer sector. Subsidies were abolished and the import tariff reduced from 10% to 5%. However, this policy was largely ineffective because the ground work had not been properly laid for the private sector to take over. Fertilizer use declined sharply and the FGN reintroduced a fertilizer subsidy of 25% in May 1999 and procured 101,000 tonnes to be distributed by the states. The fertilizer was to be targeted to poor farmers by the local governments. The FGN then discontinued the subsidy in August 2000 and abolished the import fertilizer tariff. FGN again procured and subsidized a portion of Nigeria's fertilizer in 2001 (164,000 tonnes). In 2002, 163,700 tonnes was approved to be procured and subsidized at 25%. In 2002, the import tariff was reinstituted at 5%.

Inconsistent FGN fertilizer policy and the dual fertilizer market precluded the required response from the private sector in the post-1997 period. Problems with fertilizer quality, arbitrage, and timeliness of fertilizer distribution persisted. Government tenders for the targeted subsidized fertilizer were invariably late as was the FGN payments to fertilizer distributors and the remittances from the states to the FGN.[5] Another problem concerns over-invoicing by fertilizer importers and profiting from the arbitrage situation that exists between the official and parallel exchange rate markets.

NAFCON discontinued production in 1999. The ammonia and urea plants are being refurbished, but the NPK plant is beyond repair. The FSFC sulfuric acid plant stopped

[5] A case in point, 10% of the 2001 autumn dry season payments for fertilizer that the FGN contracted for has yet to be paid. The first payments for the 2002 February-July wet season began in September 2002. Thus, there can be a lapse of 6 months to 1 year before some importers/blenders receive their money, which adds to cost and to liquidity problems.

functioning in 1989, thus requiring the purchase of sulfuric acid from within Nigeria and from imports. FSFC closed down in 2002 for a refurbishing of the plant but should be running again by the end of the year. The FGNs stated policy is that once rehabilitated, both NAFCON and FSFC will be privatized.

Tables 3 and 4 present a picture of the fertilizer sector since 1990 that reflects the narrative above. **Table 3** presents the total fertilizer production, imports, exports and use figures and growth rates. The growth rates are all negative and exports cease in 1997/98 period. **Table 4** presents an overview since 1990 of fertilizer use and procurement, subsidy levels and cost of the subsidy, average farm fertilizer price and the fertilizer import tariff.

Table 3. Total Fertilizer Production, Imports, Exports and Use, Nigeria, 1989/90 to 1999/00

Year	Total Fertilizer Production	Total Fertilizer Imports	Total Fertilizer Exports	Total Apparent Fertilizer Use
		(Nutrient tonnes N + P_2O_5 + K_2O)		
1989-1990	324,400	219,400	121,500	380,900
1990-1991	340,000	249,700	122,100	400,340
1991-1992	318,600	207,100	113,200	429,200
1992-1993	371,200	240,000	94,600	440,000
1993-1994	330,000	281,000	92,000	461,000
1994-1995	157,700	290,300	79,300	296,000
1995-1996	138,900	23,700	44,400	183,000
1996-1997	123,800	77,200	26,700	173,500
1997-1998	46,200	91,500	0	137,700
1998-1999	81,500	152,000	0	203,500
1999-2000	85,500	117,600	0	173,100
% Growth Rate [a]	-19.3	-11.2	-	-11.7

a. Growth rates calculated using a semi-log function regressing the natural log of the variable in question on time.

Note: Data are not available to construct a supply and disposition table, i.e., Total Fertilizer Supply (Previous Year Carry-Over + Production + Imports) = Total Disposition (Exports + Domestic Use + Carry-Over) because carry-over (stocks) are not estimated. The last stock estimation was done in 1990 and total carry-over for 1990/91 was 56,737 nutrient tonnes **[APMEU, 1990]**. Also, total import figures do not account for fertilizer coming over the border from Cameroon, and total export figures do not account for fertilizer that leaves Nigeria through land ports to countries such as Niger, Mali, Burkina Faso and others.

Source: FAO data from **IFDC [2000c]**. See **Tables A7, A8 & A9** for data by N, P_2O_5, & K_2O components.

Table 4. Nigerian Fertilizer Use, Procurement, Subsidy, Price and Tariffs, 1990-2002

Year	Nigerian Fertilizer NPK Use[a] (1)	FGN Fertilizer[b] Procurement (2)	% Government Subsidy[c] (3)	Cost of Fertilizer Subsidy (Current) (4)	Average[d] Fertilizer Farm Price (Current) (5)	Fertilizer Import Tariff (6)
	(nutrient tonnes)	(product tonnes)	(%)	(₦-billion)	(₦/50 kg)	(%)
1990	380,900	1,314,000	82%	2.324	20	10%
1991	400,340	1,000,000	74%	2.202	40	10%
1992	429,200	1,410,000	86%	6.862	40	10%
1993	440,000	1,390,000	77%	7.220	80	10%
1994	461,000	1,650,000	65%	8.918	150	10%
1995	296,000	699,260	87%	14.505	150	10%
1996	183,000	577,930	74%	11.558	350	10%
1997	173,500	0	0%	0	1,250	5%
1998	137,700	0	0%	0	1,500	5%
1999	203,500	101,148	25%	0.738	1,300	0%
2000	173,100	0	0%	0	1,300	0%
2001	-	164,012	25%	0.890	1,500	0%
2002	-	163,700[e]	25%	1.000[e]	1,500[f]	5%

a. From 1990 to 1995 inclusive, FGN only government entity that procured fertilizer.
b. There seems to be a discrepancy in the fertilizer procurement figures between the **Ogunfowora and Odubola [1994]** figures and the Federal Fertilizer Department (FFD) figures for the years 1990 to 1994.
c. Subsidy from 1990 to 1996 represents FGN, state, and local government total subsidy. Subsidy % and costs from 1997 to 2002 are FGN only.
d. See **Table A10, Appendix II** for prices expressed in 2001 constant Naira and expressed as the full market price if there had been no subsidy.
e. Approved amount
f. Prices have ranged from between ₦1,300 to ₦1,800 per 50 kg.
Source: Column 1, **IFDC [2000c]**; Columns 2 & 4, **Ogunfowora and Odubola [1994]** for 1990 to 1994 figures and FFD, Abuja for figures 1995 to 2002; Columns 3, 5 & 6, FFD, Abuja.

3.2. Seed Policy

The National Seed Service (NSS) of the FMARD was established in 1992 and is responsible for coordinating development, monitoring policy, and implementing quality control (see **IFDC [2000b]** for a full treatment of the Nigerian seed industry). Agricultural research institutes are responsible for the production of breeder seed. NSS and the private sector produce foundation seed while the private sector produces certified seed. Certified seed is sold to farmers through public and private sector markets. Public sector seed sales are sold to farmers through farm-service centers, Agricultural Development Projects (ADPs), and cooperatives. There are five private seed companies in Nigeria who purchase foundation seed from NSS and agricultural research institutes and International Agricultural Research Centers (IARCs) such as International

Institute of Tropical Agriculture (IITA), International Crops Research Institute for Semi-Arid Tropics (ICRISAT), and West African Rice Development Association (WARDA). They use contract growers and sell to farmers. An informal seed market operates that provides improved but noncertified seed to farmers.

Total certified seed production is small—4,324 tonnes in 2000 **[IFDC, 2000b]**. It is estimated that less than 10% of farmers use certified seeds in Nigeria (Personal communication with P. Kormawa, IITA). Significant constraints to the development of Nigeria's seed sector are inadequate arrangements for seed certification and quality control, low funding of public sector institutions, slow release of new varieties, inadequate extension services, and conflicting roles between the private and public seed sector.

The complementarity between fertilizer and seed inputs is well known.[6] Fertilizer use with traditional or non-certified seed can increase productivity over that of non-fertilizer use, and in many cases, it is a profitable investment for the farmer. However, fertilizer use with good modern varieties especially with certified seed can substantially increase productivity over and above the traditional variety/fertilizer scenario with a high probability of being a profitable investment for the farmer. Thus, the profitability of fertilizer use by a farmer heavily depends on the seed sector producing and distributing certified seed.

IV. Fertilizer Prices, Subsidies and Primary Constraints to Fertilizer Use

The government's stated reason for fertilizer subsidies is that farmers cannot afford the high free market fertilizer price. The implication is that the crop product price to fertilizer price ratio is too low for farmers to invest in fertilizer. The alternative premise is that while the price may be high, farmers would use more fertilizer if: (1) they were assured of fertilizer and packaging quality, and (2) they were assured of the availability of the fertilizer at the time it is needed. A further impediment is the non-availability and high cost of credit for fertilizer purchases.

[6] This is the reason that the IFDC DAIMINA project focuses on both the fertilizer and seed sectors.

Stakeholders were asked what they thought was the real constraint to fertilizer use—high fertilizer prices or problems of quality and timeliness. Views were divided. Many government officials indicated that it was the high fertilizer price and therefore a subsidy was needed. Oyo State said they needed to further subsidize the price and to distribute fertilizer through the state distribution system to eliminate middlemen who would otherwise make the price unaffordable to farmers. Blenders were also divided—most, but not all, older established blending companies said it was the high fertilizer price while the newer blending companies indicated that while the price plays a part, quality and timeliness were the keys to increased fertilizer sales.[7] Farm organization views were also mixed. Some, like the Groundnut Farmers' Association of Nigeria, indicated that quality and timeliness were the constraints and that they prefer to remove the government from the fertilizer procurement and subsidy business and instead, have the government undertake a strong regulatory role. Further evidence comes from a survey conducted by IITA where quality and timeliness were cited as the main constraints ahead of fertilizer price (personal communication with P. Kormawa, IITA). All stakeholders indicated that acquiring credit for fertilizer purchases was a significant problem but put quality and timeliness constraints ahead of credit problems.

Stakeholders were also asked if farmers actually received the subsidized fertilizer at the subsidized price in 1999 and 2001. An overwhelming number of stakeholders indicated that most farmers did not obtain the subsidized fertilizer at the subsidized price, and a substantial amount was sold on the black market.[8] To be fair, some states do a good job of administering the subsidy but many states take advantage of the arbitrage situation and use the subsidized fertilizer for patronage purposes. Thus, the subsidy is not playing the full role that the government intended.

There is also the question of fertilizer affordability. **Table 5** presents maize farm budgets showing economic returns to: (1) a small-scale holding that uses no fertilizer, (2) a small-scale

[7] The Golden Fertilizer Co. says it can and will deliver fertilizer to anyone within 48 hours. The company has an aggressive marketing strategy and sells its fertilizer brand at a price higher than most competitors. Farmers know that the company sells a good quality product and are willing to pay the high price. Contrast this with KASCO who allowed its fertilizer quality to be diminished in the past. KASCO has made adjustments and its quality has improved but farmers are still reluctant to purchase the product that sells at a lower price than the Golden Fertilizer brand.

[8] This study was unable to categorically verify any arbitrage or patronage dealings. This is a job for the FFD or an independent body that monitors and traces the subsidized fertilizer from the port to the farmer.

holding that uses a moderate amount of fertilizer (34 to 45 N per ha), and (3) a large-scale fertilizer holding that uses fertilizer at a rate of about 86 to 115 N per ha (data from **Projects Coordinating Unit [PCU], 2002**). The benefits to Farm 1 are low—a benefit-cost ratio of 1.21. With the addition of a moderate amount of fertilizer in Farm 2, the benefit-cost ratio increases to 1.52. Admittedly, a 1.52 B/C ratio is low, but it is higher than that of Farm 1 where no fertilizer was used and has increased the net revenue of Farm 2 by ₦8,845/ha over Farm 1. The use of still more fertilizer in Farm 3 along with the complementarity effect of improved seed increases the B/C ratio to 2.85. The net revenue increase over Farm 1 is ₦61,216/ha. The marginal rates of return from using fertilizer for Farm 2 and 3 are 105% and 300%, respectively. These are good rates of return that are likely comparable if not higher than other agricultural endeavors or even non-agricultural enterprises that the farmer might invest in.

Benefit-cost ratios were also reported by the **PCU [2002]** study for millet (2.87), rice (1.61), cassava (2.66), and yam (3.85) obtained by small-scale farmers using moderate amounts of fertilizer. However, for the year 2000, groundnut (0.68) and sorghum (0.97) had B/C ratios that were not greater than one at moderate fertilizer levels but sorghum had a 1.37 B/C ratio for large-scale farmers.[9] There will always be year-to-year variations in the return to fertilizer use based largely on the weather. There is a level of risk involved, and good returns to fertilizer use are not guaranteed.

The information in **Table 5** shows that there is a return to fertilizing maize. Large-scale farmers use more fertilizer because they are able to obtain credit or use their own resources for purchasing fertilizer. Also, they are likely in a better position to obtain the quantity of fertilizer they need on a timely basis. Small-scale farmers do not use as much fertilizer as large-scale

[9] A study by **Baanante [1986]** shows maize yield response increments for the Nigerian sub-humid region for the year 1984 of between 1,119 and 1,694 kg/ha from profit-maximizing application rates of between 84.1 and 89.4 kg/ha N. The B/C ratios were between 6.2 and 11.2 and were calculated using the subsidized fertilizer price at the time. Other studies have also shown good response rates (**FMARD [1980]** and **Christianson and Vlek [1991]**). More work needs to be done to update studies on fertilizer response rates and the optimum economic return from fertilizer use and other inputs under various climatic and geographical locations in Nigeria. Fertilizer response rates do change over time, particularly with soil organic matter depletion that is taking place in Nigerian soils (personal communication with IITA scientists) This is part of the responsibility of the National Fertilizer Development Center, Kaduna, which is under the FFD. Unfortunately, they are under-funded and do not have the means to carry out this work.

farmers because they cannot obtain credit and because they have a limited amount of their own resources to purchase fertilizer.[10] The small-scale farmer also has a problem of obtaining the quantity of fertilizer needed on a timely basis.

Table 5. Maize Farm Enterprise Budgets, Nigeria, 2000

	Small-Scale Holding No Fertilizer (Farm 1)	Small-Scale Holding With Fertilizer Application (Farm 2)	Large-Scale Holding With Fertilizer Application (Farm 3)
Average Variable Costs (₦/ha)			
Planting Materials	361	361	840
Fertilizer	0	6,080	15,200
Fertilizer Application	0	400	800
Packaging Bags	500	875	1,505
Simple Tools	500	500	500
Land Clearing	800	800	300
Land Cultivation	3,200	3,200	3,000
Planting	1,000	1,000	800
Weeding	5,500	5,500	5,500
Harvesting	1,000	1,800	3,000
Threshing/Winnowing	1,000	1,500	2,150
Bagging	75	125	215
Transport	300	500	860
Total Costs (₦/ha)	**14,236**	**22,641**	**34,670**
Yield (kg/ha)	750	1,500	4,300
Maize Price (₦/kg)	23	23	23
Gross Revenue (₦/ha)	17,250	34,500	98,900
Net Revenue (₦/ha)	3,014	11,859	64,230
Net Revenue Over No Fertilizer Application	-	8,845	61,216
B/C Ratio	1.21	1.52	2.85[b]
Marginal Rate of Return From Fertilizer Use[a]	-	105%	300% [b]

a. Marginal Rate of Return = (Marginal Net Benefits/Marginal Costs) x 100. See **CIMMYT [1988]**.

b. Farm 3 uses improved seed that costs more, thus the higher B/C ratio and marginal rate of return for Farm 3 is not only for a higher fertilizer level but also for the complementarity effect between fertilizer and improved seed.

Source: Values for Columns 2 and 3 are from **PCU [2002]** (Table 28.1) and are farm management survey data for the year 2000. Values for Column 1 are based on exact or pro-rated figures from **PCU [2002]** (Table 28.1). The yield for Farm 1 is assumed. Small-scale holding farmers cultivated an average 2.6 ha. Large-scale holding farmers cultivated between 6 and 10 ha. Given a fertilizer cost of ₦1,300/50 kg, fertilizer application for small-scale holding farms is about 4.5 bags or an application rate of between 34 to 45 N per ha. Large-scale holding farmers used about 11.5 bags or 86 to 115 N per ha.

[10] Stakeholders have indicated that there is a sharp decline in the price of small ruminants during peak fertilizer demand periods as farmers sell their livestock to obtain the capital to purchase fertilizer.

The critical question is not one of whether it pays to purchase fertilizer at market prices but one of how to get small-scale farmers using at least the same amount of fertilizer as large-scale farmers. Yes, a subsidy that lowers fertilizer prices may help, assuming the subsidy gets to the farmer. However, tackling the problems of quality, timeliness, and credit may, in the long run, be a better option. Thus, the blanket statement that fertilizer subsidies are required because farmers cannot afford the high market prices must be reexamined.

V. Impact of Past Fertilizer Input Policy

The review in Chapter 3 indicates a number of changes in government policy over the years toward procurement, responsibility of transport and storage, level of subsidy, and how the subsidy was administered. The policy of liberalizing the fertilizer sector was not followed through with any commitment or proper planning. Since liberalization in 1997, the FGN and the states still procure and subsidize fertilizer in an ad hoc manner. Many of the changes were in answer to making the fertilizer delivery system more efficient and stopping leakage and arbitrage practices. The policy changes have been largely unsuccessful. In spite of all efforts, fertilizer use declined from a peak of 461 thousand nutrient tonnes in 1994 to 173 thousand nutrient tonnes in 2000—a decline by an average 11.7% per year since 1990 (**Table 3**). NAFCON, a key element of a successful Nigerian fertilizer strategy was left derelict through poor maintenance and management practices. The FSFC sulfuric acid plant suffered the same fate.

Past and present fertilizer policies have cost Nigerian society. These are costs in terms of low efficiency and productivity in agriculture, equity considerations, and reduced food security. This chapter outlines some of these costs.

5.1. Impact on Economic Efficiency, Equity and Food Security

It could be said that the FGN monopoly of fertilizer procurement up to 1996 restricted the amount of fertilizer use by Nigeria's farmers. The amount of FGN fertilizer procurement was not made on the basis of the economic optimum amount to either produce in-country or import as determined by the market. Procurement was based more on the amount that the port, transport, warehousing and blending capacity could handle along with national budgetary considerations.

Since liberalization in 1997, the ad hoc fertilizer policies of the FGN, the inadequate FGN preparation for liberalization, and the procurement and subsidization by some states led to a dual dysfunctional private-public market. The public sector procured a small amount in 1999 and 2001, but the private sector, unsure of the governments intentions, did not import large volumes of fertilizer.

The question is what would have been the effective potential demand for fertilizer if the government did not have a monopoly prior to 1997 and if the post-1997 liberalization policies had been effective.

Stakeholders were asked what they thought the potential fertilizer use would be today at the prevailing free market price given good fertilizer quality and availability. Stakeholder estimates varied, but most thought that there was an effective demand by farmers for 25% to 50% more than what was being supplied. One stakeholder estimated that the economic optimum amount would be about 3.0 million tonnes (about 1.2 million nutrient tonnes), and another indicated that between 2.5 to 5.0 million tonnes (between 1.0 and 2.0 million nutrient tonnes) would be needed.

Table 6 presents two calculations of actual 1989/90 to 1999/2000 fertilizer use as a percentage of potential demand. Column 2 is the calculation of actual fertilizer use as a percentage of the amount of fertilizer required if all farmers were to use recommended fertilizer rates. **Ingawa and Kwa [1998]** calculated that 3,841,736 nutrient tonnes would be required if all farmers used recommended fertilizer rates. The percentage of actual fertilizer use relative to the potential demand based on recommended levels was at 12% in 1993/94 but declined to 4.5% in 1999/2000.

The recommended rates are high and may be too high to be the economic optimum application rates. A calculation was made at an assumed rate of 1/3 of recommended rates. This puts the economic optimum application rates at about 1/3 of the rates used by the large-scale holding farmer (Farm 3) in **Table 5** and is likely to be an underestimate. The calculated amount is equal to 1,470,618 nutrient tonnes (see **Table A11, Appendix II** for the calculation). **Table 6**, Column 3, shows the percentage of actual fertilizer use relative to the demand based on the

assumed economic optimum levels. Even with this lower optimal demand, the amount of actual fertilizer use in Nigeria would have been only 25% of the economic optimum demand in 1989/90 and only 11.8% in 1999/2000.

Table 6. Fertilizer Use as % of Recommended and Economic Optimum Application Rates

Year	Nigerian Fertilizer NPK Use (1)	Total Fertilizer Use as % of Recommended Fertilizer Application (2)	Total Fertilizer Use as % of Assumed Economic Optimum Application (3)
	(nutrient tonnes)	(%)	(%)
1989/90	380,900	9.9	25.9
1990/91	400,340	10.4	27.2
1991/92	429,200	11.2	29.2
1992/93	440,000	11.5	29.9
1993/94	461,000	12.0	31.3
1994/95	296,000	7.7	20.1
1995/96	183,000	4.8	12.4
1996/97	173,500	4.5	11.8
1997/98	137,700	3.6	9.4
1998/99	203,500	5.3	13.8
1999/2000	173,100	4.5	11.8

Source: Fertilizer use from **IFDC [2000c]**; Total fertilizer use as % of potential demand in Column 2 calculated by dividing figures in column 1 by a total potential demand of 3,841,736 nutrient tonnes x 100 (from **Ingawa and Kwa [1998]**). Total fertilizer use as percentage of economic optimal demand in Column 3 calculated by dividing figures in column 1 by a total assumed economic optimal demand of 1,470,618 nutrient tonnes x 100 (see **Table A11 in Appendix II** for calculation of the 1,470,618 figure).

One can argue about the exact amount of fertilizer that would have been produced and imported under an efficient fertilizer delivery system relative to the government monopoly system prior to 1997 and the dysfunctional dual public-private market in operation today. However, it is clear that the amount would have been considerably more and somewhere between the two extremes of 1,470,618 and 3,841,736 nutrient tonnes.

The question now becomes: What would this have meant for agricultural production and productivity? **Table 2** showed that except for cotton, yield growth rates were either negative or very low. With more fertilizer (and better seed), land productivity (kg/ha) would have increased as would have labor productivity (kg/labor use/ha). Increases in yield/ha lead to increased production. Increased production and increased labor productivity lead to increased farmer income. Labor productivity increases also lead to increased wages paid to farm labor. The central

point is that not having an efficient fertilizer system has cost Nigeria the loss of agricultural production, the loss of farmer incomes, and the loss of higher wages for farm labor. This, in turn, has lost the multiplier effects that would have resulted throughout the Nigerian economy.

A crude calculation of part of this loss in revenue and production can be made for maize for the year 2000 (**Table 7**). If all maize farmers had used 40-55 kg N per ha (and improved seed), the average maize yield would have been about 750 kg/ha higher (based on relative yield from **Table 5**). The incremental gross revenue from the incremental 750 kg/ha is equal to ₦17,250 kg/ha. The incremental net revenue is equal to ₦7,775 kg/ha when the fertilizer and other costs amounting to ₦9,475 kg/ha are deducted. In 2000, approximately 4 million ha was planted to maize. Thus, there would have been 3 million tonnes more maize at a value of ₦31.1 billon in farm income.

Even if only one-half of the maize hectares in 2000 had been fertilized, the resulting amount of incremental net revenue of ₦16.5 billon and production of 1.5 million tonnes is substantial. This calculation is only for the maize crop and only for one year. The total cost for all crops during the last 10 years would be staggering.[11] The implications for equity and food security are straightforward. The higher incomes from increased fertilizer use would have improved the living standards of farm families, laborers and rural people in general. Food security would have been improved—an increase of between 1.5 and 3 million tonnes of maize per year itself is a substantial amount.

[11] A more useful analysis would be to use a partial equilibrium model that estimates the changes in consumer and producer surplus welfare measures and changes in production and trade flows for the agriculture sector from various fertilizer and related policy changes. The time nor the data existed to develop a model of this magnitude.

Table 7. Incremental Maize Revenue and Production From an Efficient Fertilizer Delivery System, 2000

Incremental Gross Revenue	
Maize Price in Year 2000 (₦ /kg)[a]	23
Increase in Yield From Fertilizer (kg/ha)	750
Gross Incremental Revenue/ha	₦ 17,250
Incremental Costs	
Fertilizer Price (₦ /50kg)[b]	₦ 1,300
Fertilizer Use (275 kg/ha)[c]	₦ 7,150
Other Costs That Vary[d]	₦ 2,325
Total Incremental Cost/ha	₦ 9,475
Incremental Net Revenue/ha	₦ 7,775
Incremental Total Net Revenue	
4 million ha in Maize in Year 2000	₦ 31.1 billion
Incremental Maize Grain Production	
750 kg/ha x 4 million ha	3 million tonnes

a. The analysis assumes a perfectly elastic demand for maize meaning that the increase in maize production would not change the maize price. This would happen in a small country open market economy that allows trade.
b. The fertilizer price may well have been lower than the prevailing year 2000 price of ₦1,300/50 kg with a more efficient fertilizer delivery system.
c. This would provide between 41 and 55 N/ha, depending on the fertilizer formulation used (i.e., 20-10-10 or 15-15-15).
d. Costs that vary include improved seed, fertilizer application, packaging bags, harvesting, threshing and winnowing, bagging, and transport to market.
Source: Calculations based on information from **Table 5**.

5.2. Impact on Imports, Exports and Foreign Exchange Costs

The possible impact on production from an efficient fertilizer delivery system has, in part, been shown in Section 5.1. The incremental production from maize and from other crops would have had a significant effect on trade flows. Food imports may or may not have decreased but more importantly, non-oil exports (mainly agricultural products) would have increased providing substantial foreign exchange earnings and reversing the non-oil exports to food imports ratio in **Table 1**.

The key to an efficient fertilizer system is using Nigeria's considerable resources to produce fertilizer. NAFCON and FSFC did produce fertilizer and NAFCON also exported fertilizer (**Table 3**). The fertilizer production did save foreign exchange and at the same time earned foreign exchange. However, the effort was short-sighted. It can be argued that not only can Nigeria produce fertilizer for itself but it has the resources, in combination with the

phosphate in Togo, to produce the fertilizer requirements for all of sub-Saharan agriculture and possibly more. This would have been a substantial foreign exchange earner for Nigeria. This scenario could possibly have developed with a liberalized fertilizer sector that had encouraged the private sector.

Along with Nigeria, many developing countries have set up fertilizer plants. Today, Malaysia has a yearly capacity to produce 530,000 tonnes NPK, 1,200,000 tonnes urea and 87,000 tonnes ammonium nitrate **[IFDC, 2002a, 2002b, & 2001d]**. The Philippines have a yearly capacity to produce 1,510,000 tonnes NPK and Indonesia has the yearly capacity to produce 9,229,000 tonnes urea. Nigeria's rated capacity before being closed was 340,000 tonnes NPK and 1,488,000 urea (or 648,480 nutrient tonnes). Nigeria has the resources to produce fertilizer for export and can match the production of Indonesia. If Nigeria matched Indonesian production capacity, which is equivalent to 4,200 thousand nutrient tonnes N, and it met the Nigerian economic optimum demand of 530 thousand nutrient tonnes N, (**Table A11, Appendix II**), the remainder could be exported.

5.3. Budget Aspects

Fertilizer subsidies also have an impact on national, state, and local government budgets. Money spent on subsidies is money that cannot be spent on other government programs or debt retirement. **Table 8** presents the fertilizer subsidies since 1990 in relation to the Nigerian national and agricultural budgets. Between 1990 and 1996, the fertilizer subsidy cost as a percentage of the national budget ranged from 16.8% in 1991 to 42.7% in 1992 (**Table 8**, column 5). These are very high percentages for a subsidy in relation to the national budget.

Table 8. Nigerian National and Agricultural Budgets and Fertilizer Subsidy Costs, 1990-2001

Year	Nigerian National Budget (1)	Nigerian Agricultural Budget (2)	Fertilizer Subsidy Cost (3)	Agriculture Budget as % of National Budget (4)	Fertilizer Subsidy as % of National Budget[a] (5)	Fertilizer Subsidy as % of Agriculture Budget[a] (6)
	(2001 constant ₦ billion)			(%)	(%)	(%)
1990	164.333	23.022	30.416	14.0	18.5	132
1991	152.492	6.428	25.662	4.2	16.8	399
1992	127.074	6.069	54.294	4.8	42.7	895
1993	93.689	9.168	36.371	9.8	38.8	397
1994	106.389	9.609	30.606	9.0	28.8	319
1995	89.023	9.374	28.979	10.5	32.6	309
1996	73.552	5.965	17.711	8.1	24.1	297
1997	162.823	8.793	0	5.4	-	-
1998	245.456	11.754	0	4.8	-	-
1999	179.599	9.064	0.968	5.0	0.5	10.7
2000	348.854	11.269	0	3.2	-	0.0
2001	496.659	10.595	0.890	2.1	0.2	8.4

a. The fertilizer budget came from the President of Nigeria's special account and was not part of the FMARD budget.

Source: Budgets from Central Bank of Nigeria (CBN, various years). Subsidy costs from **Ogunfowora and Odubola [1994]** and FFD, Abuja. See **Table A12 in Appendix II** for 1990-2001 current year data.

The fertilizer subsidy also dwarfs the national agriculture budget—in 1992, the fertilizer subsidy was 8.9 times as large as the national agriculture budget. The national agriculture budget has also suffered over the years and was only 2.1% of the national budget in 2001. The fertilizer subsidy money may have had better returns if invested in agriculture and in decreasing the cost structure from point A to point B in **Figure 1**.

5.4. Impact on the Growth of the Private Fertilizer Sector

During the 1990-96 period, a virtual government monopoly of fertilizer marketing existed in Nigeria. Most of the fertilizer was procured by the government through imports and through government-owned ports or through the government-owned NAFCON and FSFC fertilizer production facilities. At various points in time, the government also owned fertilizer warehouses. The government also owned the railways and the roads. Most of the fertilizer was delivered to farmers by state-owned companies. The only part that private enterprise had was blending, bagging, and truck transport. The blending and bagging firms received government contracts,

added their margin for profit, and delivered the fertilizer to state locations. The blending and bagging companies made their money without much risk. They did not have to develop fertilizer dealer networks or sell their product on the open market. The number of private blending companies and blending capacity stayed relatively stable between 1990 and 1996—the only addition was 150,000 tonnes in 1993 (**Table 9**). The number of public blenders and capacity other than NAFCON remained small. NAFCON had a blending capacity of 586,000 tonnes. Thus, there was no incentive for any part of the public fertilizer system to grow or become more efficient or any reason for the small private sector entities to grow or become more efficient.

The stated intention of the liberalization policy in 1997 was to have the fertilizer system operated by the private sector. The private sector did respond. Private fertilizer importers became involved, and the number of private sector blenders and blending capacity also increased. Private sector capacity increased from 550,000 in 1998, to 920,000 in 1999, and to 995,000 tonnes per year in 2000, an increase of about 80% (**Table 9**). Both old and new blending companies started dealerships and dealer networks to distribute their products to farmers.

Unfortunately, the fertilizer sector liberalization process was carried out abruptly and without the proper groundwork for a smooth transition. The private sector had little experience with marketing and setting up dealerships and managing the risk that comes with a liberalized market. Those firms who loaned money to either dealers or farmers soon learned a lesson and lost money when they could not collect. Today, all fertilizer transactions are cash and carry and many companies have reduced the number of dealerships they had or have none at all and sell only from their blending or main storage depots. Some firms also paid for fertilizer from NAFCON but did not receive the fertilizer nor have some of the firms received their money yet.

When the FGN decided to change the fertilizer policy again and procure and subsidize in 1999, this was a blow to those who had invested in what they thought was going to be a liberalized fertilizer sector. Unfortunately, several state governments also decided to enter the fertilizer blending business, which resulted in an increase in capacity from 30,000 tonnes per year in 1998 to 270,000 tonnes per year in 2000 in direct competition with the private sector (**Table 9**). Moreover, some states also decided to subsidize fertilizer as did some local governments. Added to this was the policy inconsistency of the FGN when they did not procure

or subsidize in 2000 but did again in 2001 and 2002, while at the same time saying that they were committed to the liberalization of the fertilizer sector. The policy inconsistency and the direct competition from the public sector who also sells subsidized fertilizer is not a recipe for the growth of the private fertilizer sector.

Stakeholders, including private sector fertilizer firms, say that the private sector will respond if given a consistent fertilizer policy that encourages private sector growth. The private sector has already responded with increased blending capacity and fertilizer marketing. It is encouraging to see a number of firms today providing a good quality product and aggressively marketing their products. It is also encouraging to see the enthusiasm of the small- and medium-sized input dealers that are receiving training in agribusiness management through the IFDC DAIMINA project.

Table 9. Number of Blenders and Capacity, Nigeria

Year	Total Number of Blenders	Total Fertilizer Blending Capacity	Number of Private Blenders	Private Fertilizer Blending Capacity	Number of Public Blenders	Public Fertilizer Blending Capacity
	(number of blending facilities and capacity in tonnes/year)					
1990	3	430,000	2	400,000	1	30,000
1991	3	430,000	2	400,000	1	30,000
1992	3	430,000	2	400,000	1	30,000
1993	4	580,000	3	550,000	1	30,000
1994	4	580,000	3	550,000	1	30,000
1995	4	580,000	3	550,000	1	30,000
1996	4	580,000	3	550,000	1	30,000
1997	4	580,000	3	550,000	1	30,000
1998	4	580,000	3	550,000	1	30,000
1999	8	1,070,000	5	920,000	3	150,000
2000	12	1,265,000	7	995,000	5	270,000
2001	12	1,265,000	7	995,000	5	270,000

a. Does not include NAFCON which had 586,000 tonnes of blending capacity per year when it was in full operation and before it ceased to function in 1999.

Source: FFD, Abuja. The number of blending facilities are the main facilities in operation at the time and do not include minor blending facilities.

VI. Market Friendliness and Impact of Fertilizer Policy Scenarios

Governments can choose from several main fertilizer policy options: (1) the market economy approach that allows the private sector to operate in a competitive environment, (2) the market economy approach with a government-supported voucher scheme to help resource-poor farmers, and (3) variations of a government fertilizer procurement and subsidy approach. Each of these policies can have a different effect on economic efficiency (market friendliness), equity (poverty alleviation), food security, and the cost to the treasury. There are also transparency issues unique to each. This chapter looks at the likely impact of each of these policies and the preconditions that must exist to make the policies successful. This information will hopefully be useful for a policy dialogue with governments and all stakeholders to further identify a fertilizer policy for Nigeria.

6.1. The Market Economy Approach

Chapter 2 outlined the conceptual framework of a market economy approach to fertilizer policy. The market economy approach to fertilizer delivery is a mainstay of developed-country agricultural policy. Resources are allocated to the fertilizer delivery system based on the market demand for fertilizer by farmers. Competition is essential for keeping the cost structure of the entire fertilizer delivery system as low as possible thereby providing the farmer with low-cost fertilizer (supply curve S_2 in **Figure 1**). This approach is likely to use resources in the most efficient manner and by definition is market friendly. Equity considerations are not compromised and problems of equity are dealt with by other social programs. The cost to the treasury is not an issue. Transparency is generally not a problem although the government is required to enact and enforce rules and regulations pertaining to quality, environmental hazards, and general regulations, which the entities of the sector must adhere to. While no system is perfect, the system does deliver fertilizer on time, of good quality, and at a competitive market price. The basic preconditions are fair competition and government regulatory enforcement. Transport, communications, research and information infrastructure are also vital.

The market economy approach is not new—how to successfully make a transition from a high-cost structure fertilizer sector that has had significant governmental intervention to a full functioning market economy is new (i.e., getting from supply curve S_1 to S_2 in **Figure 1**). A

number of reports have outlined specific strategies and the steps to take to get from S_1 to S_2. These include **IFDC [1981], IFDC [1994], Ogunfowora [2000], IFDC [2001a],** and **IFDC [2001b]**. Unfortunately, the reports written before the Nigerian liberalization of the fertilizer sector in 1997 were largely ignored.

The preconditions for a successful transition can be summed up as follows **[IFDC, 2001b]**:[12]

1. Create a conducive macropolicy environment.
2. Declare and adhere to consistent input marketing policy.
3. Build human capital for market development.
4. Improve access to finance.
5. Develop and implement regulatory frameworks.
6. Promote market transparency through market information systems.
7. Promote technology transfer activities.
8. Strengthen research capacity for promoting the private seed industry.

The problem of state and local government procurement and subsidy intervention remains. There seems to be little effective means that the FGN can stop state intervention. There is some scope for state governments to stop local governments from subsidizing fertilizer. State governments must approve the budgets of local governments and, therefore, could deny budget funds for fertilizer subsidies. The practicality of this is yet to be determined. If the FGN is committed to a transition to a liberalized market, then the best policy may be to ignore state and local government interventions. The process of liberalization should bring down the fertilizer price and improve quality and availability. If some states persist in procuring and subsidizing fertilizers and running public-owned blending plants, it is unlikely that in the long run, they will be able to compete in terms of quality and service with the private sector. As indicated in

[12] Variations on this theme can be found in the other reports. Nigeria is now implementing some of these preconditions on a pilot project basis through the IFDC DAIMINA project, particularly the building of human capital for market development, market information systems, and helping FFD to improve the regulatory framework. Some work is also being done on strengthening research capacity for promoting the private seed sector through the IITA component of the DAIMINA project. Technology transfer systems need to be strengthened and, above all, the FGN must declare and adhere to consistent input marketing policies.

Chapter 4, quality and fertilizer availability plays an important part in determining fertilizer use by farmers.

The restructuring and liberalization of the Albanian fertilizer sector has been the most recent success story (IFDC, 2000). The strategy included most of the above steps and established an effective market to supply fertilizer and improved seeds to Albanian farmers. Fertilizer consumption more than doubled in a 3-year period and all fertilizer is supplied by the private sector. The value of certified seed production increased from nearly zero to USD 3.8 million between 1995 to 1999. Yields of wheat and maize increased 22%. Farmers diversified into more high-valued horticultural crops because of the availability of fertilizer and improved seed, and crop protection methods.

Albania is not Nigeria. Albania is a smaller country and does not have the FGN, state, and local governmental establishment. However, the strategy is sound and can work to Nigeria's advantage.

6.2. A Voucher System for Fertilizer and Seed

A liberalized Nigerian fertilizer sector that follows a market economy approach will over time bring down fertilizer prices and improve fertilizer quality and availability. Fertilizer use will also be enhanced by appropriate credit programs. However, there may be a role for government intervention to support that proportion of farmers who are in poverty and are resource poor and therefore do not have the purchasing power to purchase fertilizer or the means to acquire credit. This will likely be the case during the transition period from supply curve S1 to supply curve S2 (**Figure 1**) and for a proportion of farmers even in a full functioning liberalized fertilizer market.

A fertilizer and seed "voucher" scheme, similar to the Food Stamp Program in the U.S.A. could be instituted.[13] Each targeted resource-poor farmer would be given a voucher for a pre-determined quantity of fertilizer and improved seed. The vouchers would carry the name of the farmer and other identification and a face value of the quantity and cash value (net of subsidy) of fertilizer and seed. The targeted farmer would purchase seed and fertilizer in the market but pay

[13] See B. L. Bumb, "Fertilizer Situation in Nigeria: Recent Developments," IFDC draft, April 2001 and IFDC/DAI/MTL, 2000 Malawi report for further information.

only that amount shown on the voucher (which would be a price lower than the market price by the percentage of the subsidy). The fertilizer and seed dealer will be able to redeem the remainder of the fertilizer or seed market price (and possibly a small commission) by presenting the voucher to an FGN authorized commercial bank. It is important that the targeted farmers be able to purchase fertilizer and seed from any dealer, whether private- or state-owned. Farmers should not be forced to purchase only from the state so as not to compromise transparency.

There is a precedent for such a scheme in Nigeria, albeit on a smaller scale. There is an NGO voucher scheme for irrigation water pumps that entitle farmers to purchase the water pumps at a reduced rate and the water pump suppliers to be reimbursed the full cost of the pumps (personal communication with Mr. A.A. Kwa, FFD).

In terms of economic efficiency, the voucher scheme should not distort the fertilizer or seed market to any great extent. Fertilizer and seed dealers would still be collecting the market price for the two inputs. There would be increased demand for fertilizer and seed, but this would likely not translate into large price movements of the inputs (assuming the resource-poor farmers do not comprise a large proportion of total farmers, and the amount of inputs collected by each is relatively small). Once the scheme was announced, the fertilizer and seed marketing system would adjust so that there would be no shortages of these inputs. There would also be increased agricultural output, but this is unlikely to greatly affect agricultural product prices (again, assuming the resource-poor farmers do not comprise a large proportion of total farmers, and the amount collected by each is relatively small). Most of the crop production would not enter the market but rather would be consumed by the resource-poor farmers themselves.

The greatest benefits from the scheme is that resource-poor farmers increase their labor productivity and increase their food production for their own use or sell any excess in the market. Thus, their incomes are increased, and this helps with poverty alleviation. Food security is also enhanced as the targeted farmers are now in a better position to feed themselves.

There are many possible pitfalls and transparency issues. First is the identification of authentic resource-poor farmers and a definition of what a resource-poor farmer is. Who will identify them and who will verify that they are resource poor and in need of poverty alleviation?

Local government or agricultural organizations are the most likely candidates to do this, but the problem of keeping non-resource-poor farmers off the target list, including non-farmers, will be an enormous challenge. There may also be the problem of unscrupulous dealers selling poor quality fertilizer and seed to the target farmers who may not be well informed. Forgery of vouchers may be another problem. Some of the targeted farmers may just sell their voucher fertilizer on to other farmers to collect the cash.

There is also the matter of the final cash value that the dealers receive when they redeem the vouchers. Presumably, even in a competitive market, different dealers may charge different prices (as they do now) based on good quality and their brand name. Does the scheme give some average price to all dealers when they redeem their vouchers or does each dealer receive his own established market price? If it is an average price, some dealers will make money on the scheme and some will lose. Those dealers who lose may refuse to sell to the targeted farmers. If the final price is established equal to each dealer's price, a fairly large price information gathering system needs to be established.

The absence of an exit strategy may prove to be a problem. Once this type of program starts, it is difficult to find an exit strategy and stop the program from continuing into perpetuity. An additional problem is how to identify and drop targeted farmers who no longer should be on the list and how to add new deserving farmers to the list. This will be a yearly battle and political pressure could be overwhelming.

The voucher scheme exerts a cost on the treasury. The costs include the cost of the subsidy, administrative costs, and the cost of monitoring and information gathering. It is also likely that many resource-poor farmers have little experience with fertilizer and improved seed. Training would be essential to acquaint the targeted farmers with the type of fertilizer formulation to purchase, the amount of fertilizer and seed to apply, how to apply it, and when.

For illustrative purposes, if five million Nigerian farm households were targeted for a voucher scheme, and each household received one bag of fertilizer (50 kg), the amount of fertilizer purchased from the marketplace by the scheme would be 250,000 tonnes (about

100,000 nutrient tonnes).[14] If the subsidy was 50% of the 2002 market price of ₦1,500, the cost to the treasury for the fertilizer subsidy alone would be ₦3.750 billion (see **Table 4** for comparisons with the subsidy costs and procurement of previous years). The subsidy cost should decrease as the real cost of fertilizer decreases with the transition to a full and efficient fertilizer market economy. The transactions costs for this program, which have to be added, may be high especially with the cost of a proper functioning monitoring and management information system. The subsidy and administrative cost for a seed voucher system would also have to be added.

Many of the problems with a voucher system can be overcome by strict monitoring and information gathering and are preconditions along with the proper identification of the target farmers if the scheme is to be successful. If leakages can be kept to a minimum, the scheme can promote fertilizer use by resource-poor farmers and assist with poverty alleviation. At the same time, the scheme is market friendly and will not distort the development of the market-based fertilizer system. That is, there should be little or no effect on the transition from supply S_1 to supply curve S_2 in **Figure 1** and no effect after the transition is complete. There should also be little effect on crop production and prices.

Nigeria is in a position to experiment and transform the present 25% fertilizer subsidy scheme that is targeted to poor farmers into a voucher scheme. Much of the work of identifying the target farmers has already been done by the states and local governments. The FGN could start by offering to the voucher scheme the same amount of fertilizer (about 165,000 tonnes) currently being procured for the current subsidy scheme. The target farmers would be given the vouchers and would themselves buy the fertilizer in the open market. The amount of fertilizer each target farmer would receive would have to be determined. Using a fertilizer cost of ₦1,500/ 50 kg, the 25% subsidy is about ₦375/50 kg. The total voucher scheme cost would be about

[14] Statistics on the total number of farm households and further breakdown do not exist. **FOS [1999]** estimates that in 1996, 67 million people were classified as poor and of this number, 71% were in agriculture and forestry (47.5 million). Data from the 1993/94 National Agricultural Sample Census (NASC) indicated that of those in agriculture and forestry, 48% were estimated to be in the "Extreme category, 28.8% in the "Moderate Poor" Category and 23.2% in the "Non Poor" Category. Applying the NASC percentages to the 1996 figure of 47.5 million in agriculture and forestry, 22.8 million would be in the "Extreme Poor" category, 10.8 million in the "
11 million in the "Non Poor" Category. If the assumption is made that there are on average six persons per household, the number of farms in the extreme poor category would have been 3.8 million in 1996. It is therefore likely that in 2002, the number of extreme poor farm households is between 4 and 5 million.

₦1.25 billion and is equivalent to what the cost would be under the original 25% subsidy scheme. The administrative and monitoring costs need to be added.

The voucher scheme is market friendly and will promote the growth of the private sector. However, there must also be a concerted effort to tie in the voucher scheme with the preconditions for a successful transition to a market economy fertilizer distribution system as indicated in Section 6.1. In particular, building human capital for market development, development of a regulatory framework, market information systems, and research and the transfer of technology, especially improved seed.

6.3. The Government Subsidy at Source Approach

Procurement, subsidies, and ownership of fertilizer production facilities and warehouses are the types of interventions in which governments usually engage. Procurement and subsidies usually go hand in hand. There are several main types of government and procurement schemes and each may vary in terms of implementation. The main procurement and subsidy schemes are: (1) government monopoly procurement and subsidy on the final product, (2) government partial procurement and subsidy on the government-procured final product only, (3) subsidy at source, and (4) subsidy at source including transportation subsidy to delivery points. The first two have been reviewed, discussed, and assessed in Chapters 3, 4 and 5. This next section will discuss the likely impact of a subsidy at source and try to determine how market friendly the scheme is.

The subsidy at source scheme operates as follows. The government does not procure fertilizer but puts a subsidy on the fertilizer at source. The government meets with all importer/blenders and in-country fertilizer producers (NAFCON and FSFC once rehabilitated) and agrees on the landed price of imported fertilizer and the price at which NAFCON and FSFC would sell their fertilizer in the open market. The government will then announce a subsidy to be paid to importers and in-country fertilizer producers. The importers and in-country producers will then sell the fertilizer at the subsidized price to wholesalers and retailers. The scheme assumes that the amount of subsidy will be passed on through the wholesaler and retailer outlets and go directly to the farmers. The scheme aims to be market friendly because the fertilizer sector wholesalers and retailers operate in a competitive market economy. The scheme can be

augmented by also subsidizing the transport cost of the fertilizer to delivery points within the country.

The subsidy at source scheme is not a new idea. ***IFDC Report*** **[1994]** discusses the workings of a subsidy-at-source scheme and a strategy and action plan for Nigeria to liberalize the fertilizer sector with a gradual reduction in the subsidy. The scheme also calls for calculating the subsidy on a nutrient basis and for undertaking similar preconditions for transition as described in Section 6.1. This plan was not adopted although the FGN has been recently talking about introducing a similar intervention.

There are pitfalls, problems, and transparency issues. First, identifying the actual fertilizer price at source could be a problem and transparency can be compromised. In the end the price would be negotiated and the negotiations may lead to higher than open market price levels. Many tricks can be played including over-invoicing. The government would have to consistently announce the subsidy in advance of the fertilizer season so that the private sector could identify what the market is likely to be and make import and in-country purchasing plans. Consistency has not been a trademark of government fertilizer policy. There is also the problem of timely FGN payments to importers and in-country fertilizer producers. The FGN track record is not good for payment of the subsidy and procurement costs. This creates liquidity problems and curtails the activity of the private sector.

The government would never know exactly how much the subsidy was going to cost the treasury. If the subsidy is announced in January, the government will not know how much fertilizer farmers will finally purchase and use until the end of the year. If the government policy was to only subsidize a proportion of the fertilizer at source, then there will be the dual private-public sector and arbitrage problems already discussed in Chapter 5. The problems of subsidized fertilizer flowing to other countries and the intervention by state and local governments will still persist.

There is the assumption that the total subsidized proportion of the source prices will be transmitted unhampered to the farmers. That is, the price that the farmer will pay is the subsidized source price plus the costs for transport, blending, bagging, marketing and delivery. If

competition is strong throughout the wholesale and retail chain, this has a good chance of occurring. If competition is not strong in any part the chain, and there is an effective demand by farmers, wholesalers or retailers may capture part, if not all, of the subsidy. This could happen in the first years of transforming to a liberalized market economy when competition may not be strong in some sectors of the wholesale or retail chain. Thus, the subsidy may not entirely go to the farmer, defeating the purpose of the intervention. The government could mandate the final fertilizer price, but then this defeats the whole liberalizing process and hampers the growth of the private sector. The best that can be done is provide information on retail fertilizer prices throughout the country to foster competition.

The preconditions are strong competition, government consistency with the policy and the program specifics and not compromising transparency when setting the source fertilizer prices. The total amount of fertilizer use must be subsidized or the problems of a dual public-private market will exist along with the other preconditions for transition as described in Section 6.1. This includes a strong government regulatory function.

In terms of economic efficiency, if all the preconditions are met, distortions would still exist. If the full subsidy is transmitted to the farmer, then fertilizer wholesalers and retailers would still earn normal profits, and there would be growth and efficiencies in the sector. If farmers receive the full subsidy, then they may use more fertilizer than is economically optimal. This would become a concern in terms of economic efficiency and the WTO if the government did not gradually decrease the subsidy to zero.

Equity considerations would be compromised if the full subsidy is not transmitted to the farmers. This may happen in the early stages of transition. The wholesale and retail chain would gain from the subsidy at the expense of the farmer. Food security would be increased as more fertilizer would be used and production increased.

Budget costs could be high depending on the level of subsidy and the success of the transition. For illustrative purposes, if the economic optimum fertilizer use for the country at the beginning of the transition period was one million tonnes of product and the subsidy was ₦500/50 kg, the total costs to the treasury would be ₦10 billion. If in the later stages of the

transition, the economic optimum fertilizer use of the country was ₦3.5 million tonnes and the staged reduction of the subsidy was set at ₦200/50 kg, the cost of the subsidy would be ₦14 billion.

The basic difference between the transition to a market economy approach in 6.1, and the subsidy-at-source approach is the subsidy itself. The preconditions are much the same for both. Policymakers must ask themselves if a subsidy is really required. There is a demand for fertilizer use and it is profitable to use fertilizer. It will become more profitable as fertilizer prices decrease through lowering the cost structure of the fertilizer delivery system.

VII. Concluding Comments

7.1. Summary

Chapter 2 outlined a conceptual framework for assessing alternative policies. The framework identified the differences between an inefficient fertilizer sector and an efficient fertilizer sector (i.e., supply curve S_1 and supply curve S_2 in Figure 1). It showed how a subsidy can be used to increase fertilizer use versus the strategy of increasing fertilizer use by lowering the cost structure of the fertilizer sector. There would seem to be more efficiencies gained by opting for a low-cost fertilizer delivery system over that of a price subsidy.

The key observation from Chapter 3 is the inconsistency of government fertilizer policy over the years. Policies kept changing to try to answer problems of availability, leakage, and arbitrage. None of the policy changes succeeded.

Chapter 4. presented a challenge to the argument that subsidies were required because farmers could not afford high unsubsidized market prices. Views from stakeholders and empirical evidence indicated that fertilizer quality and availability must be considered significant constraints to fertilizer use. The farm budgets in **Table 5** and other fertilizer response information show that fertilizer application does have a payoff at unsubsidized fertilizer prices for most crops. It is true that for a certain number of small resource-poor farmers, affordability is a significant problem, but little of the subsidized fertilizer was reaching the resource-poor

farmers under the post-1997 subsidy programs. Other policies such as a micro-finance program may be more appropriate.

The impact of past fertilizer policy was examined in Chapter 5. It was concluded that the amount of fertilizer use was severely curtailed by FGN fertilizer policy relative to a policy where the amount of fertilizer use would have been determined by the market forces. A calculation for maize alone for the year 2000 indicated the loss from not having an efficient fertilizer system that delivered an economic optimum amount of fertilizer to the country was between ₦15.5 billion and ₦31.1 billion (**Table 7**). By implication, the FGN policies have negatively impacted economic efficiency, equity and food security while increasing food imports and increasing foreign exchange costs. The cost to the treasury was also high (**Table 8**). The policies also had a negative impact on the growth of the private fertilizer sector. In addition to these loses are those from not using Nigeria's considerable resources to produce fertilizer for its own market and exporting the remainder to other parts of Africa.

Chapter 6 outlined several fertilizer policies and their impact. **Table 10** summarizes the impacts and likely consequences of these policies. A market economy policy has the best chance of fulfilling the economic efficiency, equity and food security goals. The market economy approach may be combined with a voucher system, at least in the transition period to a market economy, to help with poverty alleviation of the extremely poor farmers. The subsidy at source program is not entirely market friendly and has transparency problems and if used, should only be used as a tool for the transition to a market economy approach. The two procurement/subsidy approaches, which Nigeria has tried without success, are not market friendly and should be discarded.

Table 10. Fertilizer Policies and Their Impact

Government Policy	Economic Efficiency	Equity	Food Security	Transparency Problems	Fertilizer Sector Growth	Budget Costs
I Market Economy	High, allows economic optimum allocation of resources	High	High	No significant problems but need FGN to monitor and to enforce regulations	Encourages	Costs needed for monitoring, regulatory enforcement, infrastructure
II Voucher System	High, no significant market distortions	High, if transparency problems kept to minimum	High, allows resource-poor farmers to meet own needs	There can be major problems if not monitored properly	Does not affect	Medium cost if administered properly
III Subsidy at Source	Some distortion of fertilizer and crop markets	Not effective if subsidy price not transmitted	Can be high if properly administered	Can be source-price identification problems	Likely not to discourage	Subsidy costs can be high
IV Procurement (all) and Subsidy	Low. Non-economic optimum fertilizer use	Not effective, reduces fertilizer supply	Does not contribute	Usually problems with arbitrage, leakages, availability	Discourages	Subsidy costs can be very high
V Procurement (part) and Subsidy	Low. Non-economic optimum fertilizer use	Arbitrage and leakages; most gains made by non-farmers	Does not contribute	Usually problems with arbitrage, leakages, availability	Discourages	Costs lower than IV but depends on procured amount

7.2. Primary Conclusions

The assessment of the FGN fertilizer policy and intervention in the fertilizer marketing and distribution systems reveals the following conclusions:

1. The FGN has followed highly inconsistent and unpredictable fertilizer policies over the past several decades. The effect has been to stunt the growth of the private fertilizer sector and reduce the amount of fertilizer that would have been used by farmers.
2. The most recent policy of the procurement and subsidization of a limited quantity of fertilizer targeted to poor farmers has not had the intended results. The policy has discouraged the private sector and the targeted farmers have not been the beneficiary of the full subsidy.
3. The main supply-side constraints to fertilizer use in Nigeria are fertilizer quality and availability. Fertilizer price is a factor but not a main constraint as fertilizer is profitable at

non-subsidized prices in most instances. A significant fertilizer demand-side constraint is the non-availability and high cost of credit.

4. The past FGN fertilizer policies have exerted a cost to the Nigerian economy in terms of economic efficiency, equity, and food security. When compared with a free market scenario, Nigeria has lost agricultural production, farmer income, farm labor income, employment in both the agricultural and fertilizer sectors, and economic multiplier effects that would have extended throughout the economy.

7.3. Main Recommendations

The following recommendations follow from the assessment of the Nigerian fertilizer sector:

1. The FGN must continue to develop the private sector fertilizer market and delivery system and support activities that decrease the transactions costs of the fertilizer delivery system. The current IFDC DAIMINA project activities should be extended to other states. The emphasis should be concentrated on strengthening the regulatory system, training private sector wholesalers and retailers, and organizing marketing associations.
2. The Nigerian fertilizer subsidy policies should be critically examined in the context of Nigeria's WTO agreements.
3. The FGN should consider replacing the current subsidy policy and experiment with the voucher system. The existing allocation mechanisms established by the states for targeting poor farmers under the subsidy policy could be used for the voucher scheme and ease the transition.
4. In connection with experimenting with the voucher system, further work should be undertaken to understand how individual states have operated the subsidy system and targeted poor farmers. This information can then be used to standardize the process for the voucher system and avoid transparency problems.
5. Policy dialogue needs to be continued with both the Federal and state civil service and with policy makers at both levels. Considerable progress with policy dialogue has been made with the FGN civil service, and now this dialogue must be taken to the states and to the policy makers at both the Federal and state levels.
6. Fertilizer and related data collection and analysis need to be strengthened at both the Federal and state levels. The FFD should take the lead and coordinate the effort. The National

Fertilizer Development Center should be revitalized and conduct more work on fertilizer response rates and the economic returns from fertilizer use.

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Appendix I. List of People Visited/Interviewed

NO.	NAME	DESIGNATION
1.	CHIEF CHRIS AGBOBU	Hon. Minister of State for Agriculture and Rural Development, Abuja
2.	PROF. ANGO ABDULLA HI	Special Adviser to the President on Food Security, Abuja
3.	ALH. RABIU KWA	Ag. Director, Federal Fertilizer Dept., Abuja
4.	HON. G.A. OLAOMI	Chairman, Oyo State Agric. Input Supply Coy. Ibadan (Represented the Oyo State Hon. Commissioner for Agric.)
5.	Dr. R. I. KOLAJO	Director, Livestock Services, Oyo State Ministry of Agric., Ibadan
6.	MR. I.A. ALAWODE	Director of Planning, Research and Stat., Oyo State Ministry of Agric., Ibadan
7.	DR. Y.A. LAWAL	Director, Rural Development, Oyo State Ministry of Agriculture
8.	ALH. R.O. OGUNSESAN	Director, Produce Services, Oyo State Ministry of Agriculture
9.	MR. K.A. AKINPELU	Director, Crops, Oyo State Ministry of Agriculture and Natural Resources
10.	REV. ADEWALE SANDA	Director, Forestry, Oyo State Ministry of Agriculture and Natural Resources
11.	MR. SILE OKESOLA	Director, Finance and Admin, Oyo State Ministry of Agriculture and Natural Resources
12.	MR. T.O. OLADIPO	Ag. Director, Crops, Oyo State Ministry of Agriculture and Natural Resources
13.	MR. P.S.O. TAIWO	General Manager, Oyo State Agric. Inputs Supply Company
14.	MR. R.A. ADEDIGBA	Zonal Manager, Oyo State ADP, Ogbomoso
15.	MR. SUNIL PILLAI	Group General Manager, Fertilizer & Chemicals Ltd., Ikoyi, Lagos
16.	MR. PAUL GBEDEDO	Plant Manager/Director, Golden Fertilizer Ltd., Apapa, Lagos
17.	MR. S.A. MAKANJUOLA	Managing Director, Samie Holdings, Ibadan
18.	MR. S.T. KUNU	Chief Executive Officer, Insis (Crop Care) Ltd., Ibadan
19.	MRS. O.A. FAGBAMIYE	Managing Director, Fitsco (Nig.) Ltd.
20.	MR. S.O. ADEBAYO	Managing Director, Glorious Konnections Ltd., Ibadan
21.	MRS. FUNKE LADIPO	Manager, Kal Farmers' Shopping Centre, Ogbomoso
22.	DR. RODOMIRO ORTIZ	Director, R&D, IITA (Represented the Director General of IITA)
23.	DR. J.D.H. KEATINGE	Director, Resource and Crop Management, IITA
24.	PROF. FRANCIS S. IDACHABA	Consultant, IITA
25.	DR. S.A. ADETUNJI	Consultant, IITA
26.	DR. PATRICK M. KORMAWA	Agric-Economist, IITA

No.	NAME	DESIGNATION
27.	OYO STATE AGRIC. INPUT DEALERS ASSOCIATION	(Met them as a group)
28.	ABBA DATTI	Director, Agric. Services, Kano State Ministry of Agriculture and Natural Resources (MANR)
29.	SANUSI USMAN DANBATTA	Managing Director, Kano State Agricultural and Rural Development Authority (KNARDA)
30.	ADAMU ALI WUDIL	Director, Rural Institutions Development (KNARDA)
31.	BAKO K. KEBE	Director, Planning, Monitoring and Evaluation (KNARDA)
32.	BAWA ABDULLAHI	Deputy Director, Human Resources Development (KNARDA)
33.	MUHAMMED RILWAN HUSSAIN	AGM Finance, Kano Agric. Supply Company (KASCO)
34.	BASHIR B. AMINU	Chief Accountant, Agro Nutrients and Chemical Company Ltd (ANCC), Kano
35.	ABBA AUCHAN	National Coordinator Marketing, Dan-Hydro Fertilizer and Chemical Company, Kano
36.	SAIDU G. B. ZAKARI	National Sales Manager, Golden Fertilizer Company Limited, Kano
37.	R. A. SALEH	Marketing Manager, Golden Fertilizer Company Limited, Kano
38.	ALH. ALIYU ISA DAMARAYA	National President, National Cotton Association of Nigeria.
39.	ALH. USMAN MUHAMMAD	National Chairman, Groundnut Farmers' Association of Nigeria.
40.	UMORU MUHAMMAD ISARA	Chairman, Kano State Fadama Users' Association.
41.	SALEH M. KADERA	National Secretary, Wheat Farmers' Association of Nigeria.
42.	ENGR. A. M. KANT	Ag MD/CED, Federal Super Phosphate Company.
43.	O. P. PANDYA	Production Manager, Fertilizers and Chemicals, Ltd., Kaduna.
44.	ALH. ALIYU TSA DANMARAYA	National President, National Cotton Association of Nigeria
45.	USMAN MUHAMMAD	National Chairman, Groundnut Farmers' Association of Nigeria
46.	ABDULKADIR GUDUGI	Senior Agricultural Economist, USAID, Abuja.
47.	ANDREW LEVIN	Agricultural Development Officer, USAID, Abuja.
48.	PROF. G. A. ARIYO	Programme Leader, Dry Lands Research, ABU, Zaria, Nigeria.
49.	DR. B. A. ADEBUSUYI	Asst. Director/Head, National Fertilizer Development Center, Kaduna.
50.	DR. RAVI M. AULAKH	Chief Economist, U. S. Agency for International Development, Abuja.
51.	VICE ADMIRAL M. NYAKO	Farmer/President of All Farmers' Apex Association
52.	ABUDLLAHI GUMM	All Farmers' Apex Association
53.	ENGR. A. S. SABO	Deputy Director, Department of Rural Development
54.	DR. S.A. INGAWA	Head of Project Coordinating Unit (PCU)
55.	ISMAILA ADAMU	PCU
56.	ABUBAKAR ALIYU	Deputy Director, Federal Fertilizer Department

Appendix II. Fertilizer and Related Data Tables

Table A1. Total and Agricultural Imports and Exports, Nigeria, (in current Naira)

Year	Total Imports	Food[a] Imports	Food Imports as % of Total	Total Exports	Non-Oil Exports	Non-Oil Exports as % of Total	Non-Oil Exports as % of Food Imports
	-------(₦ Billion)-----		%	-------(₦ Billion)-----		%	%
1990	45.718	3.703	8.1%	109.886	3.260	3.0%	88%
1991	87.020	3.307	3.8%	121.535	4.677	3.8%	141%
1992	145.911	14.299	9.8%	207.266	3.973	1.9%	28%
1993	166.100	15.281	9.2%	218.770	4.991	2.3%	33%
1994	162.789	15.139	9.3%	206.059	5.349	2.6%	35%
1995	755.128	96.656	12.8%	950.661	23.096	2.4%	24%
1996	562.627	82.706	14.7%	1,309.543	23.328	1.8%	28%
1997	845.717	112.508	13.3%	1,241.662	29.163	2.3%	26%
1998	837.419	111.549	13.3%	751.857	34.070	4.5%	31%
1999	862.507	115.399	13.4%	1,189.007	19.498	1.6%	17%
2000	962.970	128.077	13.3%	-	-	-	-

[a] *Food imports include food and live animals, animal and vegetable oils and fats (do not include beverages and tobacco).*

Source: Federal Office of Statistics/CBN (1999).

Table A2. Exchange Rates and Consumer Price Index, Nigeria

Year	Naira/USD Exchange Rate (Official)	Naira/USD Exchange Rate (Parallel Market)	Consumer Price Index (1985=100)	Consumer Price Index (2001 =100)
1990	8.0	-	308.0	7.6
1991	9.9	13.5	345.9	8.6
1992	17.3	20.5	506.8	12.6
1993	22.1	36.3	800.2	19.9
1994	21.9	60.2	1,174.6	29.1
1995	81.0	83.9	2,017.7	50.1
1996	81.0	83.5	2,630.7	65.3
1997	81.6	85.3	2,864.2	71.1
1998	83.8	88.2	3,044.4	75.5
1999	92.3	99.7	3,074.6	76.3
2000	101.5	111.4	3,148.9	78.1
2001	111.9	132.4	4,031.1	100.0

Source: Central Bank of Nigeria Statistical Bulletin (CBN, various years).

Table A3. Maize and Millet Area, Production, Yield and Prices, Nigeria

Year		Maize			Millet			
		Production	Yield	Price	Area	Production	Yield	Price
		('000 MT)	(MT/ha)	(₦ /kg)	('000 ha)	('000 MT)	(MT/ha)	(₦ /kg)
1990	5,105	5,768	1,130	1.43	4,778	5,136	1,075	1.27
1991	5,142	5,810	1,130	1.83	4,560	4,109	901	1.71
1992	5,223	5,840	1,118	3.10	4,367	4,501	1031	2.15
1993	5,309	6,290	1,185	3.50	4,850	4,602	949	3.61
1994	5,426	6,920	1,272	5.43	5,007	4,757	950	5.96
1995	5,497	6,931	1,261	9.76	5,107	5,563	1,089	8.07
1996	4,273	5,667	1,326	10.84	5,356	5,681	1,061	8.94
1997	4,200	5,254	1,251	11.56	5,487	5,902	1,076	8.99
1998	3,884	5,127	1,320	12.94	5,956	5,956	1,000	10.59
1999	3,965	5,476	1,381	n.a.	5,603	5,960	1,064	n.a.
2000	3,999	4,107	1,027	n.a.	5,814	6,105	1,050	n.a.
2001	4,041	4,620	1,143	n.a.	5,855	5,530	944	n.a.
Mean	4,672	5,649	1,212	-	5,228	5,317	1,016	-
GR%[a]	-3.3	-2.8	0.5	-	2.6	2.9	0.3	-

[a] *Growth rates calculated using semi-log regression analysis. Note: Yield Growth Rate % = Production Growth Rate % - Area Growth Rate %*

Source: Federal Office of Statistics, Abuja. Prices are farmgate prices.

Table A4. Sorghum and Rice Area, Production, Yield and Prices, Nigeria

Year	Sorghum				Rice			
	Area	Production	Yield	Price	Area	Production	Yield	Price
	('000 ha)	('000 MT)	(MT/ha)	(₦ /kg)	('000 ha)	('000 MT)	(MT/ha)	(₦ /kg)
1990	4,185	4,185	1,000	1.34	1,208	2,500	2,070	2.46
1991	5,538	5,367	969	1.78	1,652	3,226	1,953	3.39
1992	5,474	5,909	1,079	3.28	1,664	3,260	1,959	4.17
1993	5,605	6,051	1,080	3.65	1,564	3,065	1,960	6.04
1994	5,738	6,197	1,080	5.99	1,714	2,427	1,416	11.20
1995	6,095	6,997	1,148	9.01	1,875	3,293	1,756	18.50
1996	6,191	7,084	1,144	9.31	1,784	3,122	1,750	24.24
1997	6,589	7,297	1,107	9.32	2,048	3,268	1,596	24.25
1998	6,635	7,516	1,133	10.82	2,044	3,275	1,602	25.11
1999	6,678	7,520	1,126	n.a.	2,191	3,277	1,496	n.a.
2000	6,885	7,711	1,120	n.a.	2,199	3,298	1,500	n.a.
2001	6,933	7,081	1,021	n.a.	2,207	2,752	1,247	n.a.
Mean	6,046	6,576	1,084	-	1,846	3,064	1,692	-
GR% [a]	3.6	4.3	0.7	-	4.5	0.9	-3.6	-

[a] *Growth rates calculated using semi-log regression analysis. Note: Yield Growth Rate % = Production Growth Rate % - Area Growth Rate %*

Source: Federal Office of Statistics, Abuja. Prices are farmgate prices.

Table A5. Cassava and Yam Area, Production, Yield and Prices, Nigeria

Year	Cassava				Yam			
	Area	Production	Yield	Price	Area	Production	Yield	Price
	('000 ha)	('000 MT)	(MT/ha)	(₦ /kg)	('000 ha)	('000 MT)	(MT/ha)	(₦ /kg)
1990	1,472	19,043	12,937	1.36	1,276	13,642	10,677	1.48
1991	2,551	26,004	10,194	1.77	1,639	16,956	10,345	1.85
1992	2,755	29,184	10,593	2.67	1,743	19,781	11,349	2.66
1993	2,844	30,128	10,594	2.29	1,906	21,632	11,349	3.29
1994	2,927	31,005	10,593	4.02	2,031	23,153	11,400	5.10
1995	2,944	31,404	10,667	9.64	2,164	22,818	10,544	7.67
1996	2,946	31,418	10,665	10.74	2,172	23,201	10,682	9.10
1997	2,697	32,050	11,882	10.95	2,170	23,972	11,048	9.15
1998	3,043	32,695	10,746	9.36	2,625	24,768	9,435	10.76
1999	3,072	32,697	10,644	n.a.	2,708	25,873	9,554	n.a.
2000	3,030	32,010	10,564	n.a.	2,742	26,201	9,555	n.a.
2001	3,430	32,586	9,500	n.a.	2,914	26,374	9,051	n.a.
Mean	2,809	30,019	10,798	-	2,174	22,363	10,416	-
GR% [a]	4.1	3.2	-0.9	-	6.5	4.8	-1.7	-

[a] *Growth rates calculated using semi-log regression analysis. Note: Yield Growth Rate % = Production Growth Rate % - Area Growth Rate %*

Source: Federal Office of Statistics, Abuja. Prices are farmgate prices.

Table A6. Cotton and Groundnut Area, Production, Yield and Prices, Nigeria

Year	Cotton				Groundnut			
	Area	Production	Yield	Price	Area	Production	Yield	Price
	('000 ha)	('000 MT)	(MT/ha)	(₦ /kg)	('000 ha)	('000 MT)	(MT/ha)	(₦ /kg)
1990	575	276	480	3.05	707	992	1,403	2.77
1991	643	309	481	5.41	1,127	1,361	1,208	3.32
1992	653	348	533	6.58	1,046	1,297	1,240	4.67
1993	362	192	530	8.75	1,566	1,416	904	5.03
1994	411	218	530	15.36	1,711	1,453	849	8.80
1995	431	251	582	23.97	1,767	1,579	894	13.20
1996	452	301	666	25.62	2,266	2,278	1,005	15.50
1997	422	341	808	26.38	2,252	2,531	1,124	15.53
1998	480	348	725	27.15	2,605	2,534	973	15.73
1999	514	381	741	n.a.	2,662	2,894	1,087	n.a.
2000	538	399	742	n.a.	2,668	2,901	1,087	n.a.
2001	542	402	742	n.a.	2,738	2,683	980	n.a.
Mean	502	314	630	-	1,926	1,993	1,063	-
GR% [a]	-0.9	4.0	4.9	-	11.5	9.9	-1.6	-

[a] *Growth rates calculated using semi-log regression analysis. Note: Yield Growth Rate % = Production Growth Rate % - Area Growth Rate %*

Source: Federal Office of Statistics, Abuja. Prices are farmgate prices.

Table A7. Nitrogen Nutrient Fertilizer Production, Imports, Exports and Use, Nigeria

Year	Production	Imports	Exports	Use
	----------(tonnes N) ----------			
1989-1990	272,400	83,400	121,500	197,400
1990-1991	284,000	56,900	122,100	209,960
1991-1992	260,600	48,500	113,200	212,000
1992-1993	287,200	56,000	94,600	220,000
1993-1994	267,000	79,000	92,000	220,000
1994-1995	151,400	114,000	79,300	186,000
1995-1996	138,000	0	44,400	100,000
1996-1997	114,300	18,200	26,700	105,000
1997-1998	41,200	36,100	0	77,300
1998-1999	71,000	72,400	0	143,400
1999-2000	80,500	36,700	0	117,200

*Source: FAO data from **IFDC [2000c]**. 1990 nitrogen stocks were 25,915 nutrient tonnes **[APMEU, 1990]**.*

Table A8. Phosphate Nutrient Fertilizer Production, Imports, Exports and Use, Nigeria

Year	Production	Imports	Exports	Use
	----------(tonnes P_2O_5)----------			
1989-1990	52,000	46,000	0	197,400
1990-1991	56,000	81,000	0	209,960
1991-1992	58,000	52,000	0	212,000
1992-1993	84,000	68,000	0	220,000
1993-1994	63,000	98,000	0	220,000
1994-1995	6,300	88,000	0	186,000
1995-1996	900	13,700	0	100,000
1996-1997	9,500	23,000	0	105,000
1997-1998	5,000	16,400	0	77,300
1998-1999	10,500	24,800	0	143,400
1999-2000	5,000	24,900	0	117,200

*Source: FAO data from **IFDC [2000c]**. 1990 phosphate stocks were 16,622 nutrient tonnes **[APMEU, 1990]**.*

Table A9. Potash Nutrient Fertilizer Production, Imports, Exports and Use, Nigeria

Year	Production	Imports	Exports	Use
	----------(tonnes K_2O)----------			
1989-1990	0	90,000	90,000	90,000
1990-1991	0	111,800	111,800	94,240
1991-1992	0	106,600	120,800	106,600
1992-1993	0	116,000	130,200	105,000
1993-1994	0	104,000	129,200	110,000
1994-1995	0	88,300	107,500	60,000
1995-1996	0	10,000	57,500	33,000
1996-1997	0	36,000	60,500	36,000
1997-1998	0	39,000	63,500	39,000
1998-1999	0	54,800	79,300	24,800
1999-2000	0	56,000	110,500	26,600

*Source: FAO data from **IFDC [2000c]**. 1990 potash stocks were 14,200 nutrient tonnes **[APMEU, 1990]**.*

Table A10. Fertilizer Price, Nigeria

	Fertilizer Price			
	Price Paid By Farmers (Current ₦)	Price Paid By Farmers in 2001 Constant Naira	Price of Fertilizer if Not Subsidized[a] (Current ₦)	Price of Fertilizer if Not Subsidized (2001 Constant ₦)
	(1)	(2)	(3)	(4)
	---------- (₦/50 kg) ----------			
1990	20	262	111	1,455
1991	40	466	154	1,795
1992	40	318	286	2,275
1993	80	403	348	1,750
1994	150	515	429	1,470
1995	150	300	1,154	2,305
1996	350	536	1,346	2,063
1997	1,250	1,759	1,250	1,760
1998	1,500	1,986	1,500	1,986
1999	1,300	1,704	1,300	1,704
2000	1,300	1,664	1,300	1,665
2001	1,500	1,500	1,500	1,500

[a] *Fertilizer prices may have been lower under a full liberalized fertilizer sector.*

Source: Actual farm prices in Column 1 from FFD. Column 2 is Column 1 adjusted for inflation using the CPI, Column 3 is Column 1 adjusted by the FGN % fertilizer subsidy to arrive at a full-cost price (note, 1997 to 2001 prices are the same as Column 1 because there was either a zero or low subsidy, and most fertilizer was sold at the market price). Column 4 is Column 3 adjusted for inflation using the CPI.

Table A11. Potential Fertilizer Use Under Assumed Economic Optimum Application

Crop	Hectares	Economic Optimum Rates			Potential Use (nutrients)			
		N	P	K	N	P	K	NPK
	('000)	----------Kg nutrient/ha --------			----------('000 nutrient tonnes) ----------			
Maize	4,672	40	20	20	186.9	93.4	93.4	373.8
Millet	5,228	20	10	10	104.6	52.3	52.3	209.1
Sorghum	6,046	21	32	30	127.0	193.5	181.4	501.8
Rice	1,846	20	10	30	36.9	18.5	55.4	110.8
Cassava	2,809	10	5	25	28.1	14.0	70.2	112.4
Yam	2,174	17	10	17	36.9	21.7	36.9	95.7
Cotton	502	17	10	7	8.5	5.0	3.5	17.1
Groundnut	1,926	0	18	8	0	34.7	15.4	50.1
Total	25,203	-	-	-	528.9	433.1	508.5	1,470.6

Note: Totals may not add due to rounding.
Source: Hectares are the mean of the years 1990 to 2001 from Ministry of Agricultural Statistics. Economic optimum rates are assumed to be approximately 1/3 that of the recommended fertilizer rates as found in the leaflet produced by Golden Fertilizer Co., Ltd., in association with IITA.

Table A12. Nigerian National and Agriculture Budgets and Fertilizer Subsidy Cost, 1990-2001

Year	Nigerian National Budget	Nigerian Agriculture Budget	Fertilizer Subsidy Cost	Agriculture Budget As % of National Budget	Fertilizer Subsidy As % of National Budget	Fertilizer Subsidy as % of Agriculture Budget
	(1)	(2)	(3)	(4)	(5)	(6)
	----------(₦ Billion) ----------			%	%	%
1990	12.556	1.759	2.324	14.0	18.5	132
1991	13.085	0.551	2.202	4.2	16.8	399
1992	15.976	0.763	6.826	4.8	42.7	895
1993	18.600	1.820	7.220	9.8	38.8	397
1994	31.000	2.800	8.918	9.0	28.8	319
1995	44.559	4.692	14.505	10.5	32.6	309
1996	48.000	3.893	11.558	8.1	24.1	297
1997	115.690	6.248	0	5.4	-	-
1998	185.375	8.877	0	4.8	-	-
1999	136.984	6.913	0.738	5.0	0.5	10.7
2000	272.508	8.803	0	3.2	-	0.0
2001	496,659	10.595	0.890	2.1	0.2	8.4

Source: Budgets from Central Bank of Nigeria ***[CBN, various years]****. Subsidy costs from* ***Ogunfowora and Odubola [1994],*** *and FFD, Abuja.*