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ABSTRACT

As a result of population growth and increasing urbanization, many African countries are failing to match food production with national needs.

Nigeria, the most populous country of Africa, has a potential food deficit of between 10 and 20 million tons of cereal equivalent by 1985 if present trends continue.

Revitalization of the agriculture sector is a cornerstone of government development policy. The role of modern off-farm produced inputs in increasing crop production is fully appreciated. As Nigerian soils have a generally low level of soil fertility, the role of fertilizers is therefore receiving particular emphasis.

Major government policy decisions which impact on the fertilizer sector are now being made or being developed in Nigeria. It is essential that these decisions are based on a review of the known fertilizer-related facts. The implications of the various decisions on the development of fertilizer use also must be clearly defined.

This publication therefore reviews fully all of the information related to fertilizer use in Nigeria, identifies constraints to its increased use, and recommends actions which, if undertaken, would accelerate food production based on the rational use of fertilizer and its related inputs.

Keywords: fertilizer, Nigeria, food production.

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NIGERIA FERTILIZER SECTOR: Present Situation and Future Prospects

INTERNATIONAL FERTILIZER DEVELOPMENT CENTER

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ABBREVIATIONS USED IN THIS REPORT

ACRONYMS

ECOWAS . . . . . Economic Community of West African States
FAO . . . . . Food and Agriculture Organization of the United Nations
FDA . . . . . Federal Department of Agriculture
FMARD . . . . . Federal Ministry of Agriculture and Rural Development
FMAWR . . . . . Federal Ministry of Agriculture and Water Resources
FMC . . . . . Federal Ministry of Commerce
FME . . . . . Federal Ministry of Education
FMI . . . . . Federal Ministry of Industry
FMS&T . . . . . Federal Ministry of Science and Technology
FMT . . . . . Federal Ministry of Transportation
FMW . . . . . Federal Ministry of Works
FMWR . . . . . Federal Ministry of Water Resources
FOS . . . . . Federal Office of Statistics
FSFC . . . . . Federal Superphosphate Fertilizer Company
IBRD . . . . . International Bank for Reconstruction and Development
IFDC . . . . . International Fertilizer Development Center
IFPRI . . . . . International Food Policy Research Institute
IITA . . . . . International Institute of Tropical Agriculture
MANR . . . . . State Ministry of Agriculture and Natural Resources
NACB . . . . . Nigerian Agricultural and Cooperative Bank
NAFPP . . . . . National Accelerated Food Production Project
NEPC . . . . . National Economic Planning Commission
NFDC . . . . . National Fertilizer Development Center
NPA . . . . . Nigerian Port Authority
NRC . . . . . Nigerian Railway Corporation
NSC . . . . . Nigerian Sugar Company
NSTDA . . . . . National Science and Technology Development Agency
NTC . . . . . Nigerian Tobacco Company
NUC . . . . . National Universities Commission
OFN . . . . . Operation Feed the Nation
RBDA . . . . . River Basin Development Authorities
TVA . . . . . Tennessee Valley Authority
UNDP . . . . . United Nations Development Programme
WHO . . . . . World Health Organization of the United Nations

OTHER ABBREVIATIONS

ADP . . . . . agricultural development project
CEC . . . . . cation exchange capacity
GDP . . . . . gross domestic product
GNP . . . . . gross national product
HYV . . . . . high-yielding variety
LGA . . . . . local government area

MEASURES

c. & f.	cost and freight
c.i.f.	cost, insurance, and freight
f.o.b.	free on board
ft^3	cubic feet
g	gram
ha.	hectare
kcal	kilocalorie
kg.	kilogram
km	kilometer
km^2	square kilometer
m^3	cubic meter
meq	milliequivalent
mm.	millimeter
ppm	parts per million
tpd	tons per day
tpy	tons per year

CURRENCY EQUIVALENTS

Currency unit = Naira (₦)
₦1 = US $1.62
₦1 = Kobo 100

Note: All "tons" refer to metric tons.

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SUMMARY AND RECOMMENDATIONS

Summary of Findings

1. The population of Nigeria was estimated at 82.6 million in 1979, making it the ninth most populated country in the world. A 2.6% population growth rate for Nigeria will place the agricultural sector under increasing pressure to meet domestic food requirements.

2. Despite the rapid economic growth experienced by Nigeria in the 1970s, productivity in the agricultural sector continues to be at a low level. While the national economy grew at an average annual rate of 5.8%, the agricultural sector grew at a rate of only 1.5%.

3. The situation in the food subsector is even more precarious. The index of per capita food production has fallen by 12 points between 1970 and 1978. If present production trends continue, Nigeria's food deficit could be about 10.6-19.3 million tons cereal equivalent by 1985.

4. The inability of domestic food production to meet food demand has led to high-rising food prices, increasing dependence on food imports, and a growing deterioration in the nutritional status of the vast majority of the population.

5. Production increases in Nigerian agriculture have traditionally come about through lateral expansion rather than intensive cultivation. Severe shortages of land in certain parts of Nigeria, massive rural-urban drift, and an aging farm labor force have slowed down the lateral expansion of cultivated area.

6. Modern off-farm-produced inputs, such as fertilizers, improved seeds, and plant protection chemicals, are not used in any appreciable quantity in Nigerian agriculture. In 1977 per-hectare fertilizer nutrient consumption was 3.1 kg/ha, which was below Africa's average of 12.4 kg/ha, and about 5% of the world's average of 68 kg/ha.

7. The low nutrient status of Nigerian soils and the need to raise agricultural (particularly food) production afford great opportunities for wider use of fertilizers.

8. Major government policies currently used to encourage adoption and increased use of fertilizers include:

   a. Fertilizer price subsidy,

   b. Crop support price (guaranteed minimum crop price),

   c. Fertilizer and crop marketing improvements,

d. Fertilizer production capacity creation,

e. Public agricultural credit schemes,

f. Expansion of land under irrigation,

g. Reinvigoration of agricultural research and extension,

h. The National Accelerated Food Production Project (NAFPP) and the Operation Feed the Nation (OFN) campaign, and

i. The World Bank agricultural development projects.

9. Many government ministries are responsible for fertilizer sector planning and/or program development. The key ministries at the Federal level are:

a. Ministry of Finance

b. Ministry of Agriculture and Rural Development

c. Ministry of Industry

d. Ministry of National Planning

At the state level, the Ministry of Agriculture has the overall responsibility for developing programs to promote fertilizer use. Little coordination exists among the ministries in the execution of their fertilizer-related programs.

International agencies such as the Food and Agriculture Organization of the United Nations (FAO), the International Bank for Reconstruction and Development (IBRD), the International Institute of Tropical Agriculture (IITA), the Tennessee Valley Authority (TVA), and the International Fertilizer Development Center (IFDC) are or have been involved in fertilizer use development programs in Nigeria.

10. Fertilizer consumption increased from 7,000 tons of fertilizer nutrient in 1970 to 85,000 tons in 1979. Recent estimates of future fertilizer consumption indicate that about 270,000 tons of nutrients will be consumed by 1985.

11. The food crops (particularly the grains--millet, sorghum, rice, and maize) and groundnuts are now the major users of fertilizer in Nigeria. This is the inverse of the situation in the 1960s, when the bulk of fertilizer use in Nigeria was on nonfood commercial and tree crops such as cocoa, rubber, oil palm, cotton, sugarcane, tobacco, and groundnuts.

12. The six northernmost states (Sokoto, Kaduna, Kano, Bauchi, Gongola, and Borno) consumed about 60% of the fertilizer used in Nigeria in 1979.

13. Thirty-five percent of the fertilizer used in Nigeria in 1979 was by farmers in The World Bank-sponsored agricultural development project areas in Gombe (Bauchi State), Gusau (Sokoto State), and Funtua (Kaduna State).

14. Nigeria still lacks a virile fertilizer industry. The only domestic production facility is a 100,000-tpy single superphosphate (SSP) factory in Kaduna which depends on imported raw materials. Technical as well as infrastructural problems have limited production to less than 30% of designed capacity. Nigeria's vast natural gas reserve should be used for nitrogen fertilizer production to supply total domestic demand.

15. More than 95% of Nigeria's fertilizer supply is met through imports. Nigeria has traditionally relied on fertilizer imports mainly from Western Europe--Italy, United Kingdom, West Germany, and Belgium-Luxembourg.

16. Fertilizer import orders have been centralized, and a Fertilizer Procurement Unit has been created in the Federal Ministry of Agriculture and Rural Development (FMARD). Significant improvements have taken place in import procurement and port logistics in recent years. There has also been a significant shift to higher analysis fertilizer nutrients such as urea, 20-20-0, and 25-10-0 compared to the low-analysis single-nutrient types such as ammonium sulfate (AS) and SSP that predominated in the 1960s.

17. Fertilizer distribution in Nigeria is characterized by its high public-sector control and the limited private-sector participation. The present system has not provided sufficient incentives to encourage private-sector participation and has not provided for sufficient retail outlets. In addition, costs have been high as a result of inefficiencies in transportation and storage.

18. Fertilizer prices are very heavily subsidized and represent a heavy financial burden on the Government of Nigeria. The retail-level price of fertilizer is officially fixed by the Government and is about 10% of the cost. The cost of the subsidy scheme based on 1979 import figures would be ₦56.62 million if all the fertilizer products were sold. As a result of the very low fertilizer prices, a favorable economic environment at the farm level exists for increased use of fertilizers on all the major food and nonfood crops in Nigeria. Based on 1979 fertilizer and crop prices, it requires less than 1 kg of rice (paddy) and less than 2 kg of maize and sorghum to pay for 1 kg of plant nutrients.

Recommendations

1. Improve Coordination of Nigerian Fertilizer Programs by the Establishment of a National Committee on Fertilizer Development

   In order to ensure close coordination between the different interests in the fertilizer sector and to help formulate and implement effective fertilizer policies and measures, it is recommended that a National Committee on Fertilizer Industry Development (NCFID) be formed. It would have the responsibility of initiation, coordination, and review of fertilizer policies, measures, and programs. The committee should consist of top-level officials both from the public and private sector concerned with the fertilizer sector. It is also recommended that the Fertilizer Procurement and Distribution Unit of the FMARD be reorganized to serve as the secretariat to the committee.

2. Improve Fertilizer Efficiency Through the Establishment of a National Soil Fertility Group

   The group should be multidisciplinary and would develop fertilizer recommendations based on the farm-level situation, taking into account soil fertility, fertilizer needs for specific crops and cropping systems, and the risk and socioeconomic constraints faced by the farmer. The group would also take into account the role of symbiotic nitrogen and organic matter recycling in maintaining and improving soil fertility.

3. Improve Economics of Fertilizer Use by Increasing the Number and Scope of Farm Management Studies

   Detailed farm management investigations should be carried out to determine the cost and returns for major crop enterprises in the different ecological zones of the country. The results of such investigations will prove very useful in deciding, on a rational basis, the level of price support as well as the level of input price subsidy that will encourage increased food production among other things.

4. Improve Fertilizer Statistics Through More Timely and Detailed Reporting

   Timely and accurate information on fertilizer imports, production, sales, and consumption is vitally needed by the government and private industry to plan intelligently the development and operation of the fertilizer sector. Data currently available from several public agencies are fragmented and inadequate and often inaccurate. It is recommended that the NCFID be assigned the responsibility and given the necessary authority for determining data needs and procedures for collecting, assembling primary source data,

compiling it in a standardized form, and publishing it on a regular basis. The following information should be published in an annual "Fertilizer Situation in Nigeria" report which would be presented to the Government and made available to all interested parties:

a. Imports by product and nutrient content;

b. Domestic production by product and nutrient content;

c. Deliveries by product and by region;

d. Year-end stocks held by importers, producers, and government agencies;

e. Apparent consumption by product and nutrient content, by crop, by states, by farm types;

f. Wholesale and retail prices of fertilizer by grade;

g. Prices received by farmers for principal crops;

h. Factors affecting fertilizer production and consumption during the past year;

i. Short- and long-term fertilizer supply/demand outlook; and

j. Recommendations for avoiding or alleviating supply/demand problems.

5. Identify and Use Better Methods of Forecasting Fertilizer Demand

NCFID should provide the leadership in ensuring a scientific basis for demand estimation. Estimation of fertilizer demand should be done with reference to three time frames:

a. Long-term (5-10 years) estimation of demand,

b. Medium-term (3-5 years) demand forecasting, and

c. Estimation of the next year's (next season's) demand.

6. Identify Factors Influencing Fertilizer Demand

NCFID should initiate fertilizer demand studies to:

a. Identify the factors influencing the adoption and continued use of fertilizers among small farmers;

b. Estimate fertilizer-demand functions at national, state, and district levels and the most relevant demand elasticities for fertilizers; and

c. Generate basic information needed for evaluation and formulation of a national fertilizer policy.

7. Improve the Fertilizer Supply System

a. A plan for improving production and efficiency in the SSP plant should be developed and closely monitored.

A capacity utilization of 70%-80% could be reasonably expected. This would significantly reduce the cost of production.

b. The Nigerian Government should place a high priority on the completion of the planned Port Harcourt ammonia/urea complex and on achieving an efficient operation after construction is completed. Likewise, similar emphasis should be placed on the associated NPK plant to permit maximum utilization of the ammonia/urea product as the source of nitrogen for the domestically produced NPK products. Alternative sources of phosphatic fertilizers for the NPK plant should be adequately explored to ensure the most economic source. Nigeria should consider building several ammonia/nitrogen fertilizer plants to use its vast natural gas reserves.

c. Studies should be initiated by NCFID to evaluate means of minimizing the cost of imported fertilizer raw materials, intermediate products, and finished products.

d. The Nigerian Government, working within the framework of the Economic Community of West African States (ECOWAS), should initiate studies on the potential for regional cooperation in fertilizer production. For example, it might be possible for Nigeria to exchange ammonia and/or urea for phosphate materials at a basic cost.

8. Develop Policies to Create a Favorable Economic Environment for Private-Sector Participation in Fertilizer Marketing

Commercialization of fertilizer procurement and distribution could improve performance and allow better allocation of human resources within the Ministries of Agriculture. Policies should therefore be geared toward encouraging increased private-sector participation. The Government of Nigeria should take steps to implement an effective fertilizer marketing system.

9. Evaluate Effectiveness of Fertilizer Subsidies

A revision of the fertilizer subsidy scheme is urgently needed:

a. To better reflect the economic value of fertilizer,

b. To encourage an economic pattern of production,

c. To increase the availability of fertilizers, and

d. To ensure the growth of an economically viable commercial marketing system.

CHAPTER 1
INTRODUCTION

As a result of the slow growth in agricultural output, Nigeria moved from a food self-sufficient status to a food-deficit position in the past decade (1). Growth in domestic food production has been estimated at about 1.0%/year, compared to an estimated annual population growth rate of 2.6%. The index of per capita food production fell by 12 points between 1970 and 1978 (2).

Soaring food prices, increasing dependence on food imports, and a growing deterioration in the nutritional status of a vast majority of the population have become prominent features of the Nigerian food scene (3).

With a population in 1979 estimated at about 82.6 million and growing at an estimated rate of 2.6%/year, increasing pressure will be placed on the agricultural sector to meet Nigeria's rapidly expanding food requirements.

Historically, production increases have come about by extending the cultivated area. Though large areas exist which can be cultivated, natural soil replenishment under bush fallow cultivation requires an extensive period for regeneration. In many areas, particularly in the eastern states, increasing population pressure has led to a severe land constraint. In addition, rural-urban drift and an aging farm-labor force have slowed down the lateral expansion of cultivated area (3).

A viable method of relaxing the food supply constraints is to increase crop yields by extending the land under cultivation and expanding the adaptation of new technology.

Experiences all over the world have shown that substantial increases in production do occur when chemical fertilizers are used together with complementary inputs such as improved seeds, plant protection chemicals, adequate water control, and improved management practices. The seed-fertilizer revolution that has spread across Southeast Asia and parts of South America is testimony to the important role that fertilizers play in the agricultural development of nations.

The Nigerian Government has clearly recognized the importance of fertilizers as a means of increasing agricultural productivity. The Third National Development Plan document contains a number of policy measures that the Government intends to use to stimulate increased use of chemical fertilizers. These include input price subsidy, crop support prices, fertilizer and

crop marketing improvements, the building of fertilizer production units, agricultural credit schemes, irrigation development, reinvigorated agricultural research and extension, and integrated agricultural development projects, etc. The goal of these fertilizer-related policies is to enhance the potential contribution of fertilizer to agricultural (particularly food) production.

Despite this wide range of policy measures, fertilizers have not made any meaningful impact on agricultural production in Nigeria. Though a number of reasons could be cited, the lack of an integrated approach to fertilizer-sector development and the complicated interactions of fertilizer policies with agricultural and economic development policies are important reasons.

The purpose of this report is threefold: first, to highlight the salient features of the Nigerian fertilizer sector; second, to identify major constraints; and third, to suggest policies, programs, and projects that will enhance the contribution of fertilizer to agricultural and, particularly, food production in Nigeria.

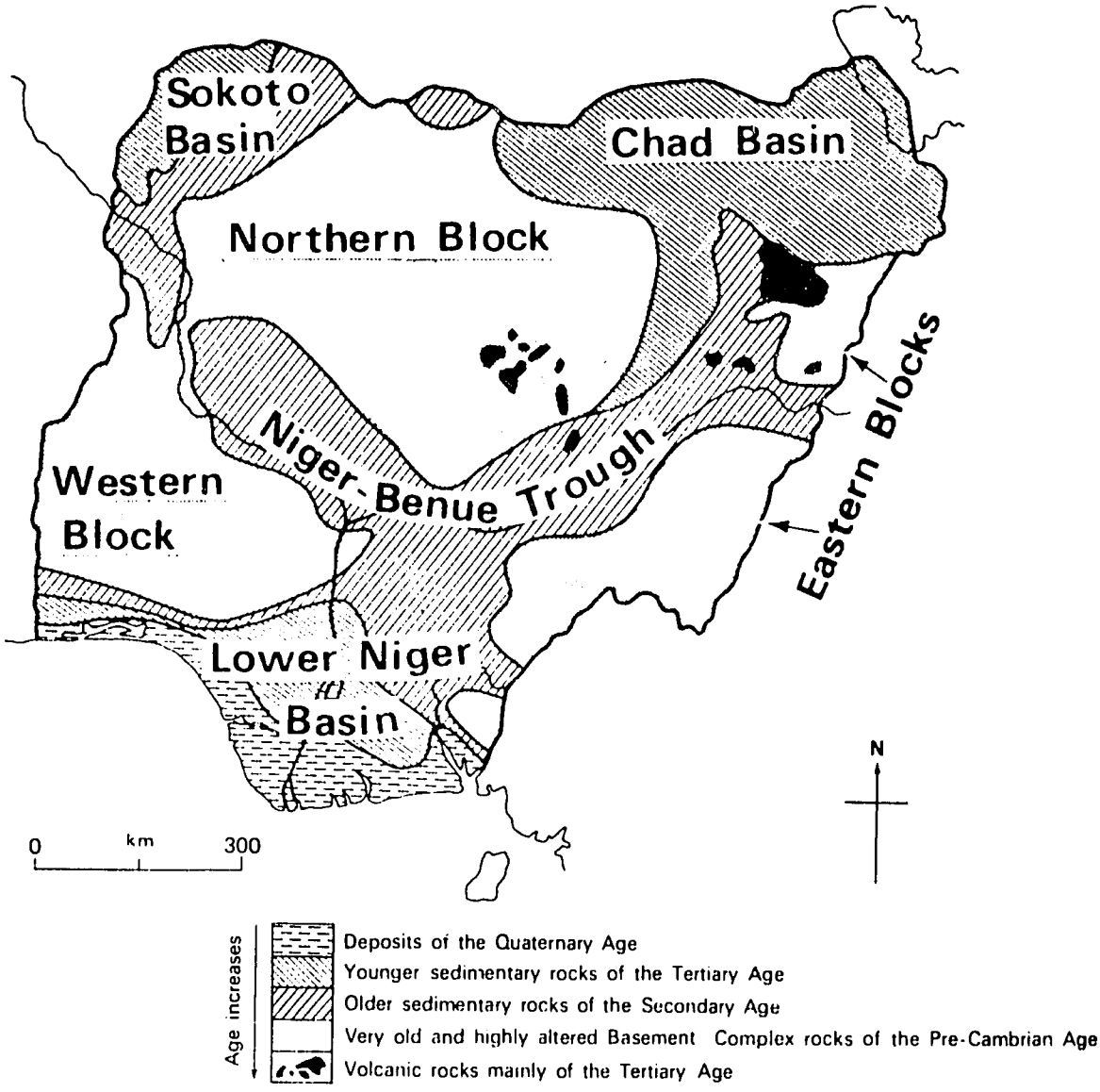
Geography

Nigeria is located on the west coast of Africa between 3° and 15° east longitude and 4° and 14° north latitude. It is bordered on the north by the Niger Republic, on the east by the Republic of Cameroon, on the west by the Republic of Benin, and on the south by the Atlantic Ocean. Nigeria is the most populous country in Africa containing about 20% of the continent's population and about 60% of west Africa's population. Total land area is 923,800 km^2. The distance from north to south is about 1,120 km and from east to west is 1,200 km. It has a coastline of about 800 km.

The topography of Nigeria is characterized by the Niger River Delta; coastal plains; the basins of the Niger, Benue, and Cross Rivers and Lake Chad; the plains of Oyo and the northern plains; Jos plateau and the eastern mountains (4) (see Figure 1).

Most of the country is drained by the Niger and Benue and their tributaries, but there are other smaller rivers like Ogun, Sapele, Imo, and Cross which drain into the Atlantic, while the Hadeija, Yobe, and others flow into Lake Chad.

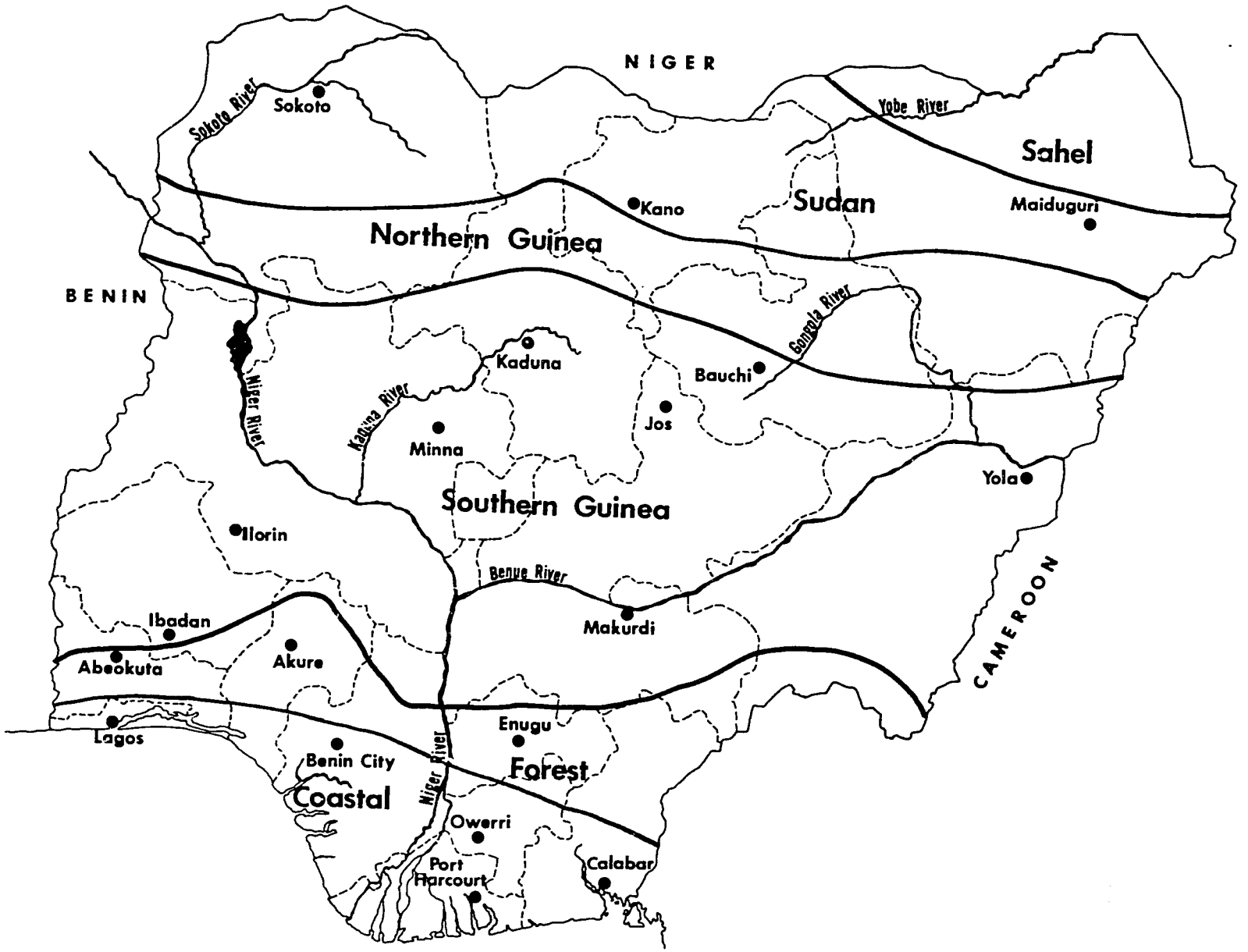
The vegetative zones of Nigeria include: coastal swamp, forest, southern guinea, northern guinea, sudan, and sahel (Figure 2).



Source: Iloeje, N. P. 1978. A New Geography of Nigeria, Spottiswoode Ballantyne, Ltd., Colchester and London.

Figure 1. Simplified Structure of Nigeria.

The forest zone generally receives more than 1,800 mm of rainfall per year which occurs in 10 or more months. The guinea zones receive 1,000-1,800 mm of rainfall per year during 5-10 months. Vegetation ranges from closed forest in the southern guinea to scattered trees and grassland savanna in the northern guinea. Rainfall in the sudan zone ranges from 700 to



Source: Iloeje, N. P. 1978. A New Geography of Nigeria, Spottiswoode Ballantyne, Ltd., Colchester and London.

Figure 2. Vegetation Zones of Nigeria.

1,000 mm/year during 3-5 months. Vegetation is primarily grass and shrubs. In the sahel zone of Nigeria 500-700 mm of rainfall occurs in 2-3 months (Figure 3). Vegetation is scattered shrubs, short grass, and wooded steppes. The vegetation in the zones reflects the decreasing water supply from south to north.

Political Characteristics

Nigeria is a republic and has recently returned to a democratically elected civilian government after 13 years of military rule. Nigeria is a federation made up of 19 states (Figure 4). The Federal Government is headed by a chief executive--the President. The President has the power to define national policy and control foreign affairs and national defense. The cabinet and a set of special advisers implement government decisions for and on behalf of the President.

A bicameral national legislature (made up of the Senate and the Federal House of Representatives) has the responsibility for making laws for the peace, order, and good government of the federation, as well as passing the national budget. Both the President and the members of the legislature are elected to 4-year terms.

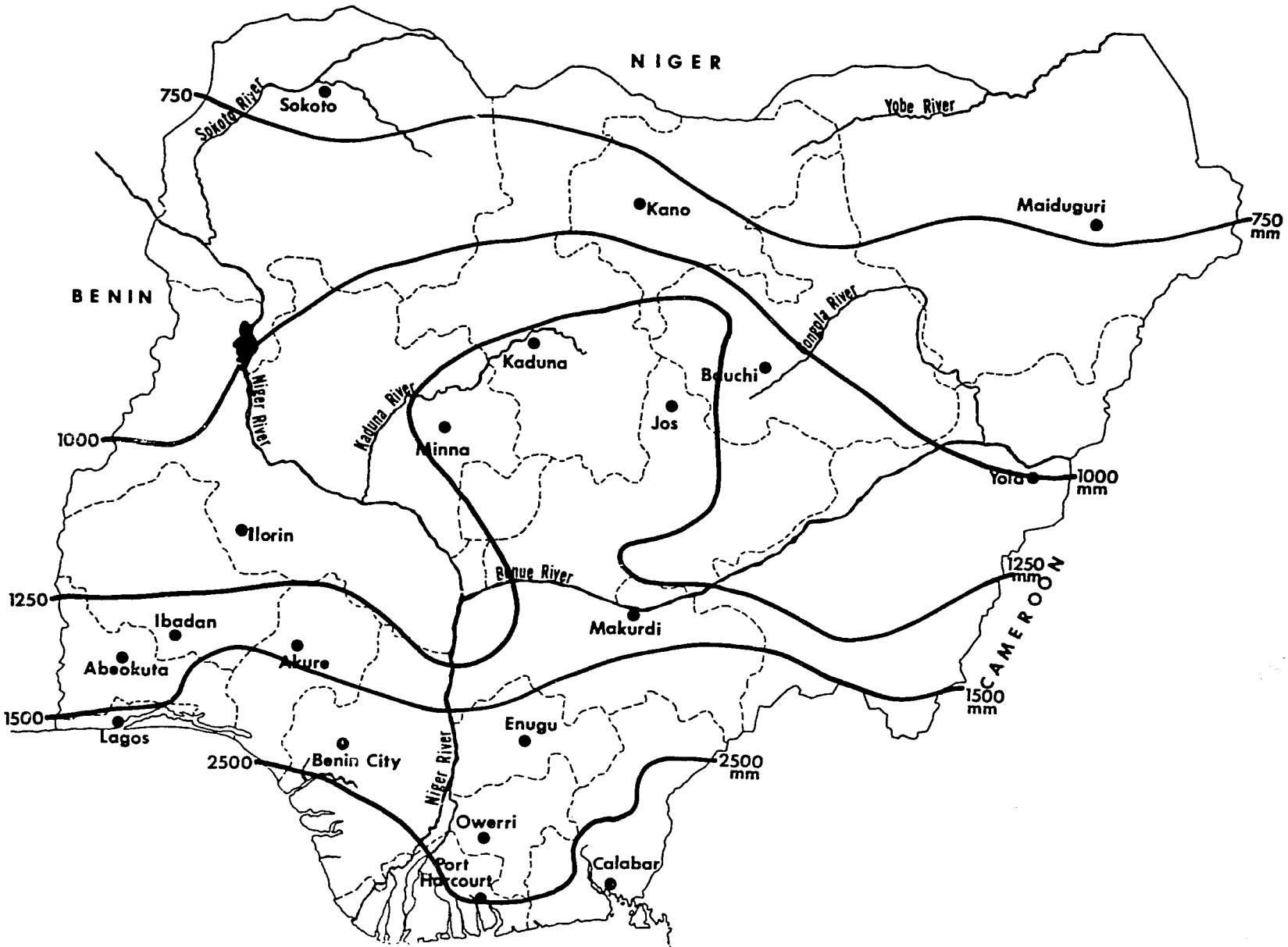
Similar arrangements exist in the 19 states where the Governor as the chief executive has a cabinet to advise him and implement government decisions and a state assembly has the responsiblity for passing the state budget among other things. Each of the states is divided into a number of local government areas (LGAs). The LGA is a unit of administration.

Cultural Characteristics

The more than 80 million people of Nigeria belong to many ethnic groups, each of which has its own customs, traditions, costumes, and language. The larger groups are the Hausas, Fulanis, and Kanuris in the north; the Tivs and Nupes in the middle belt; and the Yorubas, Ibos, Ibibios, and Edos in the south. The greatest concentration of the small ethnic groups is in the middle belt.

The extended family system is a common aspect of the traditional society of all ethnic groups.

Less than 20% of the population lives in towns which have more than 50,000 inhabitants. The majority of Nigerians, therefore, live in rural villages in which the compound, an enclosure containing the houses of a man, his immediate family, and in some cases, the houses of his brothers, is the unit of settlement.



Source: International Fertilizer Development Center. 1980. Nigeria Fertilizer Marketing Study, Muscle Shoals, Alabama.

Figure 3. Rainfall of Nigeria.

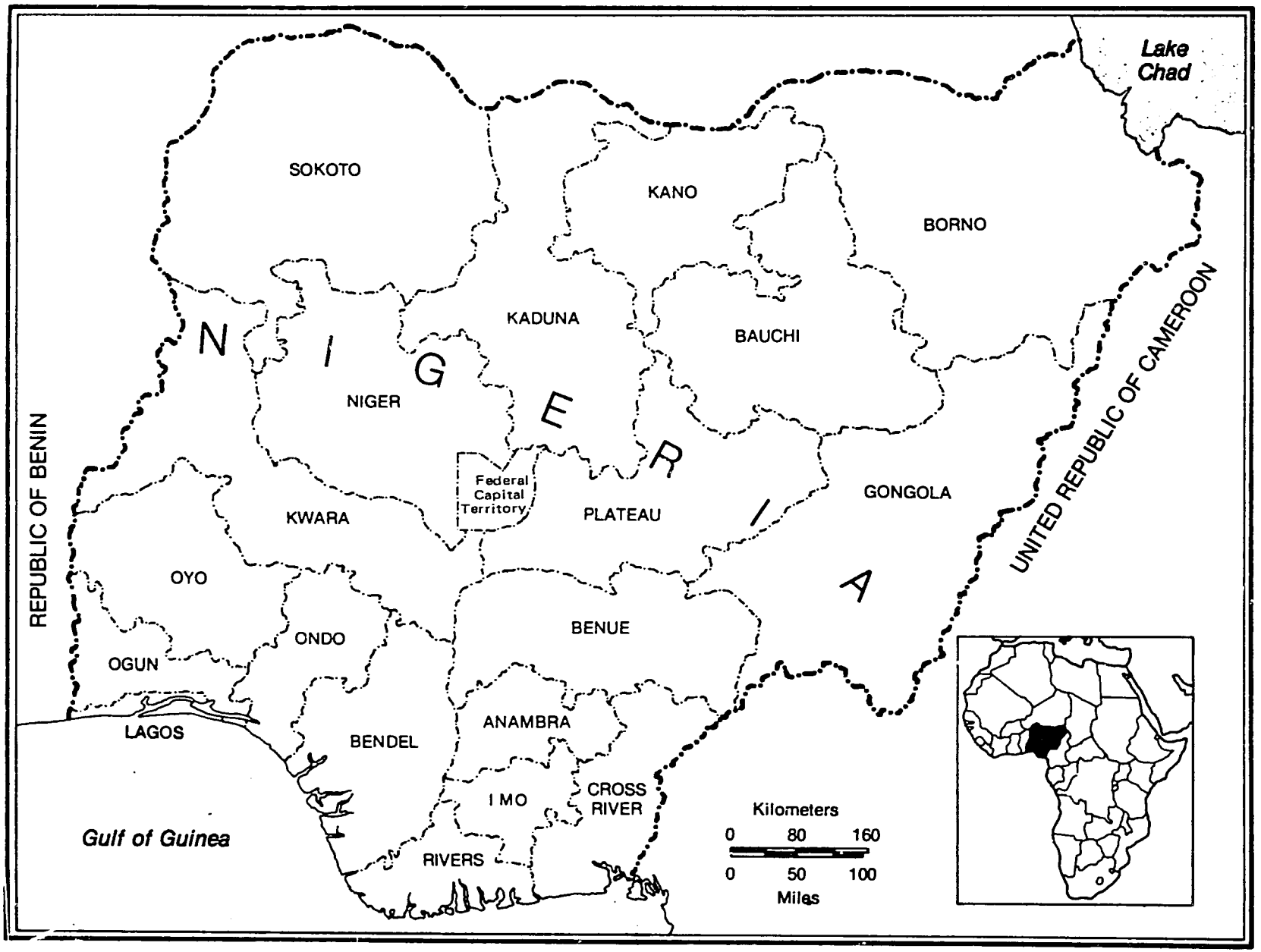


Figure 4. Country and State Political Boundaries.

About 55% of the total population is Moslem; the remainder is Christian or Animist (4).

Economic Characteristics

During the past decade, the Nigerian economy experienced extremely rapid economic growth. Between 1970 and 1977, the gross national product (GNP) is estimated to have increased at a real annual rate of 6.2% and GNP per capita at an annual rate of 3.6% (to an average of $420 in 1977) (5).

Table 1 shows the gross domestic product (GDP) between 1974/75 and 1978/79 (at 1973/74 constant factor cost). GDP increased from ₦12.800 billion in 1974/75 to ₦17.182 billion in 1978/79. This represents an annual growth rate of 7.5%. Table 2 shows that the four subsectors of agriculture together constitute the most important component of the economy. Their combined share, however, declined from 27.8% to 23.0% of the GDP. On the other hand, the share of petroleum which was at its peak in 1974/75 (21.9%) declined to 14.4% in 1978/79. The other important sectors, from the point of view of their share in the GDP, are the wholesale and retail trade, construction, and government services.

Table 1. Gross Domestic Product at 1973/74 Factor Cost (₦ million) (6)

Activity Sectors	1974/75	1975/76	1976/77	1977/78	1978/79
Agriculture	2,203.8	2,143.1	2,251.9	2,326.6	2,406.7
Livestock	491.2	393.9	399.6	408.9	422.2
Forestry	302.7	328.8	355.1	383.5	412.2
Fishing	567.2	573.8	607.1	658.7	698.2
Crude petroleum	2,797.6	2,345.2	2,676.8	2,715.7	2,480.6
Other mining and quarrying	247.8	310.5	372.6	436.0	492.7
Manufacturing	601.4	729.7	854.4	943.0	1,040.6
Utilities	51.8	59.7	74.4	95.2	117.3
Construction	1,108.4	1,411.4	1,693.6	1,981.8	2,239.7
Transport	403.1	468.2	636.8	764.1	878.7
Communication	38.9	47.7	54.9	60.3	65.2
Wholesale and retail trade	2,295.1	2,491.5	2,788.5	3,043.9	3,245.2
Hotel and restaurant	35.6	39.1	43.0	47.5	52.0
Finance and insurance	155.0	170.4	187.6	206.4	226.7
Real estate and business services	67.3	74.0	81.4	89.5	98.5
Housing	688.2	756.6	832.4	915.6	1,006.4
Producer of government services	743.4	1,049.1	1,082.4	1,208.5	1,299.2
TOTAL	12,798.9	13,392.8	14,992.5	16,285.2	17,182.2

Table 2. Gross Domestic Product at 1973/74 Factor Cost (percent) (6)

Activity Sectors	1974/75	1975/76	1976/77	1977/78	1978/79
Agriculture	17.2	16.0	15.0	14.3	14.0
Livestock	3.8	2.9	2.7	2.5	2.5
Forestry	2.4	2.5	2.4	2.3	2.4
Fishing	4.4	4.3	4.1	4.0	4.1
Crude petroleum	21.9	17.5	17.8	16.7	14.4
Other mining and quarrying	1.9	2.3	2.5	2.7	2.9
Manufacturing	4.7	5.5	5.7	5.8	6.1
Utilities	0.5	0.4	0.5	0.6	0.6
Construction	8.7	10.5	11.3	12.2	13.0
Transport	3.1	3.5	4.2	4.7	5.1
Communication	0.3	0.4	0.4	0.4	0.4
Wholesale and retail trade	17.9	18.6	18.6	18.7	18.9
Hotel restaurant	0.3	0.3	0.3	0.3	0.3
Finance and insurance	1.2	1.3	1.3	1.3	1.3
Real estate and business services	0.5	0.6	0.5	0.5	0.5
Housing	5.4	5.6	5.5	5.6	5.9
Producer of government services	5.8	7.8	7.2	7.4	7.6
TOTAL	100.0	100.0	100.0	100.0	100.0

Nigeria is moving toward increased industrialization. Industry's share in the GDP is about 50%, even though a large portion of this is accounted for by the mining sector. The manufacturing sector still accounts for less than 7% of the GDP. It is heavily dominated by light industry, low technology, and consumer goods production with an almost nonexistent engineering industry.

The service sector accounts for about 30% of the GDP. Rapid growth rates have been experienced in transport infrastructure, communication, distribution, and general government.

Nigeria's balance of payments fluctuated considerably in the 1970s. Developments in the oil sector and changes in government policies were the determinants of the fluctuations.

Apart from the deficit of ₦40.8 million recorded in 1972, the balance of payments recorded persistent surpluses from ₦8.6 million in 1970 to ₦165.6 million in 1973, reaching a record height of ₦3,102.2 million in 1974. Thereafter, the balance of payments position deteriorated dramatically to a meager surplus of ₦157.5 million in 1975. Deficits were recorded in 1976, 1977, and 1978. As shown in Table 3, the balance of payments deficit reached an all-time high of ₦1,295.5 million in 1978.

Table 3. Nigeria: Balance of Payments, 1970-78 (₦ million) (7)

Category	1970	1971	1972	1973	1974	1975	1976	1977	1978
Merchandise trade									
Oil	+464.8	+929.8	+1,141.2	+1,797.3	+5,618.3	+4,648.3	+5,826.9	+6,958.1	+5,801.4
Nonoil	-291.8	-644.8	-663.7	-773.2	-1,179.0	-3,161.2	-4,533.4	-6,330.1	-6,974.2
Total	+173.0	+285.0	+477.5	+1,024.1	+4,439.3	+1,487.1	+1,293.5	628.0	-1,172.8
Nonmerchandise trade									
Oil	-81.2	-329.2	-527.3	-624.6	-561.2	-579.3	-547.4	-613.7	-510.6
Nonoil	-186.8	-187.0	-245.4	-262.7	-753.5	-788.4	-907.6	-552.1	-526.4
Total	-268.0	-516.2	-772.7	-887.3	-1,314.7	-1,367.7	-1,455.0	-1,165.8	-1,037.0
Balance of goods and services	-95.0	-231.2	-295.2	-136.8	+3,124.6	+119.4	-161.5	-537.8	-2,209.8
Unrequited transfer	+45.0	+1.8	-14.3	-29.1	-62.1	-76.8	-97.8	-118.7	-170.6
Balance on current account	-50.0	-229.4	-309.5	+107.7	+3,062.5	+42.6	-259.3	-656.5	-2,380.1
Balance on capital account	+49.2	+293.4	+259.2	-59.2	-5.9	+141.1	-50.6	+234.4	+1,069.3
Allocation on SDR	+12.0	+10.4	+10.2	-	-	-	-	-	-
Change in reserves (- = increase) (+ = decrease)	-58.6	-127.8	+40.8	-165.5	-3,102.2	-157.5	+339.9	+447.0	-1,295.5
Errors and omissions	+47.4	+53.4	-0.7	1.4	+45.6	-26.2	-30.0	-24.9	+15.3

In a review of the state of the Nigerian economy, the Central Bank (7) has attributed the balance of payments fluctuations to several factors. These factors follow.

The Dominance of the Oil Sector in Export Trade--The share of the oil sector in export trade increased from 58% in 1970 to a high of 93% in 1974. It accounted for 89% of the export trade in 1978. The drop in oil exports in 1975 and 1978 affected aggregate export earnings accordingly.

The Declining Contribution of Nonoil Exports in Aggregate Export Trade--The volume of agricultural export crops such as cocoa, oil palm, rubber, cotton, and groundnuts has greatly diminished because the rapidly expanding population has consumed the surplus exportable edible crops, and little investment has been made to replace aged and low-yielding tree crops.

High Import Tolerance--Imports have played a crucial role in supplying technical know-how, machinery, and equipment for industrial development. Petroleum products, chemical fertilizers, and food items are other important import items. Import of capital goods and raw materials increased from ₦519.6 million in 1970 to ₦5,912.4 million in 1978. Other factors that caused increases in imports were those budgetary measures taken to considerably liberalize trade and exchange restrictions in order to counter inflationary pressures.

Persistent Deficit in the Invisible Trade Account--This was due to large payments made to the rest of the world because of shipment, management, and consultancy fees; overseas contract charges and travel; overseas training; remittances by foreigners living in Nigeria; profits and dividends; and government transactions.

Low Rates of Interest--Low rates of interest in Nigeria have tended to encourage dependence on loans in preference to equity capital, discourage capital inflow, and encourage capital outflow. With the relatively high rates of inflation over the years, real rates of interest have tended to be negative in a number of cases, thus tending to discourage investment in financial assets.

Future economic development in Nigeria will be aided when some of the projects in the ₦42 billion 1975-80 Third National Development Plan come to fruition (8).

CHAPTER 2
NIGERIAN AGRICULTURE

Agriculture is an important sector of the Nigerian economy. It provides not only food and raw materials but also employment and income to a very large proportion of the population. In 1978, 56% of the labor force was engaged in agriculture (9). Fluctuations in agricultural output are generally reflected in aggregate national income as well as in the industrial sector.

The contribution of the agricultural sector to Nigeria's export position has been equally significant. Exports of raw and processed agricultural commodities accounted for over 80% of all exports in the 1950s and 1960s. In the past decade, however, agricultural exports accounted for less than 10% of total exports (7). Despite the rapid strides that have been made in the industrial sector in recent years, Nigeria's dependence on the agricultural sector is still quite significant. An analysis of the intersectoral flows for 1973-75 by the Federal Office of Statistics (FOS) revealed that agricultural inputs accounted for about 20% of the value of industrial output. In some industries, such as the textiles; wearing apparel; leather products; food, beverage, and tobacco; wood products; and paper products, the share of agricultural inputs to the value of industrial output could be as high as 60% (9). In 1975 agricultural and allied activities contributed 91% of the gross value added in manufacturing (5).

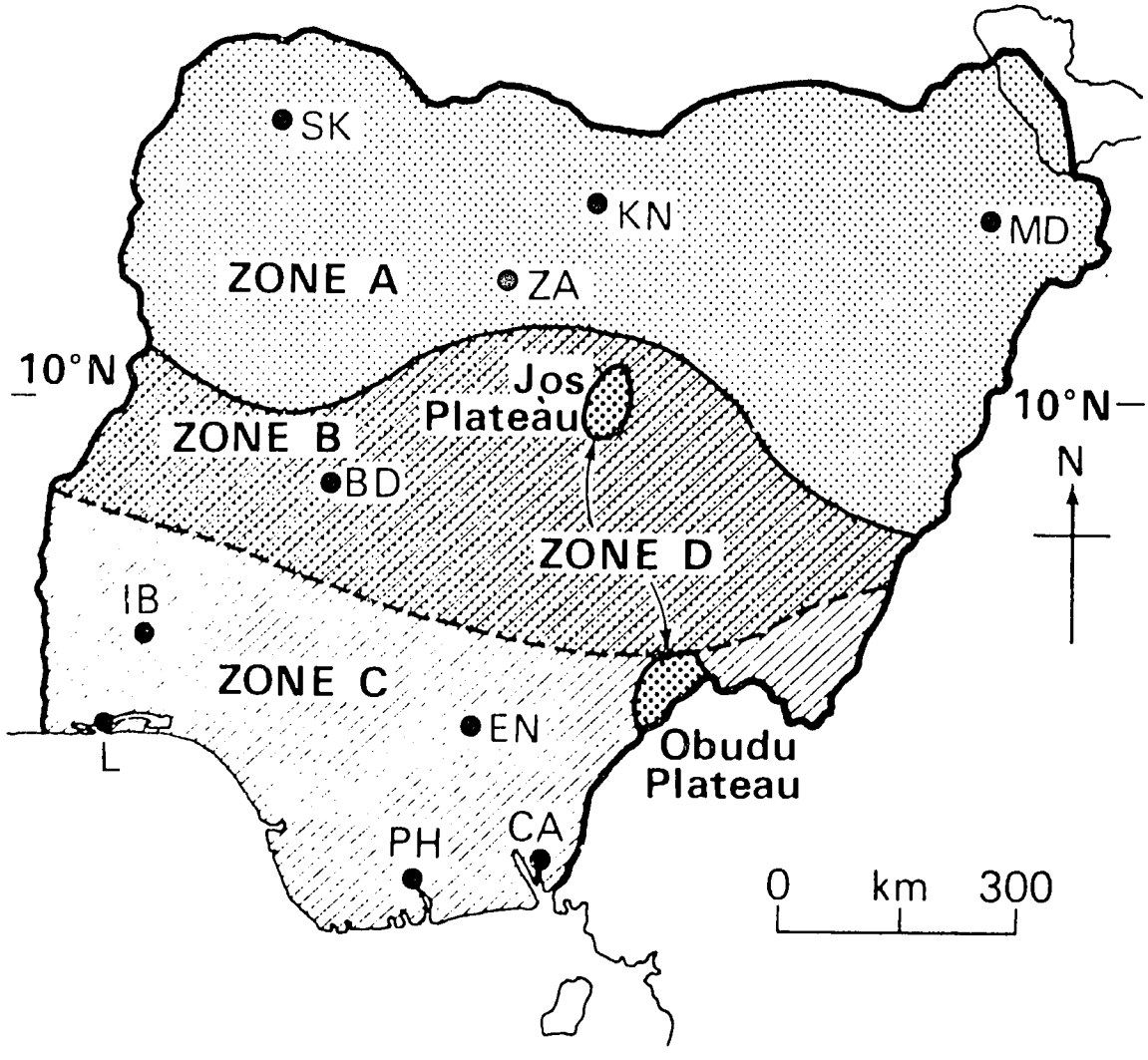
Structural Characteristics

Ecological Zones of Production

Ecologically, Nigeria consists of several agricultural zones ranging from the largely cereal and livestock zones of the north and the cereal and tuber zones of the middle belt to the largely tree and root-crops economy of the south (Figure 5). The percent of total crop area for the basic foods grown in Nigeria during 1970-79 is shown in Figure 6. Rice and sorghum are the only crops in which the area planted in 1979 exceeds that planted in 1975. Table 4 shows the crop production in the different ecological regions.

The Pattern of Land Use

The pattern of land use is shown in Table 5. As shown in the table, only about 16 million ha or 17% of total available land is



Source: Iloeje, N. P. 1978. A New Geography of Nigeria, Spottiswoode Ballantyne, Ltd., Colchester and London.

Figure 5. Food Crop Zones of Nigeria.

Table 4. Nigeria: Crop and Livestock Possibilities in Ecological Zones (1)

Ecological Region	Ecological Crop Specialization
Dry savannah	Cereals, grain legumes, livestock, vegetable seeds and nuts.
Intermediate savannah	Cereals, grain legumes, root crops and tubers, seed and nuts, livestock.
Forest	Tree crops, root crops, cereals, vegetables, fruits, seeds and nuts, legumes, pisciculture, poultry, piggery.
Mangrove swamp	Tree crops, fruits, vegetables, swamp rice, fisheries, poultry.

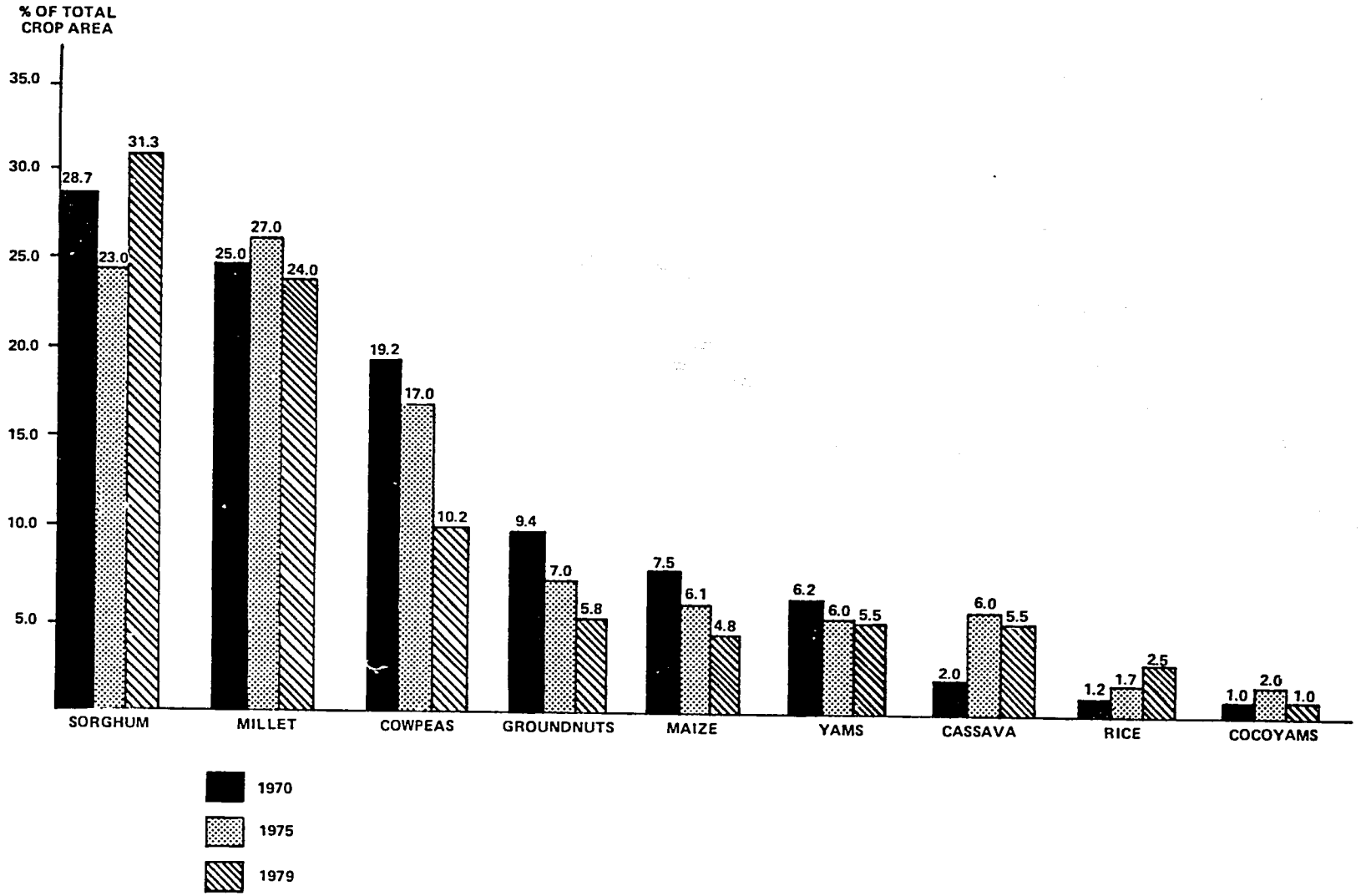


Figure 6. Area Planted to Major Food Crops in Nigeria by Percentages.

under arable crops. Even though the table suggests that over 60% of the total area of the country remains unused for agricultural purposes, in reality a large portion of cultivable land is in temporary fallows. This is because fallows are essential to the traditional cycle of cultivation.

Table 5. Pattern of Land Use--Nigeria, 1978 (2)

	Million Hectares	Percent
Total area	92.0	100.0
Area not used for agriculture	15.0	16.3
Area available for agriculture	77.0	83.7
Forest and woodland	28.0	30.4
Permanent pastures	21.0	22.8
Area under tree crops	2.0	2.2
Arable land	26.0	28.3
Area farmed	16.0	17.4

Any disturbance of the delicate balance between the extent of cultivated land and fallows can undermine the traditional farming system through deteriorating soil fertility levels and increasing soil erosion (10).

Size of Holding

The most important agricultural production unit, both numerically and in terms of output, is the small family farm. According to the 1974/75 National Agricultural Census Survey, more than 75% of the farming households cultivated less than 2 ha of farmland.

The aggregate figures hide wide disparities among the states and the various ecological zones. The modal farm size varies from less than one-half of a hectare in Imo State to about 4 ha in Kaduna and Bauchi States, as indicated in Table 6. While these differences reflect variations in population density to some degree, vegetation probably has a more significant effect.

Crop Production Technology

The traditional rainfed farming systems predominate. Area under ensured irrigation is less than 1% of total cropped area (2).

Table 6. Modal Farm Sizes in Various States of Nigeria (13)

State	Farm Size (ha)
Imo	0.25 - 0.5
Anambra, Rivers, Cross Rivers, Lagos, Ogun	0.5 - 1.0
Oyo, Ondo, Bendel	1.0 - 1.5
Kwara, Kano	1.5 - 2.0
Benue, Plateau	2.0 - 2.5
Niger, Sokoto	2.0 - 3.0
Gongola, Borno	3.0 - 3.5
Kaduna, Bauchi	3.5 - 4.0

As Okigbo (11) has pointed out, mixed cropping is the predominant practice for both major staples and cash crops. The number of crops involved in the mixture may be quite large. Norman (12), in a study of intercropping combinations in Zaria Province of the Kaduna State of Nigeria, reported up to 156 different crop mixtures consisting of the following: sole crops, 16.6%; two, 42.1%; three, 23.7%; four, 12.1%; five, 5.5%; and six, 5.5%.

The predominant practice of maintaining soil fertility is bush fallowing. This practice involves consecutive cropping periods of 1-5 years alternating with fallow periods of from 2 to over 5 years, depending on the population pressure on the land.

The most widespread "multiple" cropping systems consist of mixed intercropping and relay intercropping. Double-cropping is limited to the growing of two crops of maize. In market gardens and in certain types of vegetable crops, double-cropping, triple-cropping, and alternate strip-cropping systems are sometimes practiced.

Land-clearing systems involve slash and burn techniques. Planting on mounds or heaps and sometimes ridges is a general practice except in areas with deep alluvial or sandy soils where planting on the flat is not uncommon.

Land and labor are the most important production inputs. Hoes, cutlasses, and machetes constitute the major farm implements. Generally, home-produced seed of traditional unimproved

varieties is used. There is limited use of purchased inputs such as fertilizers, improved seeds, and plant protection chemicals.

Recent Trends in Crop Production

There are serious deficiencies in the system for collecting and reporting crop production data in Nigeria. Various institutions, such as FOS, the Federal Department of Agriculture (FDA), State Ministry of Agriculture and Natural Resources (MANR), and/or Ministry of Economic Planning, publish crop production figures. Statistics on area, yield, and output for different crops vary considerably depending upon the source of data.

The most important statistical reporting agency in Nigeria is FOS. The agricultural survey unit of FOS provides estimates which are based on sample surveys, while the figures provided by the state agencies are generally desk estimates. Ideally, the figures provided by FOS should be more accurate; however, many of these figures contained obvious errors. The areas planted to major crops and the annual production as published by FOS for the years 1971-78 are shown in Table 7. There was a marked decline in the production of the major (staple) crops, primarily as a result of decline in cultivated area. For example in 1971/72, the total area planted to those crops listed in Table 7 was 16.38 million ha, a loss of 42% in planted area.

Serious questions have been raised as to the reliability of the FOS figures because they do not appear to be consistent with general observation and price movements. The usefulness of the FOS data is mainly in providing a general direction and not necessarily the exact magnitude of production.

Alternative estimates of crop production have been made by the state Ministry of Agriculture, IBRD, and FAO (2).

Table 8 shows the comparative growth rates of production of the major staple food crops between 1974 and 1978.

Though instability in food production seems to be characteristic of rainfed agriculture, considerable opportunities exist to increase and to some degree to stabilize production by adopting improved packages of technology.

Population and Food Requirements

Population--Nigeria's population in 1979 was estimated to be 82.6 million, with an estimated net annual growth of 2.6%/year.

Table 7. Area Planted, Production and Yield Per Hectare of Major Crops, 1971/72 - 1977/78 (13)

Crops	Area in '000 Hectares, Production in '000 Tons, Yield in kg/ha	Years 1971/72	1972/73	1973/74	1974/75	1975/76	1976/77	1977/78
Groundnuts	Area	1,796	2,032	2,076	1,796	1,472	684	755
	Production	1,381	1,350	878	1,946	449	459	557
	Yield	769	665	423	1,084	305	671	737
Cotton	Area	798	236	121	478	197	384	278
	Production	426	105	85	481	81	294	269
	Yield	533	445	705	1,006	411	765	968
Yams	Area	1,197	788	855	671	776	679	577
	Production	9,766	6,900	6,936	7,160	8,621	6,560	6,661
	Yield	8,159	8,871	8,111	10,656	11,110	9,661	11,544
Cassava (old)	Area	399	344	361	415	331	363	198
	Production	4,516	2,573	2,912	3,582	4,214	1,876	1,900
	Yield	11,318	7,478	8,066	8,631	13,033	5,168	9,596
Millet	Area	4,788	3,692	5,651	4,787	5,478	3,930	3,090
	Production	2,835	2,391	3,794	5,554	4,737	2,893	2,579
	Yield	592	648	671	1,160	860	736	834
Sorghum	Area	5,387	3,792	5,516	4,653	5,721	4,842	3,480
	Production	5,794	2,298	3,125	4,738	3,328	2,950	3,327
	Yield	704	606	567	1,018	581	609	956
Rice	Area	200	237	373	269	261	193	246
	Production	279	447	487	525	515	218	408
	Yield	1,395	1,886	1,304	1,952	1,973	1,130	1,656
Maize	Area	1,197	1,050	1,130	579	971	892	610
	Production	1,274	639	808	528	1,332	1,075	758
	Yield	1,064	609	715	912	1,372	1,205	1,243
Soybeans	Area	4	2	2	-	5	-	3
	Production	1	1	0	-	6	-	2
	Yield	250	500	0	-	1,200	-	667

(Continued)

Table 7. Area Planted, Production and Yield Per Hectare of Major Crops, 1971/72 - 1977/78 (Continued)

Crops	Area in '000 Hectares, Production in '000 Tons, Yield in kg/ha	Years						
		1971/72	1972/73	1973/74	1974/75	1975/76	1976/77	1977/78
Cocoyams	Area	200	266	167	108	113	112	83
	Production	800	1,357	1,106	480	504	532	398
	Yield	4,000	5,102	6,623	4,444	4,460	5,215	4,795
Beniseed	Area	22	11	2	2	43	32	18
	Production	21	4	4	1	15	14	9
	Yield	955	363	571	500	349	438	500
Melon	Area	399	326	427	91	236	184	167
	Production	63	91	187	49	271	167	142
	Yield	158	280	438	538	1,148	908	850

Notes:
1. Cassava (old) relates to cassava harvested in the year of survey.
2. Time reference covers a period of 12 months, beginning from May of one year to April of the following year.
3. - = Nil.
4. 0 = less than 0.5 thousand tons.

Table 8. Comparative Production Growth Rates as Reported by Different Agencies for Major Food Crops in Nigeria, 1974-78

Crop	World Bank[a]	FAO[b]	FOS[c]	States Estimates[d]	National Plan Targets[e]
	(%/year)				
Yams	-1.0	2.2	-1.8	1.4	3.1
Cassava	2.3	2.7	-6.8	5.7	3.2
Cocoyams	-0.7	NA	-4.5	-1.2	1.6
Maize	0.13	2.8	5.3	3.2	7.5
Rice	4.6	10.6	-0.04	4.8	14.5
Millet	1.2	0.8	-8.7	0.7	3.2
Sorghum	-0.8	1.2	1.6	2.7	3.2
Groundnuts	-0.04	-8.1	-13.5	-3.6	NA
Cowpeas	1.1	NA	NA	1.6	NA

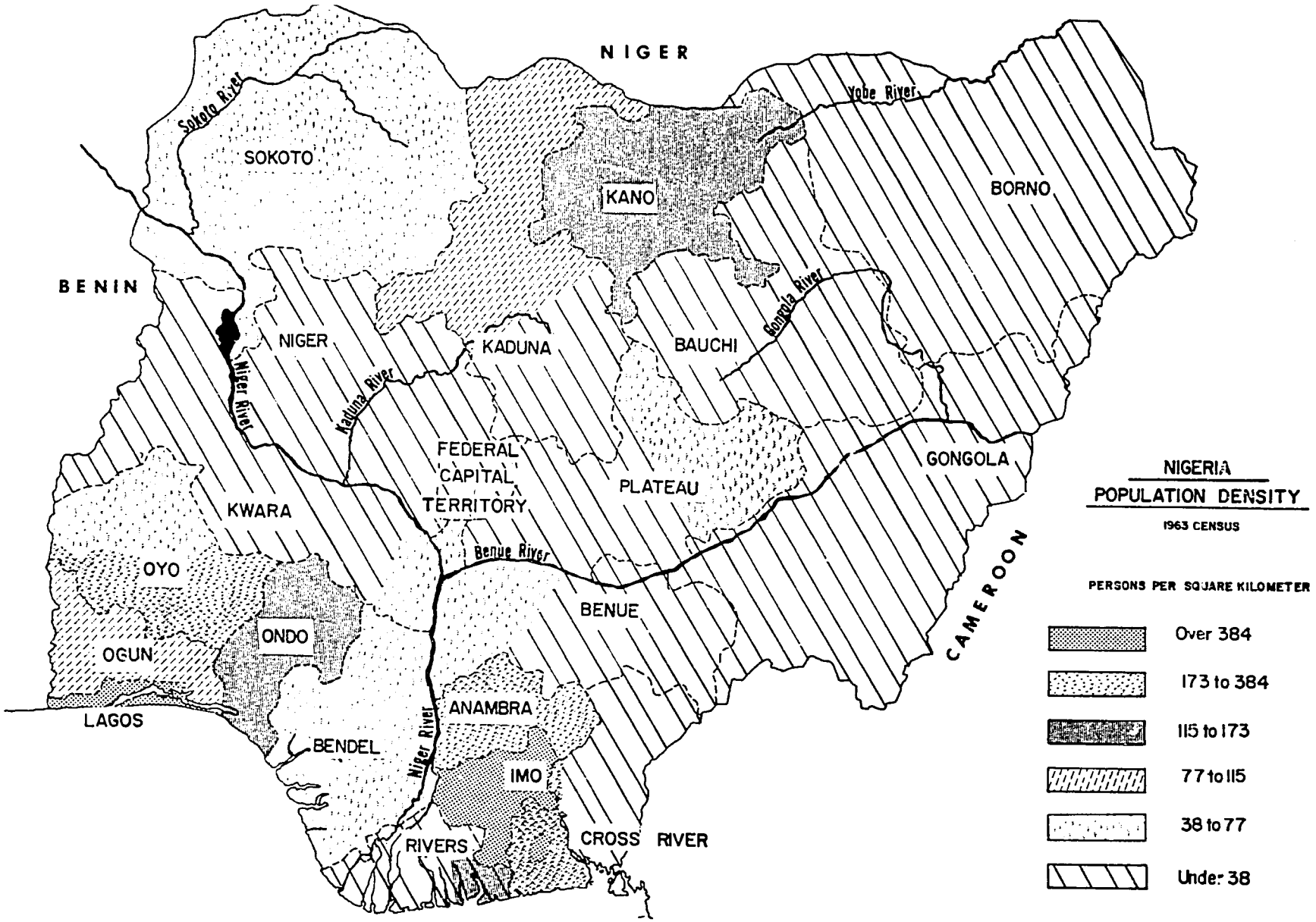
a. (17).
b. (2).
c. (6).
d. Based on reported data from States' MANR.
e. (8).

FOS estimates a population of 96.3 million by 1985 and 109.3 million by 1990 (14).

Population in the urban areas is increasing at a rate of 4.7%/year which is more than twice that in rural areas. The urban sector accounted for 18% of the population in 1977. According to the 1963 National Census, about 58% of the population was between the ages of 15 and 64. There is no evidence to the contrary in 1979.

Population densities are highest in the eastern section of Nigeria with approximately 415 persons/km^2 in Imo State. Kano State has a population of over 115 persons/km^2. The middle belt of Nigeria is an area with the lowest population even though the area seems to be well settled. In the past 10 years there has been a significant migration of the farming population to cities and towns. The states having the greatest influx of people from the rural population are Lagos, Oyo, Kano, Kaduna, Sokoto, Borno, Rivers, Ondo, Bendel, Anambra, and Plateau (Figure 7).

Food Requirements and Projections--Various studies exist that have estimated national food requirements, food supply, and projections of food demand and supply. Some of the recent studies are the IBRD agricultural sector review (3), the International Food Policy Research Institute (IFPRI) study (15), and the Nigerian Agricultural Statistics Task Force Report (16).



Source: International Fertilizer Development Center. 1980. Nigeria Fertilizer Marketing Study, Muscle Shoals, Alabama.

Figure 7. Population Density of Nigeria.

Periodic food balance sheets for Nigeria have shown declining per capita food availability (see Table 9). The IBRD sector review estimated that in 1975 only 1,876 kcal/day was consumed by the average Nigerian. Assuming this estimate is correct, the average Nigerian is 16% short of meeting the minimum Food and Agriculture Organization of the United Nations (FAO)/World Health Organization of the United Nations (WHO) dietary requirements of approximately 2,240 kcal/day.

Table 9. Estimates of Per Capita Food Availability in Nigeria

	IFPRI 1959-61[a]	FAO 1963/64[b]	Olayide 1968/69[c]	IBRD Sector Review 1975[d]	Olayide 1975[e]
Calories kcal/day	2,450	2,182	2,199	1,876	1,984
Proteins g/day	51.3	59.4	58.4	48.0	56.6

a. (15).
b. (2).
c. (16).
d. (1).
e. (16).

The World Bank study also predicts that by 1990 per capita calorie consumption will increase to 2,177 kcal/day. In the same study it was estimated that by 1990 Nigeria's gross demand for foodstuffs would be 27.4 million tons of cereal equivalent. Domestic production (given current trends) has been projected to be 16.8 million tons. This would lead to a deficit of 10.6 million tons. For this deficit to be filled by domestic production, aggregate domestic production would have to grow at a compound growth rate of 4.8%, compared to a current rate of less than 1.0%. Individual target annual growth rates for major food crops are shown in Table 10.

The World Bank estimate seems to be conservative compared to that of other studies. IFPRI projected a deficit of 17.1 million tons in 1990, while the Agricultural Statistics Task Force study projected a deficit of 17.4 million tons for the same year (Table 11).

Table 10. Suggested Production Growth Rates for Major Food Crops to Bridge the Gap Between Supply and Demand, 1975-90[a]

	IBRD Sector Review (3)	Agricultural Statistics Task Force (16)
	(%/year)	
Yams	3.8	5.9
Cassava	3.4	5.9
Cocoyams	3.8	5.9
Millet	3.8	7.3
Sorghum	3.8	7.3
Maize	3.9	7.0
Rice	5.0	8.8
Cowpeas	4.0	8.2

a. About 75% of the calorie intake in Nigerian diets is supplied by the eight staple food crops--yams, cassava, cocoyams, maize, rice, millet, sorghum, and cowpeas (3).

Table 11. Comparative Demand/Supply Projections for Nigeria, 1975-90
('000 in tons cereal equivalent)

Source	Assumptions: Production Growth Rate	Assumptions: Population	Assumptions: Per Capita Income	Supply in Base Year 1975	Total Demand (1990)	Total Supply (1990)	Deficit	Required Annual Compound Growth Rate
	(per year)							(per year)
IFPRI[a]	0.5	3.03	6.3	17,898	36,414	19,304	17,110	4.8
IBRD[b] Sector review	0.45	3.03	2.0	15,721	27,402	16,816	10,586	3.8
Agricultural Statistics Task Force[c]	1.2	2.5	5.2	18,465	39,495	22,083	17,412	5.1

a. (15).
b. (1).
c. (16).

While differences in underlying assumptions led to different projections, one common conclusion of all these estimates is that if past production trends of agricultural growth continue, the result will be a massive food deficit. This downward trend is taking place in a country that was self-sufficient in food production until this decade.

CHAPTER 3
INSTITUTIONAL FRAMEWORK FOR FERTILIZER SECTOR PLANNING AND DEVELOPMENT IN NIGERIA

The fertilizer sector in Nigeria has always been rigidly controlled by government agencies. Public policies in the fertilizer sector have been designed purposely or inadvertently to provide government ownership and control of fertilizer production, distribution, and sales at government support prices.

There are many institutions and agencies that provide input for policy formulation and/or plan, execute, monitor, and evaluate programs and projects affecting the fertilizer sector. These institutions and their interrelationships are shown in Figure 8.

National Agencies

National Economic Planning Commission (NEPC)(Ministry of National Planning)--The functions of the NEPC are to:

1. Draw up a national development plan taking into consideration the development plans proposed by the States of the Federation; and

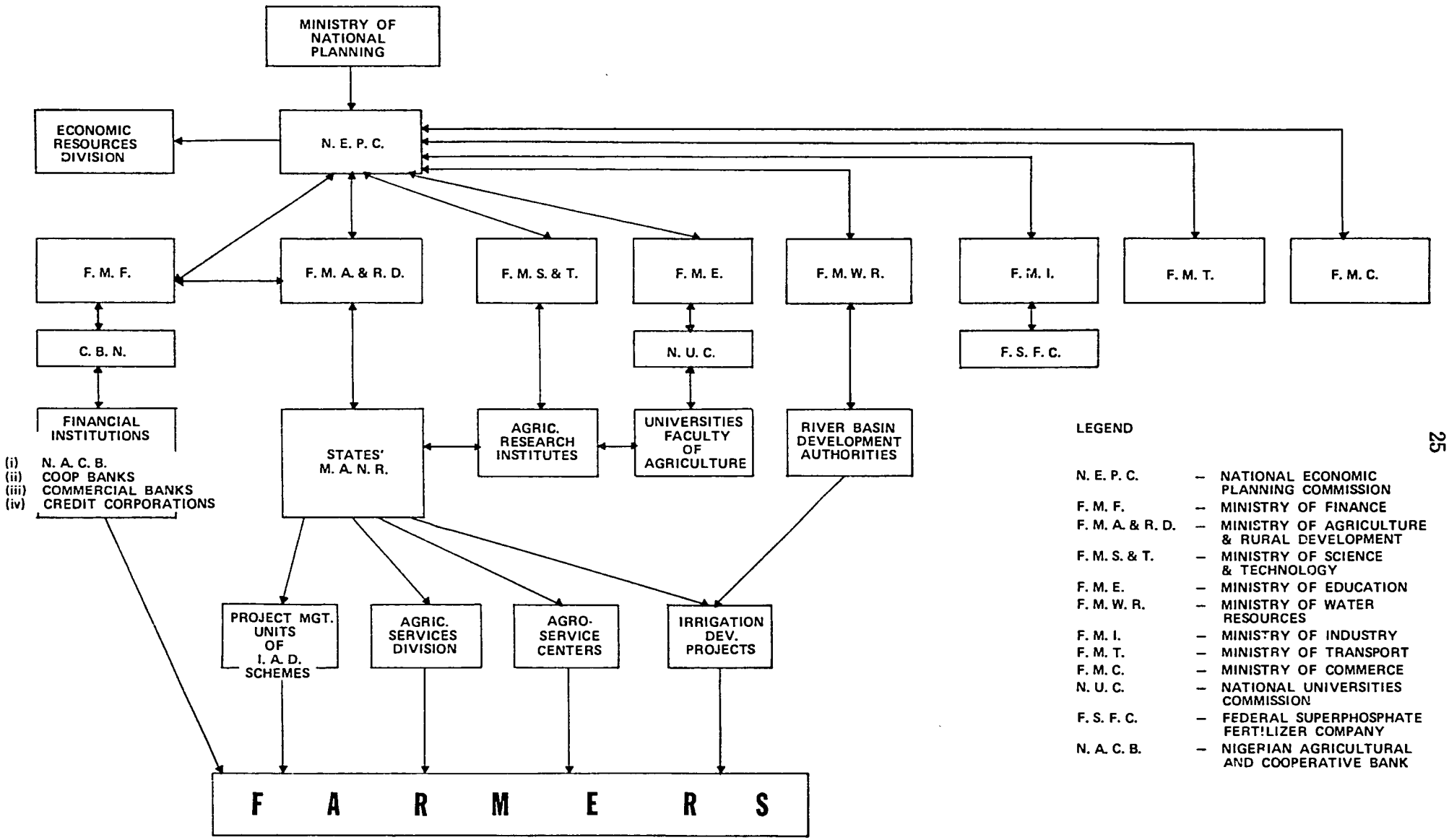
2. Supervise and monitor execution of such plans. This includes developing national policy, programs, and projects with respect to fertilizers.

Economic Resources Division (Ministry of National Planning)--This organization coordinates foreign assistance (loans, grants, and technical assistance) with respect to the development of the fertilizer sector.

Ministry of Finance--Through its monetary and banking policies, the Ministry of Finance provides the foreign exchange for paying the import bill as well as institutional credit to farmers under several programs. It also provides the funds for the fertilizer subsidy scheme.

Financial Institutions--Nigerian Agricultural and Cooperative Bank (NACB), cocperative banks, credit corporations, and commercial banks provide the channels for injecting institutional credit to several agricultural development programs.

Federal Ministry of Agriculture and Rural Development (FMARD)--FMARD is responsible for developing Federal agricultural development plans and instituting and executing agricultural development projects either alone or in conjunction with state



NIGERIA: FERTILIZER-RELATED INSTITUTIONS & THEIR INTERRELATIONSHIPS

Figure 8. Fertilizer-Related Institutions.

governments and/or their agencies. The Ministry in recent years has been responsible for fertilizer importation, primary movement to state warehouses, and administering the price subsidy schemes.

Federal Ministry of Industry (FMI)--FMI is responsible for developing, executing, and monitoring programs and projects for domestic manufacture of fertilizer.

Federal Superphosphate Fertilizer Company, Ltd., Kaduna (FSFC)--FSFC, under the control of FMI, is responsible for the domestic manufacture of single superphosphate fertilizer.

Federal Ministry of Commerce (FMC)--FMC is responsible for granting import license to the private sector to import fertilizers.

Federal Ministry of Transportation (FMT)--FMT is responsible for regulating the operations of the Nigerian Railway Corporation (NRC), the Nigerian Port Authority (NPA), and the operations of the privately owned truck fleets for transport of fertilizer and other goods.

Federal Ministry of Education (FME)--Through the National Universities Commission (NUC), FME provides financial grants to the universities. Budget allocations are made for the research activities of the faculties of agriculture.

Federal Ministry of Science and Technology (FMS&T)--FMS&T coordinates through the National Science and Technology Development Agency (NSTDA) the activities of the Agricultural Research Institutes.

Federal Ministry of Water Resources (FMWR)--FMWR coordinates the activities of the 11 River Basin Development Authorities (RBDAs) which are responsible for water resources, agricultural, and fisheries development in the river basin areas.

State Ministry of Agriculture and Natural Resources (MANR)--The main functions are to plan and execute agricultural projects and provide extension advice. Execution of projects is either done alone or in conjunction with FMARD and through semiautonomous agencies such as The World Bank-assisted project management units and state-financed autonomous agricultural development corporations.

The Agricultural Services Division has been particularly active in fertilizer distribution as well as use-promotion programs.

Universities and Agricultural Research Institutes--Soil fertility studies, plant breeding programs, farming systems research, and socioeconomic studies have involved universities and agricultural research institutes.

Private Sector

The private sector has played a rather passive role until now. The functions of the private sector have been restricted to importing fertilizers based on government tender awards, providing the trucks for road transportation of fertilizers, and serving as retailers (stockists).

Two private-sector companies--the Nigerian Tobacco Company (NTC) and the Nigerian Sugar Company (NSC)--have been very effective in fertilizer use promotion programs for sugarcane and tobacco.

International Agencies

Many international agencies have been involved in fertilizer use development. The scope, pattern, and form of assistance have varied from one agency to another but can generally be categorized as follows:

1. Removal of supply bottlenecks,
2. Improvement of the delivery system,
3. Market development to help create effective demand, and
4. Development of improved packages of crop production technology.

Food and Agriculture Organization (FAO)--FAO has had the longest connection with fertilizer-use development programs in Nigeria. FAO activities on fertilizer use in Nigeria began in the early 1960s and are in the areas of fertilizer promotion campaigns, demonstrations, trials, fertilizer distribution, and credit. In executing these programs technical assistance has been given by the United Nations Development Programme (UNDP) and the governments of Sweden, Norway, and West Germany.

The World Bank (IBRD)--The World Bank has also promoted fertilizer use in its integrated agricultural development projects. This has come about through the provision of improved packages of technology to the farmers, development of rural infrastructures, farm training, and provision of agricultural credit.

International Institute of Tropical Agriculture (IITA)--The Institute has proved extremely useful to Nigerian agriculture through its research activities in such areas as soil fertility, cropping systems, and plant breeding.

National Fertilizer Development Center (NFDC-TVA)--The center, in the late sixties and early seventies, conducted prefeasibility and feasibility studies for alternative fertilizer supply schemes for Nigeria (18).

International Fertilizer Development Center (IFDC)--The Center has provided market development assistance to Nigeria. It has provided technical assistance to the SSP fertilizer factory in Kaduna and through its research capabilities has generated information useful in policy formulation for fertilizer production, marketing, and use strategies. A recent example was the Nigerian Fertilizer Marketing Study prepared for FMI (Government of Nigeria) (19).

Recommendations

From the foregoing discussion it is clear that there are many public institutions involved in the fertilizer sector. However, the mechanism for coordinating their activities is inadequate. Much of the coordination that exists is ad hoc. There is therefore a need for a central authority to coordinate the activities of the various agencies/ministries.

Establishment of a National Committee on Fertilizer Industry Development

It is recommended that a National Committee on Fertilizer Industry Development be formed to plan, organize, and implement programs and projects necessary for the development of the fertilizer sector. The main functions of the committee would be:

1. To formulate a strategy and master plan for the development of the Nigerian fertilizer sector based on identified government policies and programs. The nature and role of government and private enterprise involvement must be delineated.
2. To mobilize and coordinate the activities of the public- and private-sector organizations involved in fertilizer-related activities into a cohesive and dynamic national fertilizer program.
3. To prepare a program outline for increased agricultural production through efficient use of fertilizers.
4. To conduct an annual review of the fertilizer program in Nigeria.

The composition should include top officials of both the public and private sectors concerned with the fertilizer sector. Suggested membership will comprise:

1. Permanent Secretary, FMARD;
2. Director, FDA;
3. Director, Petro Chemical Division, FMI;

4. Director, Agricultural Resources Division, Ministry of National Planning;
5. Representative from the Federal Ministry of Finance;
6. Representative from FMT;
7. Representative from the Agricultural Research Establishment;
8. Representative from the Nigerian Chamber of Commerce, Industry, Mines, and Agriculture; and
9. Experts from within and outside the universities.

The Fertilizer Procurement and Distribution Unit in the FMARD could serve as the secretariat for the Committee.

CHAPTER 4
FERTILIZER USE RESEARCH IN NIGERIA

An effective fertilizer use development strategy needs to be based on a thorough knowledge of the technical basis for fertilizer use as well as the provision of economic incentives to ensure profitable use.

Technical Basis for Fertilizer Use

Fertility Status of Nigerian Soils

The fertility status of the soils in Nigeria is generally low. It varies, however, with the soil type, fallow practice, extent of cultivation, and climate. Available information indicates a widespread nutrient deficiency, particularly of one or more of the primary plant nutrients--nitrogen, phosphorus, and potassium (N, P, and K). Some of the secondary and micronutrients, e.g., sulfur in the savanna zone, are also important in crop production.

Characteristics of related surface soils are shown in Table 12. Alfisols and generally the well-drained Entisols have base saturations higher than 35% but have low total bases because of low cation-exchange capacity (CEC). Productivity of these soils is limited by nutrient deficiencies, combined with physical constraints such as water availability, crusting, and erosion (20). Increasing soil acidity is a problem accompanying intensive crop production. Entisols along river flood plains are generally more fertile than the upland Entisols.

Low CEC, low base saturation, and low content of weathèrable minerals lead to nutrient imbalances and nutrient leaching in Ultisols. Nitrogen, phosphorus, calcium, and magnesium deficiencies, as well as aluminum, manganese, and iron toxicities, can limit crop production (21). Soil fertility limitations of Oxisols are deficiencies of nitrogen, phosphorus, potassium, calcium, and magnesium. Iron and manganese toxicities frequently occur in paddy fields. Good physical properties of Oxisols partially offset the mineral stress problems.

Crop Response Studies

A great quantity of soil fertility research has been conducted in Nigeria. Most of the work conducted prior to the 1970s was with very low levels of fertilizers and used native varieties, slash

Table 12. Some Properties of Selected Surface Soils From Nigeria Sampled Under Natural Vegetation (22)

Properties	Onne (Onne)	Nkpologu (Nsukka)	Alagba (Ikenne)	Funtua (Zaria)	Bauchi (Bauchi)
pH (H_2O), 1:1	4.3	4.6	6.1	5.5	5.7
pH (KCl), 1:1	3.6	3.8	5.6	4.8	5.0
Organic C, %	1.04	1.08	1.56	0.68	1.84
Clay, %	17	26	13	24	10
Silt, %	16	7	15	50	14
Sand, %	67	67	72	26	76
Exchangeable cations, meq/100 g					
Ca	0.26	0.35	5.36	2.40	1.15
Mg	0.09	0.12	2.89	1.48	0.57
K	0.07	0.05	0.25	0.16	0.12
Na	0.14	0.10	0.16	0.07	0.17
Al	1.83	0.95	0	0.20	0
H	0.45	0.29	0.22	0	0.08
Effective CEC, meq/100 g	2.86	1.86	8.88	4.31	2.09
Base saturation, %	20	33	96	93	96
Exchangeable Al Saturation, %	64	51	0	4	0
Bray P_1, ppm	26	4	6	2	3
Classification	Oxic Paleudult	Ustoxic Paleustult	Oxic Paleustalf	Paleustalf	Paleustalf
Parent materials	Coastal sediments	Sandstone	Coastal sediments	Eolian drift	Granite and gneisses
Vegetation	Wet forest	Derived savanna	Drier forest	Savanna	Savanna

and burn rotations, no pest control, and often poor weeding. Under those conditions, responses to fertilizers were limited, and only low levels of N and P were found to be profitable. A review of these earlier studies was carried out by R. B. Diamond (23).

Soils of the northern region generally are low in organic matter, and response to nitrogen fertilizer can be expected. In the forest zone, responses to nitrogen may not be obtained during the first 2-4 years after clearing of dense forest but may occur in the first year after clearing thicket-shrub vegetation. Progressively higher rates of nitrogen are needed to maintain high yields with prolonged cropping of all soils. Increased efficiency of nitrogen is obtained from split applications.

Phosphorus responses are common on both forest and savanna soils. On most soils of Nigeria low rates of P_2O_5 (20-40 kg/ha) are adequate for optimum yields. Good responses in the years following application also are observed on most soils. One implication of this is that higher rates of application of P_2O_5 may be applied to the cash crop in a rotation with resulting benefit to the following food crop. The farmer may be willing to purchase P_2O_5 for the cash crop; whereas, he is more reluctant to purchase it for the food crop.

Generally, responses to applied K_2O are not found on soils derived from basement complexes. In the southern region responses to K_2O are expected on soils derived from sedimentary rocks. In the northern region few responses to K_2O have been observed although with increasing rates of N fertilization, higher crop yields, and more intensive cultivation, responses may be expected in the near future. High rates of K should be avoided on the sandy soils in the northern region since that could cause a potassium-magnesium imbalance and result in magnesium deficiency.

Sulfur deficiencies have been observed for maize in the southern savanna, but sulfur deficiencies are of more significance for legume crops (24). Sulfur deficiencies are expected to develop over wide areas of the northern region if fertilizers containing no sulfur are used. This is a result of low organic matter and low quantities of sulfur in rainfall. Currently, the use of SSP and AS fertilizers supplies the sulfur requirements. About 7-15 kg/ha/year of sulfur appears adequate to correct deficiencies (25).

Zinc deficiencies for maize have been reported in the southern savanna. Zinc applied at 1-2 kg/ha corrects the deficiency (26). Boron deficiency is often observed on cotton and sometimes observed on groundnuts (20). Molybdenum deficiency is sometimes observed on groundnuts.

Table 13 summarizes fertilizer response data from a large number of fertilizer demonstrations and trials conducted in the FAO fertilizer program in the 1960s and early 1970s.

The results are highly variable and no doubt incorporate substantial differences in rainfall and other environmental factors. Results of these experiments might be more meaningful if they could be analyzed by soil and climatic regions.

Results of FAO fertilizer trials conducted in Kwara State, (27) 1970-72, are shown in Table 14. Unfortunately, the selection of treatments does not permit a determination of response to individual nutrients. Basically, the results show good responses to fertilizer. It appears that desirable N rates would be 50-60 kg/ha for maize, 30-40 for rice, and 30-50 for yams. For P_2O_5 it can only be said that responses were not obtained at rates higher than 20 kg/ha, but it is not known if responses were obtained to 20 kg/ha. No responses to K_2O were indicated by the overall average yields.

Results of the 1976 campaign for FAO fertilizer demonstrations in Sokoto state show about 10 kg of millet per kilogram of N plus P_2O_5 (low rates), and 10-12 kg of groundnuts per kilogram of P_2O_5 was obtained (Table 15). Fertilizer, either with farmer or improved cultural practice, resulted in greater yield increases than improved practice over farmer practice without fertilizer.

Table 13. General Nature of Crop Response to Fertilizer Nutrients From Trials and Demonstrations in Nigeria

Crop	Year	Applied Nutrient: Nutrient	Applied Nutrient: Rate, kg/ha	Yield Response, kg Crop/kg Nutrient: Mean	Yield Response, kg Crop/kg Nutrient: Range
Fertilizer Trials[a]					
Maize	1961-70	N	45	10.8	6-14
		P_2O_5	22	7.6	5-12
		K_2O	22	4.0	1-7
Millet and sorghum	1963-71	N	22	6.2	5-10
		P_2O_5	22	5.6	4-8
		K_2O	22	3.1	0-6
Upland rice	1961-70	N	45	17.9	10-20
		P_2O_5	22	9.4	8-15
		K_2O	22	2.8	2-10
Groundnuts	1963-71	P_2O_5	22	19.1	12-26
		K_2O	22	2.8	3-4
Fertilizer Demonstration[a]					
Maize	1961-70	N	22	10.5	9-20
		P_2O_5	22	5.6	2-8
		K_2O	22	2.8	2-5
Millet and sorghum	1963-71	N	22	7.7	6-14
		P_2O_5	22	7.2	5-11
		K_2O	22	3.8	3-7
Upland rice	1961-70	N	22-45	21.5	10-20
		P_2O_5	22	7.5	4-12
		K_2O	22	1.5	0-4
Groundnuts	1963-71	P_2O_5	22-45	17.3	9-17
		K_2O	22	3.1	2-4

a. Summary from various FAO Fertilizer Program Reports.

Table 14. Mean Crop Yield Response to Fertilizer in Kwara State in Nigeria-FAO Fertilizer Trials, 1970-72 (27)

Nutrient Rate, kg/ha: N	Nutrient Rate, kg/ha: P_2O_5	Nutrient Rate, kg/ha: K_2O	Yield, kg/ha	Yield Increase Over Control: kg/ha	Yield Increase Over Control: kg/kg Nutrient
Maize, 76 Trials					
0	0	0	871	-	-
47	19	0	1,888	1,017	15.2
70	19	0	2,159	1,288	14.5
73	40	0	2,159	1,288	11.4
70	47	47	2,021	1,150	7.0
Rice, 41 Trials					
0	0	0	2,065	-	-
25	25	0	2,965	900	18.0
63	25	0	3,187	1,122	12.8
55	13	0	2,962	897	13.2
48	25	0	2,975	910	12.5
42	19	19	2,954	889	11.1
Yams, 79 Trials					
0	0	0	9,656	-	-
26	0	0	13,160	3,504	134.8
52	0	0	14,320	4,664	89.7
19	19	19	13,216	3,560	62.5
38	38	38	14,348	4,692	41.2

Table 15. Summary Results of Nigeria-FAO Fertilizer Demonstrations, Sokoto State, 1976 Campaign (28)

Nutrient Rate, kg/ha				Response to Fertilizer Practice		
N	P_2O_5	Practice	Crop Yield, kg/ha	kg/kg Nutrient	kg/ha	
- - - - - - - - - - - - - - Sorghum, 49 Demonstrations - - - - - - - - - - - - - -						
0	0	Farmer	770	-	-	-
31	24	Farmer	995	4.1	225	-
0	0	Improved	842	-	-	72
62	48	Improved	1,289	4.1	447	-
- - - - - - - - - - - - - - Millet, 55 Demonstrations - - - - - - - - - - - - - -						
0	0	Farmer	777	-	-	-
0	0	Improved	843	-	-	66
15	12	Improved	1,115	10.1	272	-
- - - - - - - - - - - - - - Groundnuts, 35 Demonstrations- - - - - - - - - - - - - -						
0	0	Farmer	607	-	-	-
0	18	Farmer	838	12.8	231	-
0	0	Improved	748	-	-	141
0	36	Improved	1,092	9.6	344	-
- - - - - - - - - - - - - - Cotton, 15 Demonstrations - - - - - - - - - - - - - -						
0	0	Farmer	521	-	-	-
0	0	Improved	660	-	-	139
31	24	Improved	901	4.4	241	-

Wheat yields from NAFPP mini-kit trials in Kano State were highest with 80 and 40 kg/ha of N and P_2O_5, respectively (Table 16). Response to N was high without P_2O_5 but higher with applied P_2O_5 while response to P_2O_5 was low without N but rather high with N. Other trials have shown erratic response to K_2O. Results from well-designed fertilizer response trials are needed for wheat to define optimum rates of application.

Table 16. Crop Yield Response of Wheat to Fertilizer in Mini-Kit Trials, Kano State, 1973/74 - 1975/76 (29)

Nutrient Rate, kg/ha		Wheat Yield, kg/ha	
N	P_2O_5	Mean, 51 Trials	Mean, 22 Trials
0	0	1,867	1,518
0	50	-	1,748
80	0	-	2,478
40	20	2,390	-
80	40	2,938	3,354
120	60	2,662	-

Fertilizer Recommendations

Fertilizer recommendations vary somewhat depending upon the organization and, of course, the crops and regions for which they are made. A summary of recommendations is illustrated in Table 17. In most instances it is recommended that N be applied near planting time and as a sidedressing 3-6 weeks after plant emergence. Although K is not currently recommended for crops other than cassava and yams in the northern region, it likely will soon be included in recommendations for intensive cultivation. It appears that initially K_2O need not be applied at more than one-half the rate of P_2O_5.

Table 17. Fertilizer Nutrient Recommendations and Suggested Nutrient Ratios of NPK Fertilizers to Supply the Recommended Rates (30)

	Nutrient Recommendation, kg/ha					
	Extension			NAFPP		
Crop	N	P_2O_5	K_2O	N	P_2O_5	K_2O
North						
Millet	13	11	0	35	27	0
Sorghum	26	22	0	58	27	0
Wheat	115	18	0	115	45	0
Maize	71	40	0	105	36	0
Rice	100	34	0	70	31	0
Cowpeas	0	15	0	-	-	-
Cassava	30	15	90	30	20	45
Yams	24	24	34	-	-	-
Groundnuts	0	18	0	-	-	-
Cotton[a]	25	25	0	-	-	-
Sugarcane	80	80	0	-	-	-
South						
Maize[a]	70	30	30	70	30	30
Rice-Upland	21	11	11	-	-	-
-Swamp	30	30	30	50	30	30
Cassava	60	30	30	30	20	45
Yams	24	24	34	-	-	-

a. If out of forest more than 10 years.

Suggested approximate ratios of $N:P_2O_5:K_2O$ for crops in Nigeria are as follows:

Nutrient Ratios	Crops
1:4:0; 1:3:1	Millet, sorghum, sugarcane
1:1:0; 2:2:1	Wheat, maize, rice (all north)
1:2:2	Maize, rice (all south)
1:2:2	Cassava, yams[a]
0:1:0 + S; 0:1:0 + S + B	Groundnuts, cowpeas
1:2:1 + S + B	Cotton
3:3:1 + Mg	Cocoa, rubber
3:3:1 + Mg	Oil palm[a]
1:0:0	Sidedressing, all crops except groundnuts and cowpeas

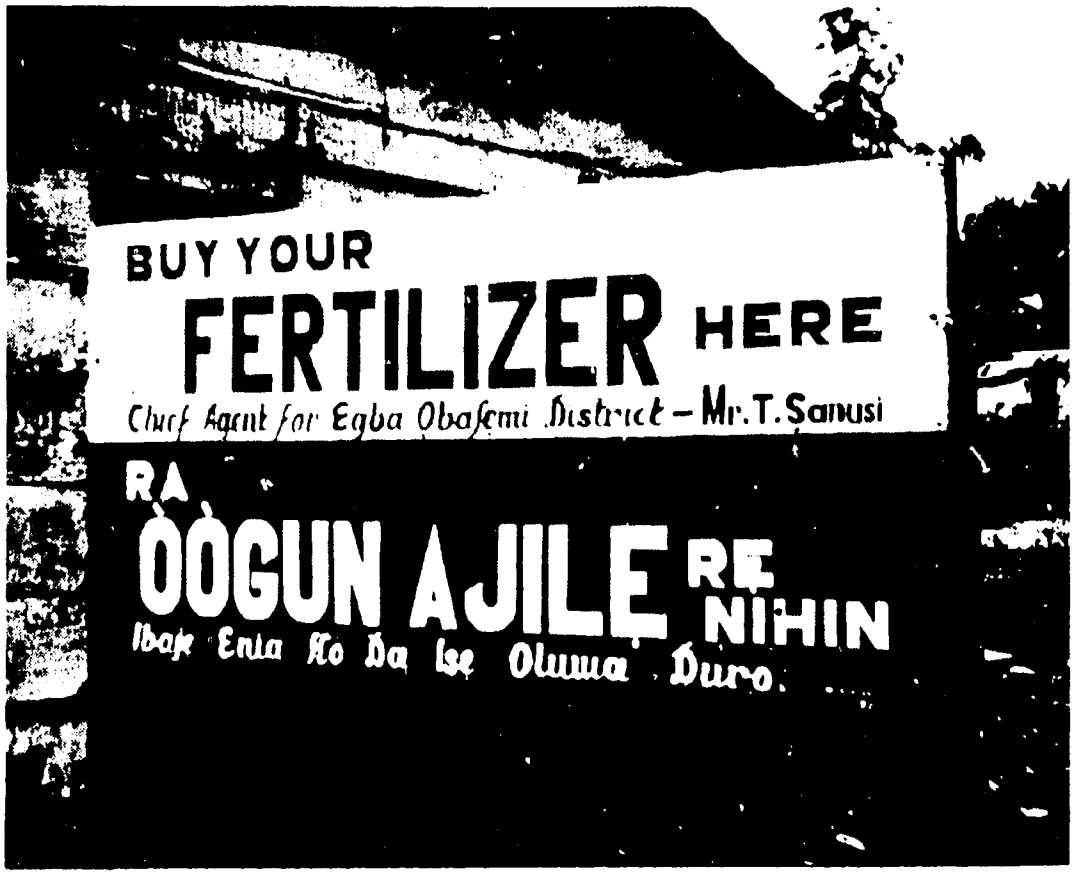
a. Additional K_2O is often recommended to meet the potassium requirements of these crops.

Mixed cropping is the predominant practice for both major staples and cash crops.

Plantain is collected in a village and moved into the marketplace for selling to the consumers.

Trainees listen to an explanation on rice research.*

*Photograph provided by IITA, Ibadan, Nigeria.



Few private fertilizer dealers are left in Nigeria. The retailing function of the marketing system is being performed by the Agro-Service Centers.

Currently, the only general recommendations for nutrients other than N, P, and K are for magnesium on cocoa, rubber, and oil palm and sulfur on groundnuts. In addition, specific recommendations are made in some crop production schemes for boron on groundnuts and sulfur and boron on cotton.

Economic Returns From Fertilizer Use

In economic terms a "good" response is one which renders the use of fertilizer economic or profitable for the economy as a whole. To be economic, the response must suffice to pay for the cost of the fertilizer and related inputs to the economy and still leave a surplus. Economic response is determined by the technical crop response to fertilizer and the unsubsidized and untaxed prices of fertilizer and crop produced.

To the farmer the financial return from fertilizer use is based on the difference between the value of the increased output and the actual cost of fertilizer to him. The actual cost of fertilizer to the farmer includes the price he pays for the fertilizer and the associated costs involved with its use (cost of application, cost of extra weeding, and cost of harvesting additional yield.) The level and certainty of the returns will dictate his use of fertilizers. Theoretically, the optimum level of fertilizers to be used is that point when the marginal cost of fertilizer equals the value of marginal output (when all other factors such as climate, water, etc., are constant). As a rule of thumb, FAO has used a value:cost ratio of 2 and above to indicate profitability of fertilizer use.

Adequate data are not available in Nigeria to develop fertilizer response functions that give optimum amounts of fertilizer that should be used. Research data that are available have been summarized in Table 18 for the major food crops with various management practices. Agricultural extension recommendations for N, P_2O_5, and K_2O are based on results obtained from fertilizer trials conducted on farmers' fields. Yield data from research stations are usually higher than those obtained on farmers' fields.

Table 18 shows the economic returns to fertilizer use for the major staple food crops in Nigeria. At the subsidized price of fertilizer the value:cost ratio for all the major food crops clearly exceeded 5. Highest financial returns come from the use of fertilizers on root crops--cassava and yams.

It is also clear from evaluating the cost of the fertilizer and the value of the output achieved that farmers can increase profits by using fertilizer even if it is not subsidized and crop prices are not increased above current levels.

The degree of profitability varies with the specific crop. Fertilizer is less profitable on cereals (particularly sorghum and maize) and more profitable on root crops. When the fertilizer-related costs and risk and technology factors are incorporated, fertilizer use on cereal crops may be only marginally profitable.

Recommendations

1. A national soil fertility group should be established to advise on government policy and fertilizer-related programs to improve fertilizer use and crop production. The group should be multidisciplinary, and the areas of research activity to be reviewed include soil and land use mapping, soil fertility, agronomy, and socioeconomics.

2. The group should plan for detailed farm management investigations to be carried out that will determine the cost and returns for major crop enterprises in the different ecological zones of the country. The results of such investigations will prove very useful in deciding, on a rational basis, the level of price support, and the level of input price subsidy that will encourage increased food production among other things.

3. The group will encourage an integrated approach to the maintenance and improvement of soil fertility, using both organic and inorganic nutrient sources.

Table 18. Average Economic Response to Fertilizer Based on Selected Fertilizer Response Studies in Nigeria

Crop	Farm Practice	Area	Year	Treatment $N:P_2O_5:K_2O$	Additional Yield (kg)	Average Response Over Control (kg/kg of Nutrient)	Subsidized Cost of Fertilizer[a]	Unsubsidized Cost of Fertilizer[b]	Value of Incremental Output[c]	Value:Cost Ratio Subsidized	Value:Cost Ratio Unsubsidized	Source and Remarks
							(Nairas)					
Millet	Improved	Sokoto	1976	17-12-0	338	11.7	5.0	20.0	57.9	11.6	2.9	Joly, 1976; demonstrations
Sorghum	Farmer	Sokoto and Niger	1976	35-24-0	299	5.1	10.0	40.5	51.8	5.2	1.3	Joly, 1976; demonstrations
	Improved	Sokoto and Niger	1976	70-48-0	700	5.9	21.0	81.0	121.3	5.8	1.5	Joly, 1976; demonstrations
Maize	NA	Kwara	1970/72	73-40-0	1,288	11.4	22.0	74.2	219.6	10.0	2.9	Poulson, 1975; trials
	NA	Bendel	1976	75-34-34	836	5.8	20.2	80.9	142.5	7.0	1.8	NAFPP, 1976; demonstrations
Rice	Farmer	Niger	1976	84-36-0	591	4.9	21.0	76.1	106.1	5.0	2.3	Joly, 1976; demonstrations
	Improved	Niger	1976	126-36-0	1,234	7.6	28.0	96.5	221.6			Joly, 1976; demonstrations
	NA	Nigeria	1961/71	22-22-22	470	7.1	9.2	39.4	84.4	9.2	2.1	FAO, 1974; demonstrations
Wheat	Indus variety	Kano	1973/75	80-40-0	1,442	12.0	21.2	78.0	403.8	19.0	5.2	Pandey, 1978; mini-kit
Yams	NA	Nigeria	1961/71	22.4-22.4-22.4	2,232	33.4	9.4	40.1	626.5	66.6	15.6	FAO, 1974; trials
Cassava	NA	Nigeria	1961/71	34-28-34	4,300	44.8	13.5	55.1	684.5	50.7	12.4	FAO, 1974; demonstrations
Groundnuts	Farmer	Niger and Sokoto	1976	0-18-0	269	14.9	3.5	17.6	78.0	22.3	4.4	Joly, 1976; demonstrations
	Improved	Niger and Sokoto	1976	0-36-0	602	16.7	7.0	35.2	174.6	25.0	5.0	Joly, 1976; demonstrations

a. Subsidized prices used are 0.167, 0.195, and 0.06/kg of N, P_2O_5, and K_2O, respectively.
b. Unsubsidized prices used are .486, .967, and .328/kg of N, P_2O_5, and K_2O, respectively.
c. Based on 1979 average farm prices.

NA = not available.

CHAPTER 5
FERTILIZER USE SITUATION IN NIGERIA

It is difficult to find reliable fertilizer-use statistics which encompass total use of fertilizer materials or plant nutrients in Nigeria. Even though records of shipments to the states by the Federal Government are available at the Fertilizer Procurement Section and from state records in MANR offices, annual records of actual sales, consumption, and beginning stocks are not available in Lagos and were available only in a few states.

It is quite hazardous to attempt to estimate the magnitude of aggregate consumption from the yearly import figures. This is because of the well-known fact that some State governments carry large inventories from one year to another. This is mainly due to overly optimistic fertilizer requirements calculated by officials of the Ministry of Agriculture oftentimes without a thorough assessment of the stock available, the previous year's sales, and developments at the farm level that are likely to favor or hinder

Table 19. Estimated 1979 Fertilizer Consumption and Ending Stocks (19)

State	Consumption 1979	Ending Stocks 1979
	(tons)	
Anambra	7,071	-
Bauchi	32,500	16,000
Bendel	1,855	1,776
Benue	14,819	16,073
Borno	12,000	16,000
Cross River	1,500	15,000
Gongola	15,125	10,000
Imo	10,048	5,000
Kaduna	36,700	32,500
Kano	36,935	30,600
Kwara	7,150	14,581
Lagos	107	28
Niger	15,200	11,300
Ogun	3,698	9,500
Ondo	8,000	13,300
Oyo	10,827	5,700
Plateau	25,475	3,600
Rivers	1,200	195
Sokoto	23,754	16,137
	263,964	217,290

increased use of fertilizers. IFDC has calculated that of the 394,300 tons of fertilizer materials imported in 1979/80, only 263,964 tons was sold to farmers (Table 19).

Present Level of Use

Based on IFDC estimates for 1979/80 and historical data supplied through FAO statistics, fertilizer consumption has increased rapidly from 7,000 nutrient tons in 1970 to 85,000 nutrient tons in 1979 (Table 20).

Table 20. Estimated Plant Nutrient Usage: Nigeria, 1970/71 - 1979/80

Year[a]	Estimated Usage			
	N	P_2O_5	K_2O	Total
	('000 tons)			
1970/71	3	3	1	7
1971/72	4	4	1	9
1972/73	9	7	4	20
1973/74	5	6	5	15
1974/75	13	11	5	29
1975/76	30	16	8	54
1976/77	35	30	14	79
1977/78	35	25	14	74
1978/79	31	22	6	58
1979/80	46	28	11	85

a. Fertilizer year, July 1-June 30.

Note: Historical data prior to 1979/80 based on FAO statistics; 1979/80 data primarily on consumption data from state MANR offices and shipments from Federal Office of Fertilizer Procurement, Lagos.

This increased consumption represents a growth rate of 32% annually. Despite this impressive growth rate, the latest FAO report indicates that the fertilizer consumption per hectare of cropland in 1977 was only 3.1 kg/ha compared to a world average of 68.0 kg/ha and the continent's average of 12.4 kg/ha (31) (Table 21).

The most rapid growth in consumption has occurred in nitrogen which has increased at an annual rate of 35% since 1970. Phosphate consumption has increased at a rate of 26%. Very little potash is used in Nigeria with the exception of oil palms because

soils are considered to be adequate in available potash. It appears that recently some of the southern rain-forest soils are becoming deficient in available potash. However, because of the very low base, use of potash has increased at about 33% annually since 1970.

Table 21. Consumption of Fertilizers Per Hectare in Selected Countries, 1977 (32)

Country	Consumption Per Hectare of Arable Land of N, P_2O_5, K_2O
	(kg)
Japan	428.1
West Germany	422.0
United Kingdom	287.6
France	277.6
United Arab Republic	187.5
United States	99.5
Brazil	77.4
Canada	34.3
Philippines	32.2
India	25.3
Senegal	20.9
Thailand	15.6
Ghana	10.9
Ivory Coast	5.2
Nigeria	3.1
Zaire	1.4
Africa	12.4
World	68.0

The NPK ratio has changed from 3:3:1 in 1970/71 to 4:2.5:1 in 1979/80.

Consumption by States

Although the consumption of fertilizer nutrients showed continuous increases over time, the aggregate figures do not reflect the wide differences in consumption by the states. Table 22 shows the consumption of fertilizer materials by states for 1979/80.

A majority of the crop acreage is located in the seven northern states and, hence, about 70% of the fertilizer is consumed there also. Kano and Kaduna were the largest

fertilizer-consuming states in 1979 on a nutrient basis. Kaduna has a large World Bank project located at Funtua and has the largest area of crops of any state. Bauchi State, including the Gombe World Bank project, consumed almost as much nutrient tonnage as Kano and Kaduna. These three states consumed about one-third of the fertilizer nutrients used in 1979.

Table 22. Fertilizer Consumption by States, Nigeria, 1979 (19)

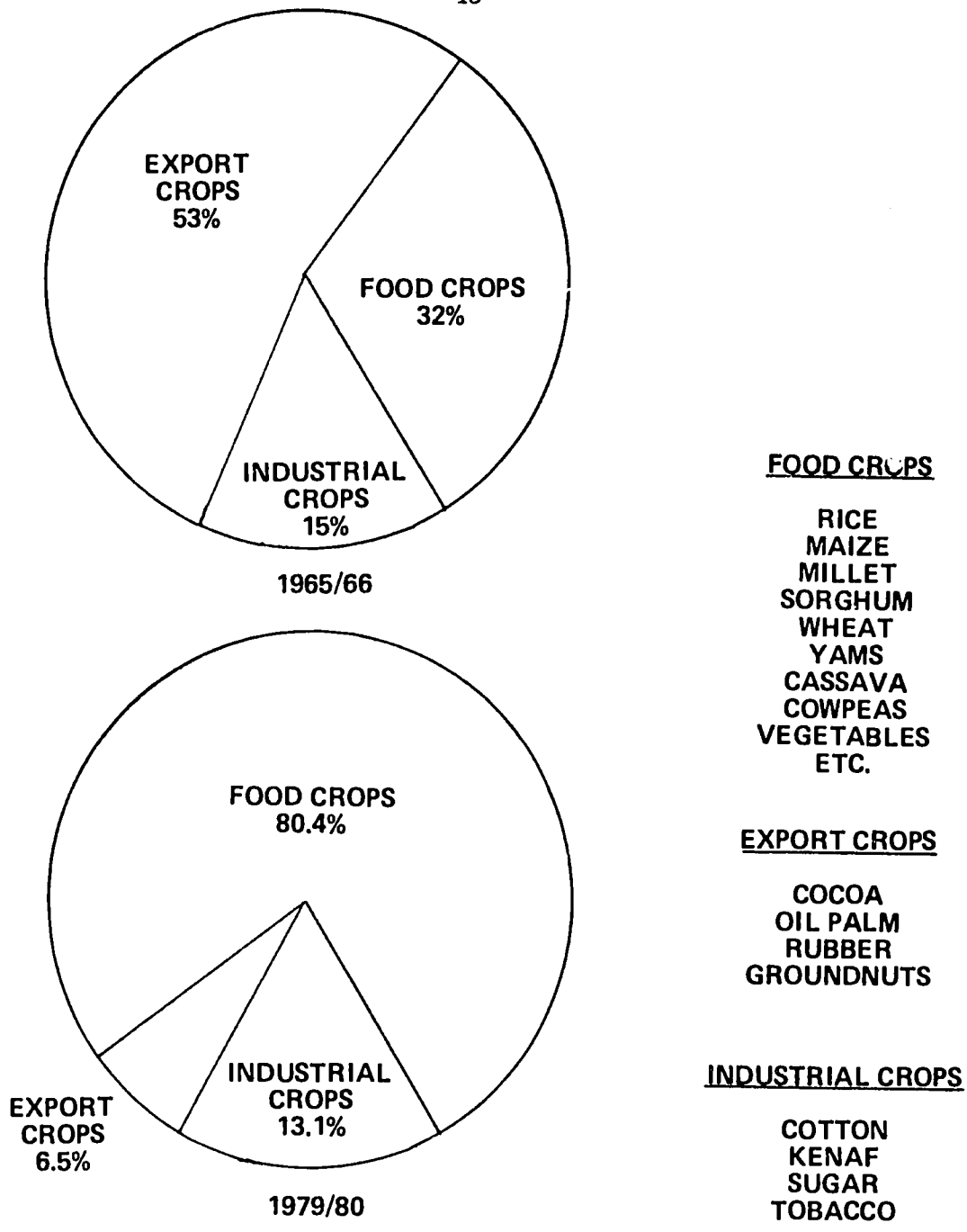
State	Product	Nutrient Equivalent N	P_2O_5	K	Total
	(tons)				
Anambra	7,071	1,027	963	1,050	3,040
Bauchi	32,500	6,129	2,875	637	9,641
Bendel	1,855	340	71	345	756
Benue	14,819	3,462	863	624	4,949
Borno	12,000	1,297	1,538	520	3,355
Cross River	1,500	101	58	139	298
Gongola	15,125	3,585	1,478	734	5,797
Imo	10,048	1,376	945	1,530	3,851
Kaduna	36,700	5,923	3,986	752	10,661
Kano	36,935	5,782	5,277	203	11,262
Kwara	7,150	1,652	734	830	3,216
Lagos	107	20	10	5	35
Niger	15,200	2,756	1,477	180	4,413
Ogun	3,698	653	329	406	1,388
Ondo	8,000	1,508	916	623	3,047
Oyo	10,827	2,108	1,697	1,301	5,106
Plateau	25,475	4,719	1,798	364	6,881
Rivers	1,200	366	90	90	546
Sokoto	23,754	3,415	2,407	986	6,808
Nigeria	263,964	46,219	27,512	11,319	85,050

Note: Includes amounts used by The World Bank agricultural development projects, Nigerian Tobacco Company, and Nigerian Sugar Company.

Consumption by Crops

During the 1960s and the early part of the 1970s, more than 60% of the fertilizer used in Nigerian agriculture was for nonfood crops, groundnuts, and cotton in the northern region and cocoa, oil palm, and tobacco in the southern half of the country. The food crops (millet, sorghum, maize, rice, yams, cassava, and cowpeas) accounted for less than 35% of total fertilizer use (19). The situation seemed to have been reversed in recent years (Figure 9).

IFDC has provided the most recent estimates of fertilizer consumption by crops. According to the IFDC study, only 14% of the cultivated crop areas received fertilizer in 1979. Sorghum and millet received the largest amount of fertilizer in 1979 although fertilizer usage per hectare was lower than that for many other crops. These two crops represented 40% of Nigeria's fertilizer usage in 1979 (Table 23).



Source: International Fertilizer Development Center. 1980. Nigeria Fertilizer Marketing Study, Muscle Shoals, Alabama.

Figure 9. Consumption of Fertilizer by Major Categories of Crops in Nigeria.

Types of Users

Previous fertilizer demand studies have identified four categories of users.

They are:

1. Small farmers, whose consumption is reflected in the states' Ministry of Agriculture fertilizer supply and subsidy programs;

Table 23. Nutrient Consumption by Crops, Nigeria, 1979/80 (6)

	Total Consumption of Nutrients, Tons			
	N	P_2O_5	K_2O	Total
Cassava	446	233	496	1,175
Citrus	3	1	0	4
Cocoa	1,204	629	417	2,250
Cotton	4,281	1,917	0	6,198
Cowpeas	0	1,662	0	1,662
Groundnuts	0	1,960	0	1,960
Sorghum	11,295	7,175	1,690	20,160
Maize	7,041	2,589	290	9,920
Millet	8,019	4,272	1,080	13,371
Oil palm	290	134	388	812
Potatoes	621	243	210	1,074
Rice	6,148	2,253	1,017	9,418
Rubber	67	52	50	169
Cocoyams	48	38	2	88
Soya bean	0	17	0	17
Sugarcane	2,183	1,283	1,546	5,012
Tobacco	619	485	662	1,766
Vegetables	991	389	609	1,989
Wheat	275	84	0	359
Yams	2,688	2,096	2,862	7,646
TOTAL	46,219	27,512	11,319	85,050

2. Institutional users, such as the agricultural research institutes, universities, etc.;
3. The consumption of plantations (public and private) may or may not be reflected in the states' Ministry of Agriculture purchases;
4. Participants in government-directed agricultural projects such as The World Bank-sponsored agricultural development projects, farm settlement schemes, NAFPP, etc.

Evidence abounds to show that of these four categories of users, it is the category one user whose consumption trend has remained volatile and unstable. Consumption in a number of states in past years is more a function of availability (time, place, and amounts) than of actual demand. How much would have been consumed had fertilizer been available at the right time and in ample quantities is often a matter of pure conjecture.

Factors Influencing Fertilizer Use

A number of factors have constrained the level of fertilizer use in Nigeria in the past. Some of the factors have been well documented in previous studies (33, 34, 35). Important among the factors are:

1. The cultural practice of shifting cultivation,
2. Absence of fertilizer-responsive varieties for certain crops,

3. Moisture stress (particularly in the drier areas of the North),
4. Inadequate technological and extension support,
5. Lack of credit, and
6. Deficiencies in the procurement and delivery system.

Several changes have occurred recently, and some are pending that had led or could lead to greater use of fertilizer, particularly on food crops. Factors that have favored increased use of fertilizers by farmers in recent years include:

1. Favorable input:crop price ratio;
2. Expansion of land under irrigation;
3. Increased availability of institutionalized agricultural credit to farmers;
4. Increasing availability of high-yielding varieties of seed (particularly maize and sorghum); and
5. Various agricultural development programs, such as the NAFPP, OFN, and The World Bank-supported agricultural development projects.

These factors have been recognized as important in influencing farmers' consumption of fertilizers. However, until there are microlevel systematic studies based on behavorial models identifying the critical variables influencing fertilizer consumption over time as well as over space, they should be treated as suggestive rather than as diagnostic and prescriptive.

Fertilizer Use Projections

There is no best way to accurately project future fertilizer use in Nigeria. Simple trend analysis has not proved to be a very accurate method of forecasting use. The time period chosen to calculate the slope of the line can distort the real long-run growth pattern.

In 1965 TVA projected that fertilizer consumption in 1970 would be 40,000 tons of plant nutrients. This would be equal to approximately 200,000 tons of products if the nutrient level was the same as that used in 1965 (36). In 1970 the government reported an import of 27,959 tons of product. Consumption was estimated to be 7,000 tons of nutrients, which was less than 15% of projected use.

Estimates of nutrient requirements for 1980 which were prepared by FAO in the mid-1960s, for example, are about six times the amounts currently used (37) (see Table 24).

Another method that has been used to project future use is to base forecasts on crop-by-crop projections of the proportion of land likely to be fertilized and to multiply these estimates by probable changes in average application rates. Estimates of total nutrient use that have been made using this method have been closer to actual use levels (33, 35) (see Table 24).

Table 24. Nigeria Fertilizer Consumption Forecasts, 1979/80

Authors	N	P_2O_5	K_2O	Total
	('000 tons)			
Trend projection[a]	170.0	235.0	95.0	500.0
Linear trend method[b]	59.0	80.0	20.6	
Crop-budgeting technique	20.9	35.1	13.0	69.0
Crop-budgeting technique[c]	47.0	44.2	18.2	109.4
States' fertilizer requirements (1975)[d] (reported by Wells et al.)	30.1	26.8	7.1	64.0
Trend projection[e]	19.3	17.6	8.1	45.0
Actual consumption	46.0	28.0	11.0	85.0

a. (37).
b. (34).
c. (33).
d. (35).
e. (38).

Projections

A wide range of policy and technology variables is likely to influence future fertilizer consumption in Nigeria, and any estimates are only as good as assumptions about these variables. A few of the variables that will have substantial impact on future consumption are:

1. Future availability of fertilizer, when needed, including physical infrastructure for distribution;
2. Future fertilizer promotion efforts including extension, NAFPP, and The World Bank agricultural development projects;
3. Price relationships of crops and fertilizer;
4. Future development of irrigation facilities;
5. Government policies including credit, subsidies, research, and extension;
6. Farmers' knowledge of fertilizer recommendations and their agronomic response;
7. Total area suitable for crops;
8. Mix of crop and area of each;

9. Effects of weather on consumption; and

10. Effects of future world fertilizer market conditions.

The longer the horizon, the more unreliable are assumptions relating to these variables.

An IFDC study has recently been completed which bases forecasts of future fertilizer use on crop-by-crop projections of the proportion of land likely to be fertilized and the probable changes in average application rates (19).

Projections of plant nutrient use from the study are shown in Table 25. Plant nutrient use is projected to increase from 85,000 tons in 1979/80 to 236,000 tons by 1984/85. Despite the threefold projected increase in use, per-hectare consumption will still be less than 10 kg which is very low, compared to world standards. The relative contribution of individual crops to future growth in plant nutrient use is shown in Tables 26-28.

Table 25. Projected Aggregate Use of Plant Nutrients, 1980/81 - 1984/85 (19)

Year	N	P_2O_5	K_2O	Total
	('000 tons)			
1980/81	57	36	13	106
1981/82	68	44	16	128
1982/83	80	52	18	151
1983/84	101	66	23	190
1984/85	129	79	28	236

Table 26. Projected Nitrogen Use on Different Crops, 1980/81 - 1984/85 (19)

Crops	1980/81	1981/82	1982/83	1983/84	1984/85
	(tons)				
Food Grains					
Sorghum	14,275	17,545	21,017	26,889	34,685
Millet	10,303	12,829	15,532	20,062	26,069
Maize	8,642	10,385	12,216	15,416	19,743
Rice	7,354	8,627	9,936	12,274	15,424
Wheat	337	398	467	588	751
Groundnuts	-	-	-	-	-
Cowpeas	-	-	-	-	-
Soybeans	-	-	-	-	-
Food Crops Other Than Food Grains					
Yams	3,192	3,717	4,248	5,214	6,497
Cassava	513	579	642	765	927
Potatoes	751	888	1,031	1,282	1,618
Oil Palm	385	493	610	802	1,063
Vegetables	1,192	1,403	1,623	2,014	2,540
Nonfood Commercial Crops					
Cocoa	1,474	1,764	2,068	2,648	3,437
Cotton	4,991	5,709	6,410	7,734	9,480
Rubber	83	98	114	141	178
Sugarcane	2,600	3,032	3,468	4,265	5,330
Tobacco	710	800	885	1,052	1,273

Table 27. Projected Phosphate Use on Different Crops, 1980/81 - 1984/85 (19)

Crops	1980/81	1981/82	1982/83	1983/84	1984/85
	(tons)				
Food Grains					
Sorghum	9,536	12,063	14,613	18,677	22,654
Millet	5,770	7,394	9,051	11,678	14,268
Maize	3,349	4,149	4,943	6,241	7,525
Rice	2,831	3,414	3,972	4,898	5,782
Wheat	109	132	157	197	237
Groundnuts	2,491	3,037	3,559	4,427	5,259
Cowpeas	2,147	2,651	3,225	4,044	4,839
Food Crops Other Than Food Grains					
Yams	2,618	3,137	3,625	4,444	5,207
Cassava	282	327	367	437	498
Potatoes	309	377	442	549	652
Oil Palm	184	240	297	387	479
Vegetables	491	595	696	863	1,023
Nonfood Commercial Crops					
Cocoa	810	998	1,1[illegible]2	1,512	1,845
Cotton	2,351	2,767	3,142	3,786	4,363
Rubber	68	83	97	121	143
Sugarcane	1,607	1,929	2,230	2,741	3,220
Tobacco	585	678	759	901	1,025

Table 28. Projected Potassium Use on Different Crops, 1980/81 - 1984/85 (19)

Crops	1980/81	1981/82	1982/83	1983/84	1984/85
	(tons)				
Food Grains					
Sorghum	2,070	2,556	3,045	3,906	4,770
Millet	1,329	1,647	1,967	2,532	3,114
Maize	352	434	516	663	818
Rice	1,173	1,376	1,569	1,937	2,298
Wheat	-	-	-	-	-
Groundnuts	-	-	-	-	-
Cowpeas	-	-	-	-	-
Food Crops Other Than Food Grains					
Yams	3,300	3,868	4,401	5,423	6,421
Cassava	553	629	694	830	956
Potatoes	247	294	341	426	512
Oil Palm	492	626	763	1,000	1,250
Vegetables	712	844	972	1,212	1,454
Nonfood Commercial Crops					
Cocoa	495	597	697	896	1,105
Cotton	-	-	-	-	-
Rubber	61	72	84	104	125
Sugarcane	1,788	2,098	2,390	2,951	3,504
Tobacco	738	836	921	1,100	1,265

The tables show that the food grains will contribute significantly to increase in use. Sixty-eight percent of the total ($N + P_2O_5 + K_2O$) plant nutrient use between 1980/81 and 1984/85 will be on millet, sorghum, maize, rice, wheat, groundnuts, and cowpeas.

The nonfood commercial crops (cocoa, cotton, rubber, sugarcane, and tobacco) are expected to use 17% of the total plant nutrients while the rest will be used on the tubers, root crops, oil palm, and other minor crops.

Fertilizer Materials

Aggregate use of fertilizer materials is shown in Tables 29 and 30. The figures are based on different assumptions as to the fertilizer products supplying the required nutrients. If 1979/80 use patterns were to remain the same up to 1985, aggregate demand will increase from 408,780 tons in 1980/81 to 796,475 tons in 1984/85. It is safe to assume that when the urea-based fertilizer factory comes on stream around 1983/84 higher nutrient-analysis fertilizer, such as urea, diammonium phosphate (DAP), 19-19-19, and 28-28-0, will become available. Projected aggregate use of fertilizer materials based on this assumption is shown in Table 30. There is a 16% reduction in tonnage. This reduction in tonnage will affect marketing costs.

Table 29. Projected Aggregate Use by Fertilizer Products (Alternative 1) (19)

Product	1980/81	1981/82	1982/83	1983/84	1984/85
	(tons)				
Urea	44,780	55,425	69,440	82,460	108,500
CAN	57,664	70,927	75,460	88,550	119,350
AS	45,522	51,420	57,120	71,400	85,680
SSP) BSSP)	130,650	170,593	197,580	227,550	283,050
MOP	10,000	11,235	11,680	12,165	14,170
28-28-0	-	-	-	-	-
19-19-19	-	-	-	-	-
15-15-15	57,664	50,510	56,610	83,250	96,570
12-12-17 + 2 Mg	25,500	17,300	20,110	20,825	29,155
20-20-0	37,000	31,365	37,000	50,000	60,000
DAP	-	-	-	-	-
TOTAL	408,780	462,775	525,000	636,200	796,475

Table 30. Projected Aggregate Use by Fertilizer Products (Alternative 2) (19)

Product	1980/81	1981/82	1982/83	1983/84	1984/85
	(tons)				
Urea	44,780	55,425	97,190	170,990	212,397
CAN	57,664	70,927	36,065	-	-
AS	45,522	51,420	2,325	-	-
SSP) BSSP)	130,650	170,593	95,075	148,395	184,322
MOP	10,000	11,235	6,328	7,050	8,764
28-28-0	-	-	60,791	97,090	120,597
19-19-19	-	-	70,727	115,820	143,868
15-15-15	57,664	50,510	31,617	-	-
12-12-17 + 2 Mg	25,500	17,300	-	-	-
20-20-0	37,000	31,365	20,926	-	-
DAP	-	-	4,217	7,050	8,764
TOTAL	408,780	462,775	425,261	546,400	678,700

Recommendations

Improved Statistical Reporting

Timely and accurate information on fertilizer imports, production, sales, and consumption is vitally needed by the government and private industry to plan intelligently the development and operation of the fertilizer sector. Data currently available from several public agencies are fragmented and inadequate and often inaccurate. It is recommended that the National Committee on Fertilizer Industry Development be assigned the responsibility and given the necessary authority for determining data needs and the procedures for collecting, assembling primary-source data, compiling it in a standardized form, and publishing it on a regular basis. The following information should be published in an annual "Fertilizer Situation in Nigeria" report which would be presented to the Government and made available to all interested parties.

1. Imports by product and nutrient content;
2. Domestic production by product and nutrient content;
3. Deliveries by product and by region;
4. Year-end stocks held by importers, producers, and government agencies;
5. Apparent consumption by product and nutrient content, by crop, by states, by farm types;
6. Wholesale and retail prices of fertilizer by grade;

7. Prices received by farmers for principal crops;
8. Factors affecting fertilizer production and consumption during the past year;
9. Short- and long-term fertilizer supply/demand outlook; and
10. Recommendations for avoiding or alleviating supply/demand problems.

Improved Methods of Demand Forecasting

National Committee on Fertilizer Industry Development should provide the leadership in ensuring a scientific basis for demand estimation. Estimation of fertilizer demand should be done with reference to three time frames:

--long-term (5-10 years) estimation of demand,

--medium-term (3-5 years) demand forecasting, and

--estimation of the next year's (next season's) demand.

From the fertilizer import and distribution angle, the annual demand estimation exercise assumes the highest importance.

The annual fertilizer demand estimation has to be a two-stage exercise. Firstly, the State Government/Project Authority/River Basin Development Authority (RBDA) has to calculate its requirements, keeping in view the:

--area under different crops,

--past consumption trends with reference to crops grown,

--the future program of high-yielding, fertilizer-responsive varieties,

--extent of irrigation and the likely extension in area,

--the type of fertilizer consumed and the cost:benefit ratio obtained, and

--likely credit support.

This exercise should be done by LGAs and by districts to build up the state totals. Once the consolidated demand is indicated by each state (The World Bank Agricultural Development Project/River Basin Development Authority) to the Federal Government in the prescribed proforma, the National Committee on Fertilizer Industry Development in consultation with the FMARD would determine if the targets of HYV, irrigation, additional food production, etc., are consistent with the planned targets and the preceding year's achievements and, finally, the quantity of nutrients required. Such consolidated figures of national demand for nutrients would then be converted into acceptable finished products, in accordance with the special agro-ecological needs of each state.

Fertilizer Demand Studies

The National Committee on Fertilizer Industry Development should initiate fertilizer demand studies to:

1. Identify the factors influencing the adoption and continued use of fertilizers among small farmers;
2. Estimate fertilizer-demand functions at national, state, and district levels and the most relevant demand elasticities for fertilizer; and
3. Generate basic information needed for evaluation and formulation of a national fertilizer policy.

CHAPTER 6
FERTILIZER SUPPLY

From the projections in Chapter 5 it was shown that Nigerian agriculture is expected to consume 236,000 tons of nutrient by 1985. The quantity of fertilizer materials supplying the projected nutrient use could vary between 679,000 and 797,000 tons, depending on the types and grades of fertilizer used to supply nutrients.

Increased demand for fertilizers can be met from domestic production and/or imports. Availability of foreign exchange determines the capacity to import. Availability of raw materials is an important consideration for domestic production.

Lacking until recently a fertilizer production facility and having a relatively undeveloped domestic fertilizer industry, Nigeria relies almost entirely on imports to satisfy its demand for fertilizer raw materials and finished fertilizers.

Domestic production and import contributions to annual fertilizer supply for the period 1965-80 are shown in Table 31.

Table 31. Nigeria Fertilizer Supply, 1965-80

Year	Imports	Domestic Production	Total
	(tons)		
1965	35,467	-	35,467
1966	30,515	-	30,515
1967	65,843	-	65,843
1968	39,188	-	39,188
1969	43,206	-	43,206
1970	28,106	-	28,106
1971	39,173	-	39,173
1972	76,083	-	76,085
1973	60,960	-	60,960
1974	83,960	-	83,960
1975	150,963	-	150,963
1976	207,000	21,601	228,601
1977	299,500	20,523	320,023
1978	189,000	17,305	206,305
1979	394,300	35,000	429,300
1980	500,000	NA	500,000

Sources: For years 1965-79 (42); for 1980 planned imports (43).

Domestic Production

Raw Material for Fertilizer

Availability of raw materials is always an important consideration for domestic production of fertilizers.

Natural gas is the principal raw material for the production of ammonia, the predominant basic nitrogen fertilizer material. Currently over 70% of the world's ammonia is produced from natural gas; the remainder is produced mainly from coal, fuel oil, and naphtha. For countries, such as Nigeria, that have large reserves of oil and natural gas and are energy exporters, natural gas is clearly the most economical feedstock for the production of ammonia. Ammonia plants utilizing natural gas are less capital-intensive and less complex when compared with plants utilizing other feedstocks.

Nigeria has proven reserves of natural gas of $4^2 \times 10^{12}$ ft^3. These reserves are adequate for Nigeria to become a major producer of ammonia and other nitrogen fertilizers, such as urea, produced from ammonia. For example, three 1,000-tpd ammonia plants operating for 15 years (typical operating life) would require only about 1% of the proven natural gas reserves. Nigeria's current annual production of natural gas is 365.6 billion ft^3 (40). Based on utilization of 50% of this current gas production for ammonia, about seventeen 1,000-tpd ammonia plants could be operated.

Therefore, in the evaluation of alternative uses for the domestic reserves of natural gas, Nigeria should consider the production of ammonia and other nitrogen fertilizers for export beyond the level presently planned. Nigeria could become a major supplier of nitrogen fertilizers for other African countries and possibly Europe, North America, and other countries where ammonia feedstocks are more expensive. Also Nigeria should consider bartering nitrogen fertilizers for phosphate fertilizers with other African countries such as Upper Volta, Togo, Mali, and Senegal that have phosphate rock reserves but inadequate reserves of raw material for nitrogen fertilizer production.

A phosphate deposit has been reported in southwestern Nigeria by H. A. Jones (41). However, the deposit has not been developed commercially.

Nigeria does not have any known deposits of potash ores. Potassic fertilizer requirements would continue to be met by imports.

Installed Capacity

Prior to 1976 all fertilizers used in Nigeria were imported. On January 5, 1976, the country produced its first fertilizer in the form of 18% P_2O_5 SSP manufactured by FSFC, Kaduna. The superphosphate factory was designed to produce 100,000 tons annually.

At the present time all materials used in the production of superphosphate are imported. Phosphate rock is imported from Togo while elemental sulfur is purchased on the world markets for the production of sulfuric acid. The sulfuric acid plant is rated at 42,000 tpy of 98% sulfuric acid.

Capacity Utilization--Annual production at the Kaduna plant has been at 20%-35% of designed capacity as shown in the following:

Year	Tons	Utilization, %
1976	21,601	21.6
1977	20,523	20.5
1978[a]	17,305	17.3
1979	35,000	35.0

a. Estimate.

Some of the constraints leading to low-capacity utilization are shortages of electricity and water, availability of raw materials, and production techniques (19).

Proposals--A nitrogenous fertilizer plant is planned for Port Harcourt. The planned designed capacity is 1,000 tpd of ammonia and 1,700 tpd of urea. The project would also provide facilities for the production of compound fertilizers. The plant, which is expected to be constructed by Pullman Kellogg, is anticipated to come on stream by 1983.

Fertilizer Imports

Pattern of Import Development

Following an irregular growth pattern in the earlier years, imports increased from 35,467 tons in 1965 to 500,000 tons in 1980 as shown in Figure 10. This represented a 14-fold increase in imports. As noted in Table 32, nutrient tonnage rose from 5,480 to 162,750 tons, corresponding to about a 30-fold increase or approximately double the product increase. The average annual rate of growth was about 20% on a product basis and about 25% on a nutrient basis.

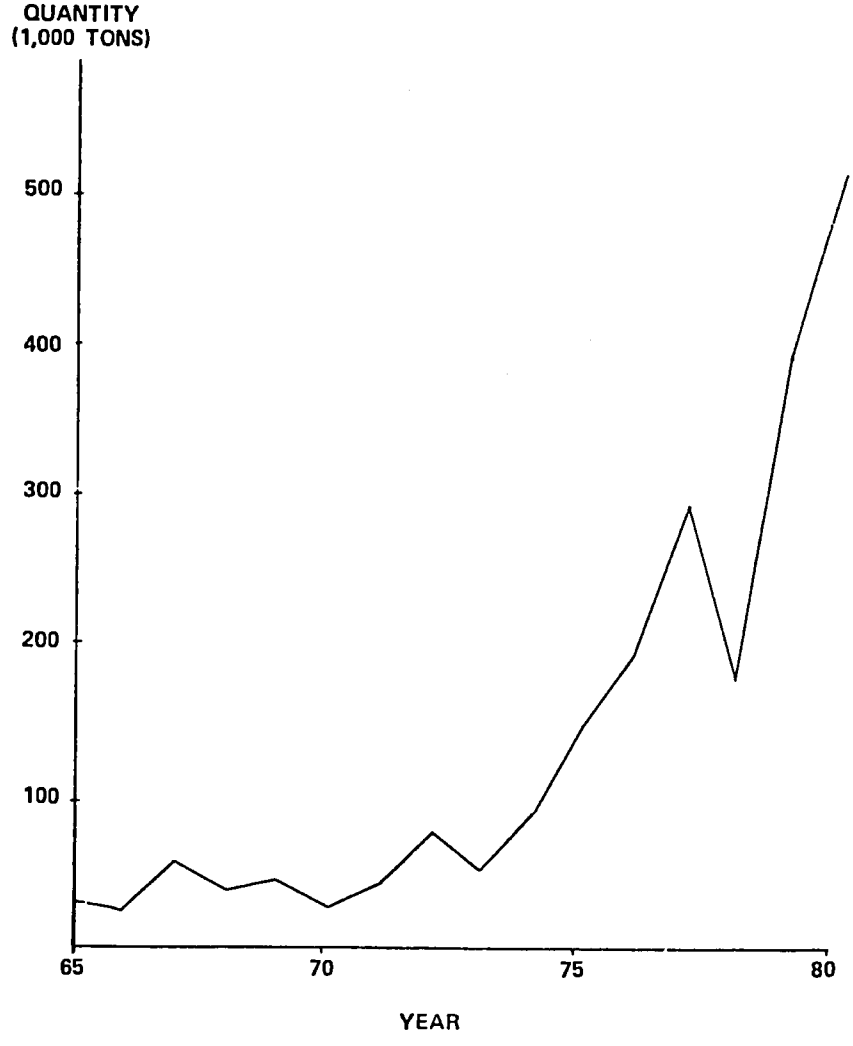


Figure 10. Trend in Fertilizer Imports to Nigeria, 1965-80.

Table 32. Nigeria Fertilizer Imports, 1960 - 80 (42)

Year	Fertilizer Product	Nutrient Content			
		N	P_2O_5	K_2O	Total
	(tons)				
1965	35,467	1,996	2,154	1,330	5,480
1966	30,515	3,324	4,480	1,617	9,421
1967	65,843	5,911	7,181	2,092	15,184
1968	39,188	3,675	4,972	255	8,902
1969	43,206	3,493	6,726	1,236	11,455
1970	28,106	2,908	3,471	1,218	7,597
1971	39,173	5,088	5,311	1,787	12,186
1972	76,085	11,150	6,883	3,446	21,479
1973	60,960	2,352	8,056	6,522	16,930
1974	83,960	2,353	14,440	904	17,697
1975	152,963	18,868	12,395	2,880	34,143
1976	207,000	31,043	20,908	4,443	56,394
1977	299,500	50,650	24,700	9,200	84,550
1978	189,000	31,720	18,450	4,500	54,670
1979	394,300	66,474	40,614	15,861	122,949
1980[a]	500,000	86,580	53,810	22,360	162,750

a. Planned import.

Structure of Imports

The general increase in fertilizer imports was also accompanied by interesting changes in the composition of imports.

Nitrogenous Fertilizers--The share of nitrogenous fertilizers in total imports averaged about 36% between 1965 and 1968. Between 1968 and 1974 the share in total imports exhibited wide fluctuations ranging from a high of 43% in 1972 to a low of 10% in 1969. Between 1975 and 1980 the share of nitrogenous fertilizers in total imports increased again, accounting for about 40% on the average. Apart from the increased share in total imports, there was also a shift to higher analysis fertilizers as indicated in Tables 33 and 34.

Table 33. Types of Fertilizers Imported, 1965 - 80 (42, 43)

	1965	1970	1975	1980[a]
	(tons)			
Straight materials				
Nitrogen[b]	14,834	7,233	83,308	182,000
Phosphate[c]	10,660	14,329	62,588	130,000
Potash[d]	3,273	1,355	4,605	10,000
Subtotal	28,767	22,917	150,501	322,000
Multinutrient fertilizers				
NP fertilizers[e]	2,570	1,114	300	70,000
NPK fertilizers[f]	4,130	4,095	1,162	108,000
Subtotal	6,700	5,209	1,462	178,000
TOTAL	35,467	28,106	151,963	500,000

a. Planned imports.
b. Principally ammonium sulfate.
c. Principally normal superphosphate.
d. Principally muriate of potash.
e. Principally 26-12-0 and 20-20-0.
f. Principally 15-15-15 and 12-12-17 + 2 Mg.

Table 34. Import of Fertilizer by Products, 1976 - 80 (42, 43)

Fertilizer	1976	1977	1978	1979	1980
	(tons)				
Urea	7,648	30,000	26,000	36,000	40,000
Ammonium sulfate	16,482	30,000	12,000	40,000	40,000
Calcium ammonium nitrate	3,293	60,000	44,000	59,000	102,000
Superphosphate	9,843	50,000	43,000	72,000	80,000
Boronated superphosphate	-	20,000	20,000	32,000	50,000
15-15-15	9,867	45,000	20,000	72,000	100,000
26-12-0	5,867	40,000	6,000	32,000	25,000
20-20-0	-	500	15,000	27,000	45,000
12-12-17 + 2	-	-	-	6,000	8,000
18-18-7	-	-	-	6,300	-
Muriate of potash	-	10,000	2,500	6,000	10,000
$CaMgSO_4$	-	4,000	500	6,000	-
Lime	-	8,000	-	-	-
15-15-6-4	-	700	-	-	-
TOTAL	53,000[a]	298,200	189,000	394,300	500,000

a. Federal Government purchase after the centralization of purchases. States had purchased approximately 154,000 tons prior to the centralization of purchase.

Phosphatic Fertilizers--Historically, phosphatic fertilizers constitute the most important fertilizer imported to Nigeria. Phosphatic fertilizers accounted for about 50% of total imports between 1965 and 1976. The importance of phosphatic fertilizers to Nigerian agriculture could not be overstated in view of the widespread phosphate deficiency of most Nigerian soils, particularly in the north, and the large removal of phosphorus from the soil by the annual crops of groundnuts and cotton. In recent years the share of phosphatic fertilizers in total imports is less than one-third. This could be attributed to the increased emphasis being placed on multinutrient fertilization and, hence, the increasing use of mixed fertilizers.

Potassic Fertilizers--Fertilizers of the potassic group have not been of as great importance in the total import figure, seldom exceeding 6% of total imports (except for the occasional spurts in 1965 and 1973). This situation could be attributed to the fact that most Nigerian soils appear to be well supplied with potassium. Apart from plantation requirements for use on such crops as rubber, oil palm, sugarcane, and tobacco, the use of straight potash fertilizer is uncommon in most Nigerian farms.

Multinutrient Mixed Fertilizers--The position of the mixed fertilizers was the reverse of the nitrogenous and phosphatic fertilizers. The group declined from 19% of total fertilizer imports in 1965 to less than 1% in 1975. Imports rose between 1969 and 1972, with the group accounting for about 28%, 19%, 48%, and 18%, respectively, of total imports (Tables 33 and 34).

The decline (both in absolute and relative terms) of multinutrient fertilizers is attributable to the fact that most of the fertilizer experiments carried out in the 1960s emphasized the use of single-nutrient fertilizers. This is particularly true of the northern region of Nigeria, where virtually all the fertilizer recommendations suggest the use of single-nutrient types (AS and SSP). However, in the late 1960s and early 1970s, fertilizer recommendations in western, eastern, and midwestern sections emphasized the use of multinutrient fertilizers on rice, yams, maize, and cassava, and also the export crops, cocoa, rubber, and oil palm.

Primarily as a result of the increasing emphasis on balanced fertilization, the proportion of multinutrient fertilizers in total imports has increased in recent years and now accounts for about 35% of total imports.

Import Sources--Over 80% of the fertilizer imports into Nigeria come from Western Europe. West Germany, the Netherlands, Italy, United Kingdom, and Belgium-Luxembourg are the major sources (42).

Import Costs--Table 35 shows the trend in world fertilizer prices. Fertilizer prices rose sharply in 1974, primarily as a result of the 1973 world energy crisis. Prices of fertilizer stabilized in late 1974 and showed a downward trend until 1976. Between 1976 and 1978 fertilizer prices stabilized. However, during 1979 prices increased again. After 1979 urea prices increased 37%; triple superphosphate (TSP) prices, 81%; and potash prices, 71%. In addition, freight costs have increased substantially because of higher fuel costs (44).

Table 35. Trends in World Fertilizer Prices (44)

Material	1972	1973	1974	1975	1976	1977	1978	1979
Ammonium sulfate[a]	35	42	150	56	40	65	65	80
Urea[b]	60	95	316	198	115	140	150	205
TSP[c]	68	100	304	202	97	110	105	190
DAP[c]	91	119	333	225	135	138	155	250
MOP[b]	34	43	60	81	55	51	63	108
15-15-15[b]	78	90	260	160	115	140	145	200

a. $ per ton, f.o.b. Western Europe in bulk.
b. $ per ton, f.o.b. Western Europe in bags.
c. $ per ton, f.o.b. U.S. Gulf in bulk.

Table 36 shows the trend in unit import costs of fertilizers in Nigeria. Fertilizer costs have been high in Nigeria primarily because of the uncoordinated small volume of purchases made by the respective regional/state governments prior to 1976, the tight world market situation in the early 1970s, the high and unstable transocean freight rates, and the recent price increases among the major manufacturers in Western Europe.

Based on an IFDC assessment of the world fertilizer situation (45) and informed opinion of market analysts, all indications point toward higher import prices for the major fertilizer products in the next few years.

Recommendations for Improving Fertilizer Supply System

1. A plan for improving production and efficiency in the SSP plant should be developed and closely monitored. A capacity utilization of 70%-80% could be reasonably expected. This would significantly reduce the cost of production.

2. The Nigerian Government should place a high priority on the completion of the planned Port Harcourt ammonia/urea complex and on achievement of an efficient operation after construction is completed. Likewise, similar emphasis should be placed on the associated NPK plant to permit maximum

Table 36. Development of the c.i.f. Import Prices of the Major Fertilizer Types in Nigerian Ports, 1970/71 - 1980/81

Product	Average Import Price, ₦/Ton							
	1970/71	1971/72	1972/73	1973/74	1974/75	1975/76	1979/80	1980/81
Ammonium sulfate	44.0	52.0	60.0	82.0	115.0	115.0	90.0	108.0
Urea	-	-	-	-	-	-	123.0	135.0
Single superphosphate	32.0	51.0	60.0	70.0	105.0	109.0	67.0	88.0
Muriate of potash	44.0	59.0	64.0	66.0	94.0	125.1	84.0	115.0
15-15-15	60.0	70.0	75.0	130.0	145.0	166.5	117.7	152.0
25-10-0	60.0	66.0	66.0	104.0	120.0	164.0	-	-
20-20-0	-	-	-	-	-	-	116.0	149.0
12-12-17-2	-	-	-	-	-	-	123.0	156.7

Sources: Figures for 1970-74 (33).
Figures for 1975-78 (46).
Figures for 1979-81 (44).

utilization of the ammonia/urea product as the source of nitrogen for the domestically produced NPK products. Alternative sources of phosphatic fertilizers for the NPK plant should be adequately explored to ensure the most economic source.

3. Nigeria has an abundant supply of natural gas reserves. Annual production has reached 365.6 billion ft^3. This is enough feedstock for an additional sixteen 1,000-tpd ammonia plants. Nigeria should give consideration to building several more ammonia plants and becoming a major source of nitrogen fertilizers in the world.

4. Studies should be initiated by the NCFID to evaluate means of minimizing the cost of imported fertilizer raw materials, intermediate products, and finished products.

5. The Nigerian Government, working within the framework of ECOWAS, should initiate studies on the potential for regional cooperation in fertilizer production. For example, it might be possible for Nigeria to exchange ammonia and/or urea for phosphate materials at a basic cost.

CHAPTER 7
DISTRIBUTION OF FERTILIZER PRODUCTS

The realization of the potential of fertilizers to assist in solving Nigeria's food problem is dependent on three important factors. These are:

1. The rate and the level at which effective demand can be generated for fertilizers by Nigerian farmers,

2. The rate at which supplies can be enlarged to keep pace with increasing demand, and

3. The creation of an adequate and efficient distribution system for supplies.

While the first two factors have been discussed in earlier chapters, attention will be focused on fertilizer distribution in this chapter.

Organizational Structure

An examination of the fertilizer distribution system in Nigeria reveals that it has undergone gradual transformation.

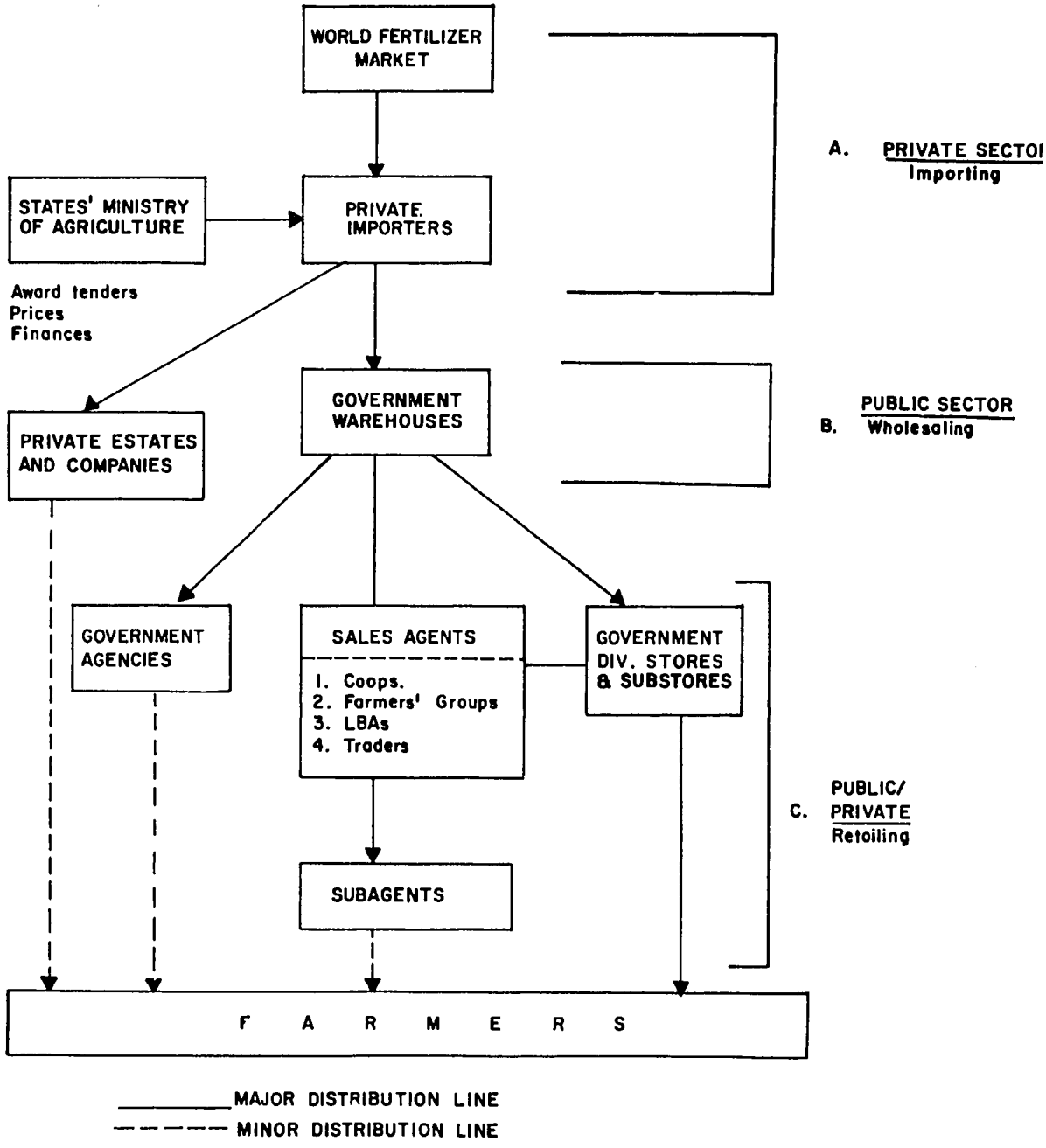
Prior to 1976

As reported in Falusi and Adubifa's study (33), characteristic features of the fertilizer procurement and distribution system were its highly decentralized, loosely coordinated nature and its high public-sector control. All planning, organization, and operation of fertilizer marketing and distribution came under the responsibility of the state (formerly region) Ministries of Agriculture.

There was no national policy and coordination on such matters as procurement, distribution, and pricing. Federal Government presence was felt only in the allocation of capital grants to states (formerly regions) for agricultural development, part of which went toward their fertilizer supply and subsidy scheme.

The organizational structure of the system is illustrated in Figure 11. In each state, the Ministry of Agriculture acting on behalf of the government:

1. Estimates the amount of fertilizer that is required during the cropping period,



Source: International Fertilizer Development Center. 1980. Nigeria Fertilizer Marketing Study, Muscle Shoals, Alabama.

Figure 11. Channels of Fertilizer Distribution, 1967-75.

2. Requests tender for the supply of the desired amount through imports, and

3. Organizes distribution to farmers.

Private-sector plantations such as NTC, Phillip Morris, and NSC import some small amounts.

After 1976

During the 1976/77 fiscal year, the Federal Military Government decided to centralize the purchase of fertilizers and distribute to the states according to their requirements.

A Fertilizer Procurement Unit was established within the Federal Ministry of Agriculture and Water Resources (FMAWR) to plan the organization of procurement and primary distribution of fertilizers to the states' warehouses. Primary responsibility for distribution within states is still vested in states' Ministries of Agriculture extension officers, allowing State governments to maintain control over retailing (see Figure 12).

The major reasons which led to change could be summarized as follows:

1. The usual late award of tender contracts by State governments and consequently late arrival of fertilizers at the ports,

2. The problems of coordination between different importing states in the matter of arrival of ships at Nigerian ports, causing heavy bunching and excessive demurrage payments,

3. Delays in evacuation and difficulties in arranging for transportation to state warehouses,

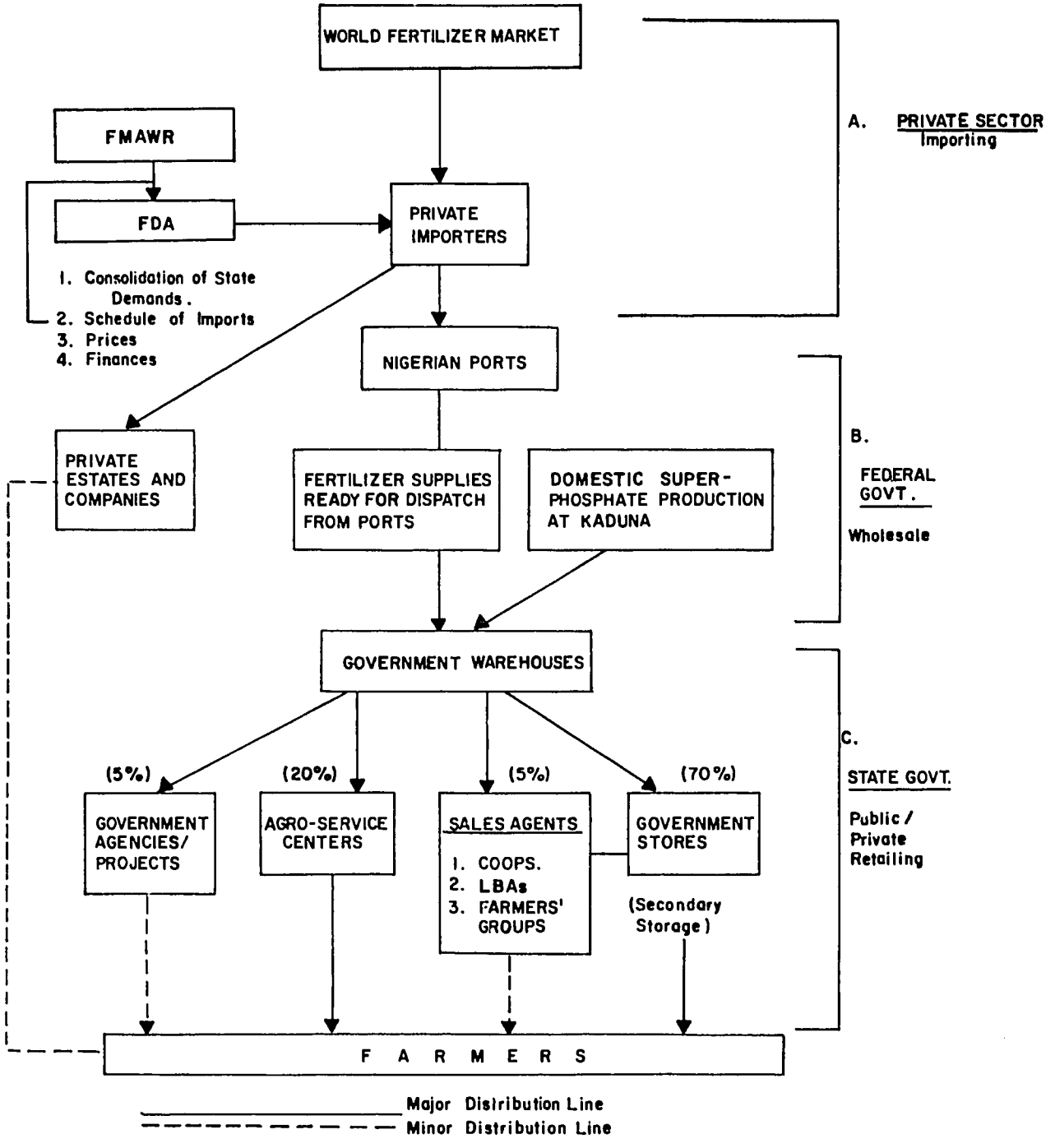
4. The importation of similar fertilizer materials by different states at unjustifiably different prices, and

5. The problems of pricing and administration of subsidies in a decentralized operation.

Logistics

Procurement

The process of central purchasing was jointly carried out by FDA and the National Committee of OFN. Purchasing still involves the following basic steps:



Source: International Fertilizer Development Center. 1980. Nigeria Fertilizer Marketing Study, Muscle Shoals, Alabama.

Figure 12. Channels of Fertilizer Distribution, 1976-80.

1. States and special agricultural project areas forecast and send in their fertilizer requirements to the Fertilizer Procurement Unit of FMAWR.

2. The quantities ordered by the states are normally high since they suspect that their order will be scaled down. The requirements are discussed, and quantities for each type of fertilizer are determined and approval sought from the Federal Executive Council.

3. Tenders are offered for the supply of the desired quantities through imports and/or local production.

4. A contract agreement is drawn up and awarded to the successful bidders. Project specification and schedules of delivery are given in the contract agreement. To guard against nonperformance, some penalty clauses are included in the contract agreement.

5. Irrevocable letters of credit are opened through the Central Bank of Nigeria to the supplier's bankers. These letters are nontransferable.

Port Delivery

Delivery of fertilizers to Nigeria begins with vessel arrival at the ports. The major ports are Lagos, Port Harcourt, Warri, and Calabar. During the 1978/79 cropping season, approximately 70% of the total fertilizer imports was imported through Lagos and 25% through Port Harcourt.

In drawing up the contract agreement with importers, specific instructions are given as to the type and size of bags, procedure in arrival of ships, type and size of ships to be used, and unloading procedures.

In the schedule of delivery, fertilizers used as a primary application are scheduled to arrive first and are distributed throughout the country using the rainfall distribution pattern as an order of priority. Thus, the southern states where the rainy season arrives early are first to receive their consignments. Priority in berthing in the ports has been given to vessels bringing fertilizers. The number of berths allocated to fertilizer ships was increased from two to six during the 1977/78 cropping season.

Transport

Road--Road transport is used primarily for hauling fertilizer from the ports to state warehouses. During the 1978/79 cropping season, more than 90% of the fertilizer import was hauled by road transport. Eighty-seven transporters were approved to move

fertilizers from the ports to the state central warehouses (43). Road transport is the exclusive means of secondary movement of fertilizers from the states' central warehouses to district depots and subdepots as well as the agro-service centers.

There have been major improvements over the past few years in the trunk road system connecting the state capitals and the major cities in the country. In the Third National Development Plan, a combined Federal and state expenditure of over ₦5 billion had been allocated. Secondary roads to local government headquarters are generally classed as all-weather roads, but beyond this level many of the roads down to village level are laterite (dirt) and not passable by truck during much of the wet season.

Railways--The Nigerian railway system comprises some 3,500 km of 3-ft 6-in (1,067-mm) narrow-gauge single-track line. The system is essentially "H"-shaped, with lines running to the north of the country from Lagos and Port Harcourt, with a cross connection between Kaduna and Kafanchan.

The system operated efficiently until about 1964 and moved agricultural produce from the northern regions to the ports and fuel, building materials, and other essential commodities to the north. A series of droughts and the oil boom in the mid-1960s changed the whole balance of traffic, and this was followed by the civil war in the late 1960s, with total disruption and damage to the eastern part of the system and a considerable loss of rolling stock. Since 1970 emphasis in the Development Plans has been on the improvement of roads and road transport. Even with this emphasis, the roads have continued to deteriorate because of poor maintenance. The system was in poor condition throughout, including track, rolling stock, and communications. Toward the end of 1978, the Government arranged for Rail India Technical and Economic Services, Ltd., to take over operation of the railway system for 3 years to improve operating efficiency.

In 1977 the Federal Military Government commissioned a study by Rail India Technical and Economic Services, Ltd., into the need for conversion from narrow gauge to standard gauge, together with a plan for investment over the next 20 years (47). The percentage of fertilizer hauled by the railway corporations was less than 10% of total imports during the 1977/78 cropping season.

Warehousing

Fertilizer is usually stored at two levels, the states' central depots and the local government depots--farm service centers/ agro-service centers. The average storage capacity of the central depots is 15,000 tons while storage capacities in the smaller depots range from 500 to 3,000 tons. There has been an expansion of fertilizer storage facilities in Nigeria in recent years. This has been made possible by:

1. The increased budget allocations by the respective state governments,

2. The storage facilities provided in The World Bank-supported integrated agricultural development projects,

3. The financial grants given by the Federal Government to states to increase their number of fertilizer stores,[1] and

4. The establishment of agro-service centers.[2]

The warehouse capacity in each state as of November 1979 is shown in Table 37. The total storage capacity amounts to 478,000 tons.

Packaging--There are two major types of bags used for fertilizer packaging in Nigeria. Imported fertilizer is packed in the 50-kg woven polypropylene outer bag with a polyethylene liner.

FSFC uses heat-sealed 25-kg bags of extruded polyethylene. Many small farmers prefer the 25-kg bag size because it is a lighter head load and may be all that they want to apply on some plots.

Advantages of the "export" (woven polypropylene) bag are its strength which allows the bag to be handled with little danger of bag failure and the 50-kg size which is generally preferred by larger users and those involved with transportation and storage.

Distribution Costs

One of the main reasons for high domestic fertilizer prices in Nigeria is the high cost of internal distribution. True distribution costs are difficult to obtain. Often, cost of personnel (involved in fertilizer promotion and distribution), cost of administration, credit, shrinkage, interest on working capital, warehousing cost, and secondary movement of stocks to the farm are either totally ignored or seriously underestimated.[3]

Some of the identifiable cost components of the distribution system are discussed below.

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1. In 1977 the Federal Government made available the sum of ₦60,000 to each state for the construction of standard fertilizer stores.
2. In the 1977/78 fiscal year, the Federal Government approved the establishment of 187 agro-service centers throughout the federation and allocated the sum of ₦18.7 million for the project.
3. Fertilizer promotion costs have always been borne by the State Ministry of Agriculture Extension Service.

Table 37. Fertilizer Warehousing Capacity by States, 1979/80 (19)

State	Number of Warehouses	Total Storage Capacity -(tons)-
Anambra	22	11,800
Bauchi	54	26,500
Bendel	14	10,400
Benue	36	25,800
Borno	57	35,000
Cross River	11	9,600
Gongola	30	41,250
Imo	28	13,000
Kaduna	204	57,000
Kano	114	56,310
Kwara	58	40,000
Lagos	8	4,000
Niger	29	23,500
Ogun	13	9,500
Ondo	46	13,500
Oyo	26	26,000
Plateau	35	30,000
Rivers	15	4,000
Sokoto	163	41,000
TOTAL	963	478,160

Transportation Costs

Transportation cost accounts for 70%-80% of the cost of internal distribution in Nigeria.

Road Transport--More than 80% of the primary movement of fertilizer from the ports/factory to the state warehouses is by road transportation.. Road transport rates are high. The rates paid by FMARD for movement of fertilizers from the ports (Lagos and Port Harcourt) are shown in Table 38. For secondary and tertiary distribution between states, rates vary between ₦0.08 and ₦0.15/ton/km, depending on the physical condition and commercial relevance of the road. Transport costs usually rise due to breakdown of economical long-distance fares into sections with relatively higher medium- and short-distance fares.

Rail Transport--Railway costs are by far less than road costs. On long-distance hauls, rates for fertilizer in NRC wagons

Table 38. Road Freight Rates for Fertilizer Movement--Government Schedules, 1979/80[a] (43)

	Ex-Lagos		Ex-Port Harcourt		Ex-Kaduna	
		(km)				
Zone 1	Abeokuta	99	Owerri	95	Minna	158
₦22/ton	Ibadan	140	Calabar	178	Jos	177
			Enugu	266	Kano	255
Zone 2	Ilorin	294	Benin	328	Bauchi	400
₦35/ton	Akure	300			Sokoto	472
	Benin	313			Maiduguri	851
Zone 3	Minna	716	Akure	494	Makurdi	488
₦50/ton	Kaduna	875	Makurdi	572	Yola	800
	Jos	1,051	Ibadan	622		
	Kano	1,114	Abeokuta	647		
			Lagos	652		
			Ilorin	666		
			Jos	856		
			Yola	1,110		
Zone 4	Makurdi	800				
₦60/ton	Sokoto	1,006				
	Bauchi	1,264				
	Yola	1,400				
	Maiduguri	1,633				
Zone 5			Maiduguri	1,434		
₦65/ton			Sokoto	1,484		

a. Costs include loading and offloading.

as full wagonloads are about ₦0.01/tons/km. Current tariffs are shown in Table 39. Although freight rates are less when fertilizer is shipped by rail, there are other costs involved which present a disadvantage in comparison with transport by private trucks. Rail transport is from station to station so there is the

Table 39. Rail Freight Rates for Fertilizer Movement, 1978[a] (47)

Kilometer	Per Ton	Kobo/Ton/km
100	2.40	2.4
200	3.35	1.7
300	4.40	1.5
400	5.35	1.34
500	6.40	1.28
600	7.35	1.22
700	8.30	1.19
800	9.15	1.14
900	10.05	1.12
1,000	10.90	1.09
1,100	11.65	1.06
1,200	12.30	1.02
1,300	13.00	1.00
1,400	13.60	0.97

a. Rates for fertilizer are for full wagonloads. The carrying capacity of a wagon is 35 tons.

added cost of truck transport and handling at both ends. Another real deterrent to the use of railways for the transport of fertilizer is that the extra handling could cause considerable damage to the fertilizer bags and loss of materials. Additionally, there is a shortage of rail wagons; thus, bookings for space have to be made far in advance, whereas private trucks can be mobilized without delay.

Warehousing Costs

It is very difficult to calculate the cost of warehousing since fertilizers remain in some state warehouses for long periods of time, often up to 3 years. During the 1978/79 cropping season, many state governments charged ₦3/tons for primary storage and ₦1.50/tons for secondary storage (19). Such charges appeared to bear no relationship to length of storage, amortized value of owned stores/rent on hired stores, and functional use of stores (whether multipurpose or not).

A very important cost item which could affect the c. & f. price at the state warehouse was the storage cost at the ports.

After the 72 hours' free storage periods, Port Authority charges for the use of the warehouses are:

1st-6th day	₦0.15/tpd
7th-12th day	₦0.30/tpd
After 12 days	₦0.60/tpd

Sometimes fertilizers are stored at the ports for a period of 30 days or more. Unavoidable delays at the ports due to transportation bottlenecks could constitute a serious cost-increasing component of the distribution system.

Other Costs

Frequent movement of stacks between primary warehouses and district stores leads to increased handling costs. Many states charge ₦2/tons for handling (loading and unloading). Stevedoring charges at the port, port charges, customs inspection, and document clearance were ₦10/tons during the 1978/79 season. Probable demurrage charges at the ports, costs of rebagging broken bags, and losses due to fertilizer caking can make the cost of distribution very high.

Comparison of Prior and Current Distribution Systems

A comparative analysis of the major issues in the two distribution systems (1967-75 and 1976-79) is summarized in Table 40.

Table 40. Major Issues of Fertilizer Distribution in Nigeria, 1967-75 and 1976-79

Items	1967-75 A	1976-79 B
Import procedures	Through government tenders by the respective State governments.	Centralized ordering through tenders of State's requirements by the Federal Government
Marketing channels	State government extension service through registered sales agents to farmers.	State government extension service and agro-service centers. Phasing out of sales agents.
Logistics Transport	Rail and road transportation from ports to state warehouses. Secondary and tertiary movement within state by government transport.	Increasing trend to rely on private (road) transportation.
Storage	State-owned stores at two levels: central warehouses, district depots, and subdepots.	Increasing trend toward expansion of State-owned stores.
Pricing	Uniform fixed retail price within state. (Deviation state to state, 25% maximum).	Uniform fixed retail price all over the country.
Dealers' margin	Fixed ₦2-5/ton	Not applicable.
Subsidies	Granted at state level. (Approximately 50% c. & f. price state warehouse, excluding cost of government administration.	75% of the c. & f. price State warehouse. (Federal Government absorbs 50%; State government absorbs 25%). Excluding cost of government administration and transportation within states.
Sales promotion	Exclusive use of extension personnel of states' MANR. Limited private-sector involvement.	Same as in System A.

The availability of fertilizers in the country has increased substantially since 1976. While the funds allocated to the fertilizer supply and subsidy schemes have gone up tremendously within the past 3 years, the centralization of purchases has also led to economies of scale in prices paid for imports.

There has been expansion of port facilities in Nigeria (8). There is an improved synchronization of import arrival schedules with evacuation from the ports. Since there is usually no overcrowding of ships at the ports, this invariably has reduced the chance of demurrage that might arise from ships' overstaying at the Nigerian ports.

There has also been speedier evacuation of fertilizers from the ports compared to the past system. More fertilizer stores have also been built in the country.

The establishment of agro-service centers has provided a greater opportunity for farmers to purchase fertilizer and other essential crop production inputs. The agro-service concept has made it possible for a greater number of farmers to see results of fertilization in demonstration and have access to an improved package of technology.

Even though the fertilizer supply situation has eased when compared to that of previous years, it is equally true that the present arrangement for distribution of fertilizers has been equally costly, if not more so.

Fertilizer prices are still very high because of the high cost of internal distribution. Distribution costs have increased due to higher general wages paid for stevedoring, increased port charges, and an increased transportation cost resulting from an almost exclusive use of road transportation to the neglect of the cheaper rail rates. Trucking rates have increased almost 75% between 1973 and 1979. Handling costs have also increased significantly.

The present storage policy and its trend toward increasing the number of stores, particularly at the local government areas, will no doubt shorten the distance between the farmer and the retailer. However, it will lead to increased distribution cost because storage costs will rise by the increase in the number of storekeepers and watchmen and the increased workload (on departmental staff) of supervision and control; handling cost and breakage will rise with each transaction between the main store and substore; and transport cost will rise due to the breakdown of economical long-distance fares into intersections with relatively higher medium- and short-distance fares. The system still emphasizes distribution and not a complete marketing concept.

Opportunities to Improve Marketing of Fertilizers

It is becoming increasingly clear that the present system of fertilizer distribution in Nigeria has not been cost effective. The method of applying subsidies prevents cost recovery and participation by the commercial companies, whose distribution systems are far more extensive and, therefore, places the whole responsibility on government departments which have neither the physical facilities nor the incentive to perform effectively.

Opportunities to improve on the efficiency of fertilizer marketing exist in Nigeria. Ways of improving the marketing of fertilizers include the following:

1. Develop a commercial-type operation for the management of all aspects of fertilizer marketing.

2. Maintain or reduce the cost of fertilizers to the farmer and to the country by developing a more efficient transport system using rail, river, and water means.

3. Intensify the farmer education programs on fertilizer use.

4. Make fertilizers and other essential crop producton inputs not only available but closer to the farmer through the same marketing channel.

5. Develop a production and marketing system that will supply the required plant nutrients for maximum crop yields to the farmers at the least cost to the Nigerian economy. This includes from low- to high-analysis fertilizers.

6. Enhance the farmer's purchasing power through better produce prices, marketing facilities, and credit opportunities.

7. Develop a means for collecting the necessary base data from which to plan and base operations.

8. Develop a more precise fertilizer recommendation for optimum crop yields in each farming area based on soil and climatic conditions.

9. Develop an agricultural communications system for dissemination of research findings, market information, successful transfer of technology, product availability and awareness, and crop production data.

10. Provide a means for personnel development concerned with managing the fertilizer industry.

11. Develop a limestone industry that will complement the use of fertilizers.

CHAPTER 8
FERTILIZER PRICING

Fertilizer prices have been statutorily fixed by the Government in Nigeria. The present price policy is to sell fertilizers at uniform prices to farmers throughout the country. The Government also provides a subsidy on the estimated retail price of fertilizers.

The rationale behind the system of subsidy and control on fertilizer prices through the administrative process is to be twofold:

1. To provide farmers with an incentive for fertilizer use by reducing the commercial farm-level cost of fertilizers, thereby enhancing its profitability, and

2. To treat all agricultural producers equally regardless of location, thereby facilitating a more even geographical pattern of consumption.

Pricing Mechanism

In the previous decentralized distribution system, each State government was responsible for determining fertilizer prices at the retail level. Differences in prices together with unavailability of supplies frequently led to illegal movements of fertilizers across state borders (33).

In the present system, the Federal Government is responsible for determining prices to be paid by the farmers. The retail price of fertilizer is the c. & f. price plus the port charges and transportation cost to state warehouses less subsidy.

The price setting corresponds to a cost-plus approach even though it does not account for all the costs taken into account as pointed out in the previous chapter.

Prices

As reported in earlier studies (33), the fertilizer prices prevailing in the decentralized system (1967-76) were not only unchanged for several years but were about the same as those which prevailed during 1977/78. This indicates that the real fertilizer prices paid by farmers have been declining over time, and the increased costs of fertilizer import and distribution have been borne by the Nigerian Government through increased fertilizer subsidies.

Table 41 shows the Federal Government fixed farmers' prices of fertilizers between 1976/77 and 1979/80. During 1979/80 fertilizer prices were increased by 10%-20% over 1978/79 levels.

Table 41. Farmers' (Subsidized) Prices for Fertilizers in Nigeria 1976/77 - 1979/80 (42)

Type of Fertilizer	1976/77	1977/78	1978/79	1979/80
	(N/50-kg bag)			
AS	1.5	1.5	1.5	1.80
CAN	1.5	1.5	1.5	1.80
Urea	2.0	2.0	2.0	2.25
SSP	1.5	1.5	1.5	1.80
BSSP	1.5	1.5	1.5	1.80
MOP	1.5	1.5	1.5	1.80
15-15-15	2.0	2.0	2.0	2.20
20-20-0	2.0	2.0	2.0	2.20
26-12-0	2.0	2.0	2.0	2.20
18-18-7	2.0	2.0	2.0	2.20
12-12-17-2	2.0	2.0	2.0	2.20

There has also been a more favorable fertilizer crop:price ratio. At fertilizer and crop prices prevailing in 1979, less than 1 kg of rice (paddy) and less than 2 kg of maize and sorghum are required to pay for 1 kg of plant nutrients (Table 42).

Table 42. Relationship Between the Prices of Selected Food Grains and Plant Nutrients in Nigeria (19)

Product	Kg of Product to Pay for 1 kg of Plant Nutrient[a]		
	1970/71	1974/75	1978/79
Maize	3.2	2.3	1.3
Sorghum	3.3	2.6	1.55
Rice (Paddy)	1.9	1.4	0.71

a. Based on subsidized prices of AS and SSP producer market prices for the food crops. The cost per kilogram of plant nutrients obtained from urea, TSP, and high-analysis mixed fertilizer, of course, is less.

Subsidies

Fertilizer is very heavily subsidized in Nigeria. The Nigerian Government has chosen a high fertilizer subsidy policy in order to encourage consumption of fertilizer at the farm level. The subsidy given can be broken into two components--direct and indirect.

Direct Subsidies

Up to 1978/79 all fertilizer subsidy was borne by the Federal Government. The direct subsidy was 75% of the Federal price of fertilizer.

The subsidy was injected at two points in the fertilizer distribution chain--first at the Federal level and second at the State level. After the Federal Government procured the fertilizer, it was shipped to the State government warehouses. After the State government took title of the fertilizer, 50% of the price was reimbursed to the Federal Government. At the retail point, the farmer paid 50% of the state price for the fertilizer. The balance was absorbed by the State government.

The fertilizer subsidies and prices for each of the fertilizers used in Nigeria during 1979/80 are reported in Table 43. Based on the 1979/80 supply (import and domestic production) IFDC has estimated the total cost of direct fertilizer subsidy during 1979/80 to be ₦44.58 million out of which ₦30.14 million was borne by the Federal Government and ₦14.44 million by the State government (19).

Table 43. Fertilizer Price and Subsidy in Nigeria During 1979/80, ₦/50-kg Bag (19)

Fertilizer	Federal Price	Federal Subsidy	State Price	State Subsidy	Farmer Price
AS	7.00	3.50	3.50	1.70	1.80
CAN	7.55	3.78	3.77	1.47	1.80
SSP	6.05	3.02	3.03	1.23	1.80
Urea	9.00	4.50	4.50	2.25	2.25
BSSP	6.50	3.25	3.25	1.45	1.80
15-15-15	8.50	4.25	4.25	2.05	2.20
20-20-0	8.45	4.22	4.23	2.03	2.20
26-12-0	8.65	4.32	4.33	2.13	2.20
12-12-17-2	8.75	4.38	4.37	2.17	2.20
18-18-7	8.88	4.44	4.44	2.24	2.20
MOP	7.00	3.50	3.50	1.70	1.80
$CaMgSO_4$	9.05	4.52	4.53	2.28	2.25

Indirect Subsidies

The direct fertilizer subsidy does not account for many indirect costs of fertilizer distribution which are borne by both Federal and State governments. These include:

1. Interest on working capital;

2. Transportation, handling, and storage costs incurred by State governments in moving fertilizers from central warehouses to the district depots and agro-service centers; and

3. Costs involved in sales and other promotional programs provided by the Ministry of Agriculture.

IFDC has estimated the cost of indirect subsidy during 1979/80 to be ₦12.05 million. Approximately 80% of the indirect subsidy cost burden was borne by State governments and 20% by

the Federal Government. When the indirect subsidy costs are accounted for, the Federal Government's share in total subsidy cost drops from 66% to about 58%. The total cost of fertilizer subsidy policy in Nigeria during 1979/80 was ₦56.62 million (Table 44). Since all the fertilizer allocated to different states was not sold during 1979/80, the real share of subsidy cost to states may be lower than indicated by these calculations.

Effectiveness of Subsidies

The fertilizer price subsidy scheme has stimulated increased consumption of fertilizers among small-scale farmers in Nigeria. This is particularly true of farmers in the northern states. However, as a result of the heavy subsidy, there have been some obvious disadvantages. These include:

1. The lack of a cost-related approach in pricing Government services that went into the distribution system,

2. The disincentive effects of uniform pricing (with fixed margins) to private-sector participation in retailing activities, and

3. The increased burden on the Government budget.

A revision of the fertilizer subsidy scheme is urgently needed:

1. To better reflect the economic value of fertilizer,

2. To encourage an economic pattern of production,

3. To increase the availability of fertilizers, and

4. To ensure the growth of an economically viable commercial marketing system.

Table 44. Breakdown of Fertilizer Subsidy Into (a) Direct and Indirect Components and (b) Federal and State Government Share in Total Fertilizer Subsidy Cost in Nigeria, 1979/80 (19)

Fertilizer	Federal			State			Total		
	Direct	Indirect	Total	Direct	Indirect	Total	Direct	Indirect	Total
	(million ₦)								
AS	2.800	0.248	3.048	1.360	1.050	2.410	4.160	1.298	5.458
CAN	4.461	0.357	4.818	2.325	1.456	3.781	6.786	1.813	8.599
SSP	4.349	0.333	4.682	1.771	1.614	3.385	6.120	1.947	8.067
Urea	3.240	0.217	3.457	1.520	0.794	2.414	4.860	1.011	5.871
BSSP	2.080	0.170	2.250	0.928	0.773	1.701	3.008	0.943	3.951
15-15-15	6.120	0.497	6.617	2.952	1.848	4.800	9.072	2.345	11.417
20-20-0	2.279	0.184	2.463	1.096	0.685	1.781	3.375	0.869	4.244
26-12-0	2.765	0.226	2.991	1.363	0.831	2.194	4.128	1.057	5.185
12-12-17-2	0.526	0.043	0.569	0.260	0.155	0.415	0.786	0.198	0.984
18-18-7	0.560	0.046	0.606	0.282	0.165	0.447	0.842	0.211	1.053
MOP	0.420	0.029	0.449	0.204	0.126	0.330	0.624	0.155	0.779
$CaMgSO_4$	0.542	0.043	0.585	0.274	0.155	0.429	0.816	0.198	1.014
TOTAL	30.142	2.393	32.535	14.435	9.652	24.087	44.577	12.045	56.622
Percent	92.6	7.4	100.0	59.9	40.1	100.0	78.7	21.3	100.0
			57.5			42.5			100.0

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