ECONOMICS OF FERTILIZER DISTRIBUTION AND USE IN GONGOLA STATE

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A thesis submitted to the Postgraduate SchoolAhmadu Bello University, in partial-fulfilment of the requirements for the Degree of Master of Science in Agricultural economics

DEPARTMENT OF AGRICULTURAL, ECONOMICS
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DEDICATION

This thesis is dedicated to my husband Dan, and our children Terwase, Ember, Umbur and Erdoo.

ACKNOWLEDGEMENT

I am highly indebted to Dr. M.S. Krishnaswamy who closely supervised this work, and to Dr. S. Famoriyo for his invaluable suggestions. I am also grateful to Dr. K. Agori-Iwe for his assistance in analysing the data for this study and Dr. A.O. Ogunbile for his advice and encouragement.

My profound gratitude also goes to the Ministry of Agriculture and Cooperatives, Gongola State for the cooperation I received from their staff, without which this study might not have been possible. Most especially, I thank the Permanent Secretary, the Chief Agricultural Officer Mallam Babale Maikidi, and the Principal Agricultural Officer in charge of fertilizer procurement and distribution in the state, Mallam Suleiman Adabakin for their assistance. I also thank the Divisional Agricultural Officers of the [illegible], the extension staff and enumerators who participated in the study and the sampled farmers.

I am grateful to the Ministry of Education, Gongola State and the Centre for Social and Economic Research Ahmadu Bello University Zaria, for financing the study. I am grateful to Mr. Akin Fadahunsi, the Acting Director of the Centre and my colleagues at both the Centre and the Department of Agricultural Economics and Rural Sociology for their encouragement.

Finally I want to express my appreciation to Miss Floxy Uzo for typing both the first and final drafts of the thesis and, most especially of all, to God Almighty for seeing me through with the study.

ABSTRACT

The objective of this study has been to identify the problems confronting the fertilizer distribution programme, and fertilizer use in Gongola State of Nigeria.

To obtain the data necessary for this study, 152 farmers, both users and non-users of fertilizers from six villages in three Local Government Areas, 20 contract transporters of fertilizers, 15 extension workers, and nine store-keepers/ attendants were interviewed.

The study shows that problems facing the fertilizer distribution programme include transportation bottlenecks, absence of storage facilities at the village level, poor records of fertilizer inventory, dearth of trained manpower, use of extension staff to distribute fertilizers, administrative delays, unavailability of complementary inputs and farmers lack of knowledge about them and high fertilizer distribution costs. The major reasons cited for non-use and low level of use of fertilizers were cash constraints, non-availability of fertilizers especially at the time required, distance from fertilizer stores, lack of knowledge of how to use fertilizers. cost of applying fertilizers and the unavailability of complementary inputs. Statistical analysis (Multiple linear stepwise regression technique) *of* the relationship between the non-use aid low level of use of fertilizers, and some socio-economic variables was Jone. The results show that. income level, number of seasons of fertilizer use, distance "bo fertilizer

distance to fertilizer stores, means of fertilizer transportation from stores, frequency of extension contacts, membership of farmers' cooperative unions and availability of fertilizers were significant in affecting fertilizer use.

In addressing the afore mentioned problems, therefore, the promotion of the application of fertilizers in recommended quantities, and the use of improved management practices are of paramount importance in the production of an adequate food supply for Gongola State and the nation a whole.

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CHAPTER I

INTRODUCTION

1.1 The Importance of Fertilizers in Agricultural Production.

Researchers have established in many parts of the world today, that one of the surest and perhaps most effective ways of raising agricultural productivity is through the application of fertilizers, especially when combined with adequate water supply, improved seeds and good management practices (FAO, 1974). Indeed, in Nigeria where food production has degenerated to what many now regard as a crisis level, resulting in a serious deficit in food requirements, both the Federal Government and the World Bank have listed low fertilizer use level as being among the major factors responsible for this decline.[1] The Food and Agriculture Organisation, too, discovered in fertilizer trials in different locations in Nigeria between 1961 and 1967 that the use of fertilizers alone increased yields on the average by as much as 55 percent (Centre d'etude de L'Azote, 1967).

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1. Others are the shortage of requisite manpower, decreasing soil fertility, inadequate extension services, transportation bottlenecks, inadequate supportive services such as farm credit and marketing facilities, problems of landownership, low returns from agriculture, rural-urban migration, backward technology and population explosion (Oalaloku, 1979).

Table 1 below shows the importance of fertilizers in yield response.

Table 1 Maize Yield Data from a Series of Experiments at Selected Sites in Gongola State (1970).

Site	Yield without Fertilizers in kg. per Hectare	Yield with Fertilizers in kg. per Hectare		
		Type: Ammonium Sulphate	Type: Urea	Type: Calcium Ammonium Nitrate
Gembu[a]	1290	1210	1300	1200
Gwoza	587	2204	2226	2355
Hong	2355	3474	3063	3782
Numan	1771	3654	3846	4823

a. The Low yield response experienced in Gembu was probably caused by the application of the wrong fertilizers to the soil (Ministry of Natural Resources, 1978). In the course of the study the Ministry of Agriculture in Gongola State changed names from Ministry of Natural Resources in 1978 to Ministry of Agriculture and Cooperatives in 1979 and Ministry of Agriculture in 1981.

Source: Adapted from Ogborn (unpublished) in FAO/UNO "Report on the FAO/NORAD and Federal Department of Agriculture Seminar on Fertilizer Use Development in Nigeria, April 1 - 9, 1972, Ibadan, P. 132.

It is consequent to the decline in food production that, in 1980 alone, Nigeria imported as much as 1.5 billion naira worth of food (Abalu et al, 1981). Table 1.2 shows that the situation has been growing worse with time. The implication of this for the country's foreign exchange reserves and the economy as a whole cannot be ~~over~~emphasised.

Table 1.2. Value of Food Imports into Nigeria (₦'000).

Year	Food Imports
1971	87,910
1972	95,103
1973	126,250
1974	154,760
1975	298,805
1976	441,700
1978	1,020,700
1980	1,500,000

Source: Adapted from Nigerian Central Bank Review 1976 and Abalu et al 1981.

In view of this, it is necessary to raise the productivity of available land by modernising agriculture, through the use of inputs like fertilizers, improved seeds, chemicals, plus time - and labour-saving technologies for performing farm operations. This step will not only improve the economic position of 80-85 percent of the Nigerian population, whose livelihood is solely dependent on agricultural systems, but it would, in addition to solving the food deficit situation, be a source of foreign exchange for the country.[1] At the same time, it must not be forgotten that, "without the speedy increase in agricultural production, the conditions necessary for achieving steady social and economic progress are not fulfilled" (Centre d'etude de L'Azote, 1967). As of now, even though agriculture is the mainstay of the Nigerian economy, in the sense that over 80 percent of its population are dependent on it, the sector contributed only about 18.4 percent of the Gross Domestic Product in 1979, while the Petroleum Sector contributed nearly 70 percent (Federal Office of Statistics, 1980).

It is in recognition of the above that the Federal Government in the Fourth Plan allocated ₦972 million for agricultural inputs, of which ₦470 million or about 50 percent will be spent on fertilizers alone. State Governments too are expected to provide

1. Between 1950 and 1960, the agricultural sector in Nigeria contributed about 80 percent of the Gross Domestic Product (Eicher and Liedholm, 1970).

about ₦375 million for the purchase of fertilizers. Other agricultural programmes embarked upon by the Federal Government for the purpose of facing the challenge posed by food shortage include the Operation Feed The Nation of 1976, the National Accelerated Food Production Programme, National Seed Multiplication Programme, the establishment of River Basin Development Authorities, Agro-Service Centres, and the Green Revolution Programme which was started in 1979.

1.2 The Problem and Objectives of the Study.

In spite of the effectiveness of fertilizer use in increasing productivity of crops and hence farm income, the level of fertilizer use in Nigeria has remained low compared to farmers' level of awareness of the importance of fertilizers, recommendations based on research findings, and the level of fertilizer use in other countries (Robinson and Falusi, 1974). The recommended rates of fertilizer application for improved varieties range from 100 to 200 kilogrammes of nutrients per hectare, which is over three times the rate recommended for traditional varieties (Falusi and Adubifa, 1975). As of 1980/81 however, given that the requirement of fertilizers for that season was fully met and utilized, it has been estimated that the consumption rate of fertilizers per hectare in Nigeria could only reach 18.5 kilogrammes, of NPK as opposed for example to Japan's 474 kilogrammes, West Germany's 394 kilogrammes, USA's 92 kilogrammes and Brazil's 88 kilogrammes as of 1976. In fact it would even be lower than

the World actual average fertilizer consumption of about 68 kilogrammes per hectare (Sodanga, 1981).

While the moves by the Federal Government of Nigeria to increase fertilizer supply are no doubt steps in the right direction, the basic aim of this thesis, nevertheless, is to show that increasing fertilizer supply can at best be regarded as a necessary, and not in itself a sufficient condition for eliminating the fertilizer bottleneck in Nigeria. Equally, if not more important, is its distribution. In Gongola State where this study was carried out, the great discrepancy between requests for fertilizers by the State Government, the amount received by it from the Fertilizer Procurement and Distribution Division (FPDD), and the amount actually received and used[1] by farmers provides a prima-facie case to support this case.

On the basis of such preliminary evidence, therefore, this thesis aims to examine fertilizer distribution and use in Gongola State. A study of this nature at the state level is essential, because even though similar studies have been done at the national level, the problems of fertilizer distribution may vary from state to state depending on the locality. The results of such an investigation will hopefully be useful not only to Gongola State but also other states in the Federation, where food production

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1. It is assumed that lower fertilizer use figures mean less people used fertilizers in that locality, or that they used very small quantities.

has been adversely affected by an inefficient fertilizer distribution policy. To this effect, the study has as its central preoccupation the following specific objectives:

1) To study the present arrangements for the procurement of fertilizers at the state level and their distribution to the local government areas (LGAs) and farmers, and the operational and administrative problems involved.

2) To study the cost components, adequacy[1] and efficiency[2] of the fertilizer distribution system.

3) To find out farmers opinion on their level of satisfaction with the distribution programme with a view to identifying factors that limit their use of fertilizers.

4) To analyse the influence of factors identified by objective three.

5) And finally, to draw conclusions from the study and make recommendations for the improvement of the existing distribution machinery.

---

1 and 2 Adequacy and efficiency are defined here in terms of i) Physical quantities of fertilizers available for sale to farmers in the State's Local Governments ii The timeliness of fertilizer supply to farmers, iii) The cost at which it is made available for purchase to farmers, iv) The cost of distribution incurred by the State Government, v) Fertilizer storage facilities and their structure, vi) The operations of the fertilizer stores/depots and vii) The availability of sufficient manpower.

1.3. Outline of the Thesis.

The study is organised in the following manner:- Chapter one gives introductory information on the importance of fertilizers, especially, to Nigerian agriculture and the objectives of the study. Chapter two reviews literature on aspects of fertilizer distribution which are relevant to the study while Chapter three presents the methodology of the research and some background information on the area of study. Chapters four and five discuss empirical findings of the research on the organisational set up of the fertilizer distribution programme, factors influencing the distribution and level of use of fertilizers in Gonçola State and findings of farmers' survey related to fertilizer distribution and use. Finally Chapter six presents a summary of the research findings and recommendations for improving the distribution system in the state.

CHAPTER II

LITERATURE REVIEW

2.1. The Fertilizer Distribution Programme in Nigeria in Retrospect.

Planned attempts to promote fertilizer use in Nigeria was started in 1957 by the Governments of the then Northern, Eastern and Western Regions. These attempts were complemented by the Food and Agriculture Organisation/Freedom from Hunger Campaign (FAO/FFHC), whereby many European countries such as Western Germany donated fertilizers for demonstration trials to farmers. During the subsequent years, fertilizer use and importation rose steadily from less than 21,000 English tons of fertilizer materials or product in 1957 to over 66,000 tons in 1967, with years in between, when imports declined (Falusi, 1973). It, however, dropped again during the civil war years when the Federal Government embarked on foreign exchange - saving measures such as limited importation. The rise in fertilizer use over the last decade was attributed to the following reasons:-

a) the increase in awareness of the gains from fertilizer use by farmers
b) the subsidization of the retail price of fertilizers
c) and the availability of more information on the response of local varieties of crops to fertilizers (Falusi, 1973).

Up till 1975, the procurement of crop nutrients was solely the responsibility of the states. A lot of problems resulted from this

uncordinated approach. Due to recommendations made to the Federal Government by a team of experts from the Nigerian Institute of Social and Economic Research (NISER), however, the procurement process for the whole country was centralised in 1976, and it has remained so to this day (Falusi and Adubifa, 1975). Details of this National Policy on fertilizers are discussed later.

2.2 The Current Supply, Farmers Knowledge and Use of Fertilizers in Nigeria.

In Chapter one, the importance of fertilizer use as a means of solving the food deficit problem in Nigeria was briefly discussed. The use of fertilizers to solve this problem would, however, only be effective if, and only if, farmers know about fertilizers and how to use them. This in turn will depend on the supply of fertilizers to the farmers. The Food and Agriculture Organisation realized this and hence stressed that it was essential for the supply of fertilizers to be improved as a matter of urgency, because the demand for fertilizers in Nigeria seemed to be dictated by the supply situation (FAO, 197).

2.2.1. The supply of fertilizers.

The supply and distribution of fertilizers in Nigeria are controlled by the public sector and met partly through domestic production by the Federal Superphosphate Fertilizer Company (FSFC) situated in Kaduna and mainly through imports by the Fertilizer

Procurement and Distribution Division of the Federal Government, using private importers since 1976 (International Fertilizer Development Centre, 1981). The proportion of requirements met by import and domestic production[1] through time is shown in Table 2.1.

Table 2.1 Fertilizer Product Supply in Nigeria 1965-80 Tonnes.

Year	Import	Domestic Production	Total
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		76,083
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	N.a*	500,000

*not available

Source: International Fertilizer Development Centre Bulletin, June 1981, Page. 953

1. Domestic production of fertilizers in Nigeria only started in 1976.

The Fertilizer Procurement and Distribution Division is headed by a Director under the Federal Department of Agriculture and Cooperatives, which was then, the Federal Ministry of Agriculture. Due to the fact that there are no reliable statistics on the total yearly consumption of plant nutrients by type, nor on the increase in cropped hecterage and dosage, the estimation of demand for fertilizers in Nigeria and its supply depend on intelligent guesses. These guesses are based almost entirely on past experience and budgetary constraints (Sodangi, 1981). This situation arises because State Governments carry over to the next cropping season large inventories of fertilizers resulting from the imperfect synchronisation of the arrival of supplies at the ports and consequently at the state level, and the seasonal nature of fertilizer demand. This results in either over-supply or under-supply of fertilizers required for the season. Similar experience has also been documented in other countries such as Turkey, Iran, Pakistan etc (Central Asia Treaty Organisation, 1974). Table 2.2 shows an estimate made by the Nigerian Institute of Social and Economic Research (NISER) in 1975, of the National fertilizer requirements for the cropping seasons from 1975/76 to 1979/80 and the actual quantities that were supplied by the Fertilizer Procurement and Distribution Division. In three out

of the five years, the amount of nutrients supplied was smaller than the estimates, while in 1976/77 and 1979/80, there seemed to have been an over-supply of inputs. It is possible, however, that farmers could have used even much more fertilizers than the quantities actually supplied or estimated by NISER in the different years.

Table 2.2 Nigeria's Fertilizer Requirements, Estimates and Actuals, for the Cropping Seasons from 1975/76 to 1979/80.

Year	Estimated Requirements (NPK) Tonnes	Actual Delivery (NPK) Tonnes
1975/76	50,117	16,373
1976/77	62,607	130,213
1977/78	74,219	50,630
1978/79	89,981	75,000
1979/80	109,280	173,400
1980/81	296,597[1]	-

1. The figure was based on requests from states and projects for the 1980/81 cropping season.

Source: Sodangi, Fertilizer Distribution and Use in Nigeria, Problems in the Development of Increased Consumption, March 1981, Rome Italy.

On the whole, plant nutrient consumption has increased in Nigeria even though very slowly, from 0.62 kilogrammes per hectare in 1969/70 to 3.1 kilogrammes in 1977. When compared to consumption per hectare in other countries, which is shown in Table 2.3, this figure is indeed very low, the lowest except for the Republic of Zaire and Argentina. Consumption per hectare in Nigeria is, however, likely to have increased to a higher level than that by now, judging from the increasing quantities supplied.

This trend suggests that the use of fertilizers in Nigerian states is constrained by the unavailability of fertilizers.

2.2.2. Farmers' knowledge of and use of fertilizers.

In a case study of knowledge transfer in the Gusau Pilot Extension Project of Northern Nigeria, Daniels (1966), found that 95 percent of the farmers interviewed in the area were aware of the value of superhosphate. In a similar study in the same area Laurent (1968), found that 97 percent of farmers interviewed who used fertilizers, had heard of the Extension Demonstration Programme and had seen a demonstration plot in, or near the local villages, while the counterpart sample showed that an almost equal percentage (94 percent), who did not use fertilizers, were aware of the programme and most had seen one or more of the demonstration plots. This high degree of awareness clearly indicates that the extension service has been successful to an extent in exposing farmers to its programmes.

Table 2.3 Consumption of Fertilizers per Hectare in Selected Countries, 1977.

Country	Level of NPK (Kilogrammes)
Africa	12.4
World	68.0
Nigeria	3.1
Ghana	10.9
Zaire	1.4
Ivory Coast	5.2
Kenya	23.83
South Africa	41.52
U.A.R.	187.5
India	25.3
Japan	428.1
W. Pakistan	13.92
Phillipines	32.2
Thailand	15.6
W. Germany	422.0
U.K.	287.6
France	277.6
Canada	34.3
U.S.A.	99.5
Argentina	2.21
Brazil	77.4
Chile	32.89
Senegal	20.9

Source: FAO, An Annual Review of Fertilizer Consumption, Rome, Italy, 1978.

This is most especially true of cash crop-growing areas of the Northern States, for example Zaria, Kano, Gusau, and Gombe areas.

Extension Demonstration Programmes have also been successful in creating awareness of the use of fertilizers in the Southern States of Nigeria. In the Western State in 1968, for example, 58 percent of the farmers had heard agricultural radio programmes on fertilizer use, while 18 percent indicated that they had actually seen agricultural demonstrations on the same (Kidd, 1968). It is no wonder therefore that, much later in 1974, the FAO Fertilizer Mission to Nigeria, disagreed with the proposition that lack of knowledge of the benefits from fertilizer use limited its use in Nigeria (FAO, 1974). Generally, however, aggregate use of fertilizers is higher in the Northern States than in the Southern States (Robinson and Falusi, 1974), probably due to the relative predominance of tree crops in the South.

Table 2.4 gives an indication of the explosive rate at which the consumption of fertilizers is going up in Nigeria. Given this high level of awareness of the value of fertilizers by Nigerian farmers, there is an urgent need to establish an efficient fertilizer distribution system at the farmers' level in the country.

Table 2.4 Fertilizer Consumption in Nigeria from 1953 to 1980.

Year	Consumption NPK (Tonnes)
1953	603[1]
1960	3,337
1965	3,900
1970	10,682
1974	26,900
1978/79	75,000
1979/80	173,431
1980/81	296,591[2]

1. Includes consumption in the British Southern Cameroons

2. Based on requests from States and Projects for the 1980/81 cropping season.

Source: Idachaba et al, The Green Revolution: A Food Production Plan for Nigeria May, 1980.

2.3. Fertilizer Distribution Phases.

According to Eric de Guia (1972), the major successive phases of fertilizer distribution include the estimation of national requirements, the procurement of national supplies, primary and secondary movements of fertilizers, regional storage, and finally retailing to farmers. These phases and the institutions involved

with them need to be taken seriously, because the efficiency of any fertilizer distribution programme rests on the characteristics of these institution, and how well the different phases are handled. The five phases are briefly discussed below.

2.3.1. Estimation of national requirements for the cropping season.

This could be done either in an uncoordinated, or centralized manner, and based on the cropping pattern observed within the country and soil fertility. It is better for the estimation process, however, to be centralized or at least coordinated by one or two institutions. If it is uncoordinated, it means that fertilizer needs estimation is left to change as various distributing institutions make their own estimates for the market. The consequence of this could be an overestimation of some nutrients and possible under estimation of others.

2.3.2. Procurement of supplies.

Like the first phase, procurement of fertilizers is more efficient when it is coordinated or centralized in one institution. This institution must try and make sure that the national supply as envisaged in phase one is met, and is available in time for the planting season. Buffer stocks of fertilizers are also advisable in case of contingencies.

2.3.3. Primary and secondary supply movements.

When the supply of fertilizers arrive, they are kept normally in large quantities at some central storage points, mostly at the ports of entry. From here the fertilizers can be transported to the hinterland or regional depots in smaller quantities or in bulk. A good fertilizer distribution programme must use the least-cost and yet efficient modes of transport in order to avoid delays in the arrival of fertilizers at the farm gate. This can be done through special agreements with, for example, railway corporations who own the cheapest means of transport in most countries, to give lower freight rates and priority to fertilizer transportation (Brown, 1965; de Guia, 1972).

2.3.4. Regional storage.

The demand for fertilizers is seasonal in nature, and the consumers do not reside within factory premises. It is therefore essential for a good distribution programme to maintain regional depots where fertilizers could be stock-piled and yet adequately protected from changing weather conditions. These depots must be strategically located, so that in case of shortage in any place, fertilizers can be delivered with some amount of flexibility. The depots could be owned by the distributing institution or rented.

2.3.5. Retailing to farmers.

The activities of the institutions involved in this last phase of the distribution channel is very important, as it directly affects the farmer's level of fertilizer consumption (FAO, 1972; de Guia, 1972; Central Asia Treaty Organisation, 1974). The price of fertilizers must be reasonable since consumption could be discouraged otherwise. In addition, the extension of fertilizer credit to farmers by the retailing institution, some knowledge of agronomic practices and possibility of giving farmers technical advice are also characteristics of a good retailing institution (Central Asia Treaty Organisation, 1974; de Guia, 1972; Taiwan Food and Fertilizer Technology Centre, 1975). In Nigeria the estimation, procurement and primary movement of the national supplies of fertilizers are coordinated through one organisation - the Fertilizer Procurement and Distribution Division of the Federal Department of Agriculture and Cooperatives. Secondary - tertiary movement of fertilizers on the other hand, and regional storage and retailing to farmers are organised by the individual states of the Federation with fertilizer prices uniformly fixed at Government Level (International Fertilizer Development Centre, 1981).

2.4 Organisation of Fertilizer Distribution and the Institutions Involved.

One of the problems that researchers have been concerned with as regards the distribution of fertilizers to farmers, is its organisation. This is because, the efficiency of fertilizer distribution, that is, in terms of its timely availability in sufficient quantities to farmers and at reasonable prices, and the cost of distribution, is determined by the way the distribution system is organised.

Depending on the social goals, and stage of fertilizer use in a country, fertilizer distribution can be organised in several ways, or a combination of ways. de Guia, 1972 again, has classified the organisation of fertilizer distribution on the basis of such characteristics as the following:-

a) Ownership - that is whether the distribution system is owned by the public or private sector

b) Specialised clientele - where only specific types of customers such as members of a cooperative group is served

c) Horizontal Integration - which refers to the degree of centralization and coordination at the national level,

regardless of whether the distribution is managed by the public or private sector.

d) Vertical Integration - where fertilizer distribution is managed with the activities of institutions which are complementary to the distribution of fertilizers, such as the combination of activities of credit and extension agencies with fertilizer distribution.

e) The degree of government intervention - whether the public sector or government has absolute control of the distribution methods, pricing policy etc.and to what extent.

f) Nutrient specialization - where the distributing organisation deals only with a particular type of nutrient.

g) Permanence of the right to distribute fertilizers - that is whether the involvement in the distribution activities is for a limited period of time, such as for an agricultural crash programme or permanently .

h) Types of merchandise carried - whether the distributing institution specialises in transporting and distributing only fertilizers, or fertilizer and other inputs, or a wide range of goods.

i) Financial self-sufficiency - whether the distributing institution supports itself economically through profit-making or relies on government for funds.

j) Price objectives - whether the aim of the fertilizer distribution programme is to make nutrients available at the lowest prices, at reasonable prices at uniform prices or at stable prices.

k) Profit Orientation - whether the distributing institution is geared towards maximising its profit, a minimum rate of return, no-gain-no-loss or subsidised operations.

l) Retail policy- whether the policy is only to maintain fertilizer stocks at certain locations for anybody interested to buy - a kind of passive outlet, or whether sales promotion to raise the level of consumption of fertilizers is practiced.

For the purpose of this study, and bearing in mind the characteristics listed above, only distribution systems based on the degree of government intervention are discussed. Essentially, this includes distribution systems absolutely monopolised by the public sector as is the case, for example, in Nigeria and the

United Arab Republic, completely controlled by the private sector as for example, in Japan and the Phillipines and a mixture of both public and private control of the distribution system, as, for instance, in India.

2.4.1. Public sector-monopolised distribution system.

In this type of fertilizer distribution system, all the activities involved in distributing fertilizers and policies regarding the same are controlled by the government or centralized in a government agency as in the case of the Fertilizer Procurement and Distribution Division in Nigeria, and the Agricultural Credit and Cooperative Bank pyramid (A.C.C.B.) in the U.A.R. (Egypt), which is also concerned with the complementary activity of extending credit to farmers (Human Ahmed et al, 1969).

In Egypt, the Agricultural Credit and Cooperative Bank has a complete franchise for the purchase of all locally produced and imported fertilizers. After procuring the total national supply, the Bank allocates and delivers to the various governorates, their fixed quotas, based on cropping patterns in each region. At the retail end each village has a cooperative which distributes to each farmer a specified amount of fertilizers based on his farm holding-card which contains information

on the location of the farm, its size, and the crop rotation pattern prescribed for the plot of land. There are 4,000 such cooperative retail outlets at the village level and 171 stores above the village level which receive fertilizer supplies from six central warehouses in various governorates (Hammad Ahmed et al, 1969).

Agricultural Credit and Cooperative Bank outlets also sell fertilizers directly to farmers as well as cooperatives at a stabilised price. The bank can therefore, be regarded as a monolithic structure. The advantages of this type of centralization are that:

a) the best procurment prices of fertilizers can be negotiated locally and abroad.

b) there is a better control of fertilizer supplies and its internal movement.

c) under-supply risks are limited.

d) in times of shortage the limited fertilizers available can be channelled to more strategic crops.

These advantages, however, have to be weighted on the other hand, against:

a) the relative inefficiency with which public controlled institutions operate, and

b) administrative delays which can hinder the system from responding immediately to changes in fertilizer supply and demand conditions (de Guia, 1972).

2.4.2. Private sector controlled distribution system.

In this distribution system, there is no intervention whatsoever from the public sector. The procurement, supply and retailing of fertilizers are completely left in the hands of private firms. This is the case in Japan where the activities of fertilizer distribution are monopolised by one private firm, and in the Phillipines where several firms engage in fertilizer distribution activities. In the latter, there is no macro-level institution with the responsibility for estimating national requirements of fertilizers, nor to coordinate and procure locally produced or imported fertilizers. The major channels for distributing fertilizers, especially in the primary stages, are:

a) the net work of four local fertilizer producers
b) independent whole-sale traders and
c) exclusive brand dealers and general stores at the retail level.

Cooperatives and plantation owners also sell fertilizers directly to farmers. The cooperatives, especially the sugar producing ones can

import nutrients freely from foreign suppliers for their members (de Guia, 1972). The advantages of this type of distribution system are:

a) The burden of fertilizer distribution costs are borne by the private firms and may be minimal since private firms will tend to seek out the most economical ways of operating.

b) A large number of competing institutions each aiming at promoting its own sales will bring fertilizer prices down at retail level, and to a lesser extent, at the wholesale level. This has only been true however in the sugar producing areas of the Phillipines where the demand for nutrients is highly sophisticated and cost conscious.

In the case of other crops competition has not resulted in lower prices because of traditional market imperfections such as the depdendence of farmers on the village middle men who usually sell on their own terms, especially when farmers cannot pay for the inputs immediately. For this reason the government has entered the distribution system at the retail level. The disadvantages of the system are:

a) Because each distributor makes his own independent estimate of fertilizer requirements of the market,

the quantities supplied may be small in a bid to minimise risks and make profit. The social goal of having sufficient fertilizers for agricultural production may therefore, be neglected

b) Overoptimistic estimates on the other hand are likely, resulting in a glut. This was the case in the Phillipines in 1967-68, at the height of the miracle rice programme.

c) Fertilizer bags may be adulterated or underweight in a bid to profiteer.

d) High interest rates on fertilizer loans and unfair barter ratios of fertilizers for expected output may prevail.

e) Remote and low fertilizer consumption areas might be neglected due to unprofitability.

f) If only one private firm is involved in the distribution activities unusually high monopoly prices of fertilizers may prevail (de Guia, 1972).

2.4.3. Mixed systems of fertilizer distribution.

This distribution system is mixed in the sense that both the private and public sectors are actively involved in the distribution system either at all or specific levels.

India is one of the countries where fertilizer distribution is shared between the public and private sector. On the side of the public sector, the responsibility for the distribution of fertilizers rests with the Central Fertilizer Pool which allocates 30 percent of its stock (both imports and domestic output) to private traders and 70 percent to the various state governments (Soome, 1970; Das, 1977).

The share of the state government is distributed to village cooperatives, who then sell to farmers on credit terms which have been proved to be unoperational and discouraging, through the district level administration, based on a set of criteria which favours areas with developed infrastructure, particularly irrigation. The prices of fertilizers are uniformly set and stabilised by the central fertilizer pool. The share of the private traders is on the other hand sold from private stores in the villages. It is not unusual for some state governments to sell part of their stock to private traders in addition to the 30 percent allocation from the fertilizer pool. This gives the private sector a majority share of the market. As a result of this domination, during periods of scarcity, illegal markets, with several corrupt practices such as adulteration, unreasonably high prices and unfair deals are created by the traders. And this has

been known to cause the discontinuation of fertilizer use by some farmers. Inspite of this however, the public/private sectors distribution of fertilizers in complementarity at the retail level is essential especially, as a lot of scepticism exists about leaving fertilizer distribution to the private sector completely (Hamman Ahmed et al, 1969). The success of the system, however, depends on the farmers' level of knowledge of the different types of fertilizers, application rates and the level of fertilizer prices. In this way they can chose only what they want and at the best price, eventually forcing the private traders to be more efficient in their marketing activities.

The advantage of complementarity between the private and public sector in retailing fertilizers is that while the cost of distribution to government is lessened to an extent, fertilizers can presumably still be made available to the farmers at reasonable prices due to the intervention of government in the market as occasions demand.

2.4.4. Comparative costs under public and private distribution systems.

Fertilizer distribution cost is a very important aspect of the distribution system. This is because, if care is not taken, costs can be unnecessarily high. Generally the magnitude of distribution cost under either privately or publicly controlled

distribution system is dictated by such institutional characteristics as:

a) the vertical integration of fertilizer distribution with other institutions like credit and produce marketing agencies, in which case overhead costs are reduced due to sharing.

b) the ownership of means of transporting fertilizers by the distributing institution which decreases transport costs.

c) size of shipment: Large shipments usually attract discounts hence reducing distribution costs.

d) state of concentration of fertilizers: Concentration reduces bulkiness which consequently will reduce transport cost.

e) level of technology of fertilizer transportation: This depends on the type of fertilizer. Where high level transport technology is used as in transporting anhydrous ammonia, costs of distribution will be higher.

f) changing of modes of transport in the process of fertilizer distribution, such as from rail to truck and then to another truck increases costs.

g) and finally the degree of centralization of national procurements. As was mentioned earlier, the higher the degree of centralization the better the chances of getting better price deals which will ultimately reduce costs (de Guia, 1972).

Table 2.5 compares the cost components of distributing one metric tonne of fertilizer in 1972 in Egypt and the Phillipines under the two systems of fertilizer distribution.

Table 2.5 Comparative Structure of Fertilizer Distribution Costs per Metric Tonne of Nutrient in Egypt and the Phillipines (1972).

Item	U.A.R.	Phillipines
Low concentrate fertilizer	%	%
(Ammonium Sulphate 21%N)		
Pre-distribution price	100.0	100.0
Regional landed cost	108.4	112.5
Retailer procurement price	125.6	115.5
Retailer selling price	135.6	122.9
Subsidy	-	-
Farmers' price	135.6	122.0
High Concentrate Fertilizer		
(Urea 46%N)		
Pre-distribution price	100.0	100.0
Regional landed cost	104.4	110.3
Retailer procurement price	104.9	112.8
Retailer selling price	108.3	132.8
Subsidy	-	-
Farmers' price	108.3	132.8

Source: Eric. O. de Guia: A Comperative Study of Fertilizer Distribution Systems in 5 developing countries. Development Centre of the Organisation for Economic Cooperation and Development, Paris, 1972 Pg. 79.

Using the predistribution price as a starting point, we find that while the cost of primary - secondary movement for low and high concentrate fertilizers in the U.A.R. is 35.6 percent and 8.3 percent of the predistribution price respectively, in the Phillipines the corresponding figures are 22.9 percent and 32.8 percent. In both cases, no subsidy from the government is involved. In the U.A.R., the cost includes the tariff collected for the fertilizer price stabilization fund. As has been noted before, the differences in the cost components of distribution in the two countries are due to differences in the institutional characteristics listed above. It is therefore not possible to compare the cost components in the two countries directly. This information and those contained in the last few sections are relevant to the Nigerian case though, in that they serve as yardstick for measuring the extent to which each system of distribution fulfils the required objectives. It seems also that which ever distribution system is chosen, whether public, private or mixed, with or without subsidy, depends on the stage of fertilizer use in the country. If fertilizer use is still at a low stage, then it would be adviseable for the public sector to monopolise the system since this sector is more likely to consider social goals. If it is at an advanced stage on the other hand, the private sector or a mixture of both the private and public sectors could undertake fertilizer distribution.

2.5. Factors Affecting Fertilizer Distribution in Nigeria

The word "Distribution" has been broadly defined as "all the activities that actualize a potential relationship of exchange between the makers and users of economic goods and services" (Central Asian Treaty Organisation, 1974). By this definition, the distribution of fertilizers is understood to include all the activities that take place between the factory and its arrival at the farm level. This, in other words, refers to the logistic activities which include such processes as communication, preparing, handling, transporting, warehousing, financing and marketing activities (Sodangi, 1981).

The whole problem of fertilizer distribution in Nigeria arises primarily due to the fact that most Nigerian farmers are not yet economically capable of purchasing enough farm inputs in a competitive market, for making profitable farm investments (Samsu, 1975). It is for this reason that government controls the distribution of fertilizers in Nigeria and subsidizes their prices, thereby preventing the participation of commercial firms in the fertilizer distribution programe (Falusi and Adubifa, 1975; International Fertilizer Development Centre, 1981).

In order to see clearly the problems of fertilizer distribution, it is essential to examine the functional units of the fertilizer distribution programme in Nigeria. This is the context of the next section.

2.5.1. The problems of fertilizer procurement and distribution to states.

Several reasons have been given by researchers to be the cause of the low level of use of fertilizers in Nigeria. Among these reasons, one of the important suggested impediments are the deficiencies in the procurement and delivery system of fertilizers to the small scale farmers, who form the bulk of the farming community in Nigeria. As a result of this, fertilizers arrive untimely at farm level, sometimes when half the growing season would have passed; or they may be supplied to locations too far for most farmers (Falusi and Adubifa, 1975; Falusi 1973). Furthermore, these problems arise due to the following defects in the procurement process:

a) Improper records of fertilizer inventory at both state and federal government levels which results in either under-estimation or over-estimation of national requirements of fertilizers. The result of this is either a shortage or a surplus.

b) The late award of tenders by the federal government. This results in the late arrival of supplies of fertilizers, and consequently their untimely delivery to state depots, which in turn makes fertilizers unavailable at the required time.

c) Difficulties in arranging transportation of fertilizers to states' depots, which add to port congestion resulting

from uncoordinated shipment of fertilizers (Falusi and Adubifa, 1975).

The FAO Fertilizer Industry Advisory Committee also reports the problems encountered by the pilot schemes on fertilizer distribution in Kwara and Western States of Nigeria as that of unavailability of fertilizers and other inputs at the right time, and in the required quantities (FAO, 1971). Because of this problem, the demand for fertilizers created by the success of the demonstration schemes in these places could not be met. This led to frustration and negative attitude on the part of the farmers towards extensions services. Another big handicap to the increased consumption of fertilizers reported by the advisory committee was the lack of means of transportation and the non-availability of sufficient storage facilities within the divisions. Similar findings were also reported by the FAO Fertilizer Mission to Nigeria (FAO, 1974; Federal Department of Agriculture, 1975). These problems are not peculiar to Nigeria alone. Zschernitz (1974) has cited similar problems in Kenya, where tremendous success has been achieved in fertilizer distribution to small scale farmers. Zalla et al (1977), has also shown these problems to be characteristic of fertilizer distribution programmes in many West African countries such as Senegal, Ghana, Ivory Coast etc. In Nigeria, these problems were particularly intense in the seventies. Since 1977/78 however the

problem of port congestion, especially, has been reduced by the increase in the number of berthing space from two to six, while fertilizers applied primarily are normally given priority in berthing (International Fertilizer Development Centre, 1981).

2.5.2. Fertilizer storage facilities

Fertilizers need to be sheltered because, if left exposed to the vagaries of weather, they cake. Caking renders fertilizers useless and hence adds to the cost of fertilizer procurement and distribution. The storage of fertilizers posed a big problem to the fertilizer distribution programme in the past, and it still does today to a lesser degree. The decrease in the intensity of the problem came about through heavy expenditures by both the states and federal government on fertilizer storage facilities (Sodangi, 1981; International Fertilizer Development Centre, 1981). However, the number of fertilizer stores, their capacity and the materials of which many are constructed are not adequate (FAO, 1973; Sodangi, 1981). In addition, store-keepers do not keep a proper account of fertilizer movements, hence contributing to the poor records of fertilizer stocks at state and national level. This in turn means, meaningful fertilizer statistics cannot be collected. Fertilizer storage problems have also been observed in many other countries such as Pakistan, Turkey, Britain and even the United States at one point in time, (Central Asia Treaty Organisation,

1974) and in Ghana, Cameroun, Ivory Coast and Togo in West Africa (Zalla et al, 1977). An increase in the number of storage facilities is especially necessary at the village level, so that they can serve as fertilizer retail points right at farmgates.

2.5.3. Fertilizer distribution costs.

High fertilizer distribution cost is one of the greatest problems of the fertilizer distribution programme in Nigeria. Distribution costs are escalated usually by import costs and transocean freight rates, customs duties, demurrage charges for delay in off-loading, rebagging and handling of fertilizers, transportation from ports or factory, and their storage thereafter. Other costs include that of storage at port, port charges, and stevedering charges (Stier, 1972; Falusi and Adubifa, 1975; International Fertilizer Development Centre, 1981).

Fertilizers are transported from the port to the other parts of Nigeria mostly by road, and by rail. Sometimes the mode of transport has to be changed several times before the fertilizers reach their ultimate destination. Though rail transportation is much cheaper than road transportation, the latter is used more often, probably because the railway net work does not extend to all parts of Nigeria. Infact, International Fertilizer Development Centre (1981) has calculated transportation costs to account for about 70 percent of distribution costs. The high cost of

road transport is as a result of the long distances involved and the bulkyness of fertilizers, the total effect of which is the increase in the cost incurred by government at all levels for the procurement and distribution of fertilizers in the country. Table 2.6 shows typical cost components for distributing one ton of fertilizers in 1973 in Kano state of Nigeria. The table is only indicative of the very high distribution costs as the figures must have increased as a result of the increases in the general price level.

As of 1981, due to high distribution costs, the estimated average retail price for one tonne of fertilizer had risen to about ₦240 (Sodangi 1981). This high cost of fertilizers necessitates government control and the heavy subsidy on fertilizers in Nigeria, since most farmers cannot afford the commercial price.

In recent times, the high costs of fertilizer distribution has prompted countries like India, to consider alternatives like the concentration and bulk movement of fertilizers to reduce distribution costs (National Fertilizer Development Centre, 1980). Bulk movement of fertilizers involve transporting fertilizers to the consuming areas in large quantities, where the fertilizers would then be bagged and distributed. The advantage of this is that costs such as handling charges and loss of fertilizers due to

Table 2.6 Typical Distribution Costs per one Ton of Single Superphate Delivered at Farm Level in Kano State of Nigeria, 1973.

	Cost Item	₦ : K	%
1.	Import Cost (C and F)	105 00	100%
2.	Portexpenses (Labour dues, customs examination, stevedoring and clearing etc)	4 25	104.1
3.	Port storage for an average of 25 days	8 70	112.4
	Primary Movement		
4.	Lagos-Kano by rail (1120km)	12 00	123.8
5.	Handling expenses (loading and unloading and stocking)	3 00	126.7
6.	Net Margin (Importer)	7 05	133.4
7.	C.I.F. Price (Kano Warehouse)	140 02	133.4
8.	Storage (₦1 Ton for an average of 3 months)	6 00	139.1
9.	Secondary and Tertiary Movements (Average of 100km at 7k/km/ton)	7 00	145.8
10.	Handling expenses	3 00	148.7
11.	Retailers commission	4 00	152.4
12.	Estimated cost price at village level	160 00	152.4

Source: Falusi and Adubifa, Economics of Fertilizer Distribution in Nigeria, NISER, University of Ibadan, Nigeria 1975, Pg. 60

the breaking of bags in transit would be minimised. Likewise, the concentration of nutrients can reduce the bulk of fertilizers and hence reduce distribution costs (de Guia, 1972; National Fertilizer Development Centre, 1980).

2.6 Factors that Influence Fertilizer Use by Farmers in Nigeria.

An efficient fertilizer distribution programme must also take the farmers into consideration. Unless a fertilizer distribution system "incorporates the key factors affecting farmers' decision to apply fertilizers, no matter how well the network of village outlets is arranged and how promptly fertilizers are made available, fertilizer consumption will be impeded by lack of demand" (de Guia, 1972). The factors referred to her are briefly outlined below.

2.6.1. Educational level of farmers

Researchers have proved that a positive correlation between educational level of farmer and fertilizer use exists (Central Asian Treaty Organisation, 1974). In Nigeria and many other developing nations however, the bulk of the farming population suffers from illiteracy. Formal and informal schools as provided by adult education workers and extension workers is therefore a necessity in Nigeria. The success of this type of programme in Iran, for example, has resulted in the eradication of wheat diseases and an increase in the use of fertilizers in the country from 3000 tonnes

to 273,000 tonnes between 1966 and 1969 (Central Asia Treaty Organisation, 1974).

2.6.2. Farmers awareness of fertilizer use benefits.

The awareness of farmers of the agronomic potentials to be derived from fertilizer use at recommended levels is also an essential factor in the promotion of fertilizer use. It has been mentioned earlier, however, that Nigerian farmers do seem to appreciate the imparting of fertilizer use and its benefits. The level of awareness alone is however not enough, as they also must have the knowledge and skill with which to apply fertilizers. Imparting this knowledge and skill is the traditional preoccupation of extension workers. Hence, their role in spreading new and improved agricultural practices such as fertilizer use cannot be overemphasised.

2.6.3. Research and extension

Research and extension play a significant role in the promotion of fertilizer use, and, of course, other agricultural inputs. The purpose of research in agriculture is to develop improved varieties and types of crops and animals together with advanced agrotechniques for their most efficient production (Idachaba et al, 1980). In this regard Nigerian researchers are striving to develop high yielding varieties of seeds in order to complement fertilizer use. This is important as it is known that traditional varieties of seeds do not respond as well as the improved

ones to fertilizers. This is why the federal government of Nigeria since 1975 has embarked on a National Seed Multiplication Programme to make improved seeds more readily available (Olorunnipa, 1981). Research is, however, not accorded much priority in Nigeria as it should be, especially, in terms of funds (Idachaba 1979). In countries like Mexico, Japan and the Netherlands investment in research work has produced a high ratio of efficient research workers to the ratio of active farmers (Development Centre of the Organisation for Economic Cooperation and Development, 1968).

In order for it to be useful, though, research must go hand in hand with extension work to spread research results to farmers. Most developing countries seem to suffer from a shortage of trained extension workers in addition to overburdening the few available with administrative work (Ibid, 1968). In Nigeria the ratio of extension workers to farmers is as low as 1:2000 - 2500 farmers as opposed to a suggested ratio of 1:300 required before agriculture can take off (Development Centre Studies, 1968). In spite of this, extension staff are still required to sell fertilizers to farmers in some states. The effect of diverting extension workers from their professionally more essential duties to that of selling fertilizers is very far reaching (Falusi and Adubifa, 1975). Besides this, since extension staff have no financial incentive

such as profit from the sales, it is highly unlikely that they carry out this business whole-heartedly. This problem is also noted in the interim report on the pilot schemes for fertilizer distribution in the West, Midwest and Eastern States of Nigeria (FAO, 1966).

Finally, extension workers must be well trained in order to carry out their duties. This will reduce the possibility of passing on wrong information on fertilizer application to farmers. If farmers are mislead, experience will teach them not to adopt practices recommended by extension workers, which in turn will affect fertilizer use promotion. In most developing countries including Nigeria, extension workers are not educated enough to carry out their duties (Zalla et al, 1977). For them to be effective imparters of knowledge to farmers, it is essential to give extension workers adequate training, as well as increasing their population.

2.6.4. Fertilizer - crop price ratio.

The relative price of fertilizer to the expected revenues from sale of crops can also influence the use of fertilizers. Cheap food pricing policies have been found to depress food production and hence fertilizer use in many countries. Evidence from Senegal for example shows that fertilizer use between 1970 and 1971 on millet, increased proportionately more than fertilizer use on groundnuts, because millet prices in the rural areas rose more rapidly than

groundnut prices (Ibid, 1977). Experiences in Ghana and Ivory Coast also suggest the same with respect to maize, rice, and millet (Ibid, 1977). In Nigeria, C.K. Laurent (1968) found in his study of fertilizer purchases by farmers in three villages in Sokoto Province that most farmers reduced their purchase of fertilizers in 1968 compared to that of 1967 because groundnut prices and food crop prices were low, and that the price of fertilizers averaging about 18 shillings per 56lbs bag was too high. Fertilizer-crop price relationship in Nigeria has improved in recent years, however, due to the general increase in prices, especially those of food stuff, while heavy fertilizer subsidy still remain a government policy (Sodangi, 1980).

2.6.5. Availability of credit facilities.

Credit is generally known to be essential for farmers, if they are to be able to procure farm inputs in reasonable enough quantities to induce commercialization of agricultural products (FAO, 1971; Robinson and Falusi, 1974; Central Asian Treaty Organisation, 1976). This can be given to farmers either in the form of cash or kind. Though Robinson and Falusi (1974) cite empirical proof showing capital availability as the most important constraint on fertilizer use in Northern Nigeria, they also pointed out in the same study that the best farmers invest in expensive mechanical innovations in preference to spending modest amounts on fertilizers. In spite of this, and the fact that studies in Northern

Nigeria and some other countries like Senegal and India have shown that over 80 percent of credit obtained by farmers was used for consumption purposes (Development Centre Studies, 1968; Zalla et al, 1977), there is no gainsaying that credit is valuable to farmers, especially, for acquiring farm inputs. The problems that need to be tackled are, how to ensure that the benefiting farmers use the credit as intended, and repay them. In many cases some of the credit given to farmers has to be written off as bad debts. This suggests that it is essential to give not only credit to farmers, but also to device ways of extending this services to farmers in such a way that their proper use is guaranteed.

2.6.6. Physical availability of fertilizers.

There is considerable evidence that unavailability of fertilizers at farm and/or village level is one of most important obstacles to its increased use by farmers (de Guia, 1972; Dunstan and Derek, 1976). The scarcity of fertilizers may also lead to the development of fertilizer illegal markets as is the case in Ghana and Nigeria, and West Africa in general (Zalla et al, 1977), where fertilizers are not sold in the open or supermarkets. The importance of the availability of fertilizers in promoting their use could be illustrated by the fact that fertilizer consumption increased from 500 tonnes to 10,000 tonnes in 1976 in the World Bank

Project area of Funtua, essentially due to the retail outlets that were established under the project, which ensured supplies of fertilizers. The consumption was expected to increase to 25,000 tonnes by 1978 (Zalla et al, 1977).

2.6.7. Fallow cultivation.

This traditional method of farming contributed to the limited use of fertilizers particularly in the 1960s. Continuous increase in population, however, has increased pressure on land such that land is becoming scarce. This practice is hence dying out fast in Nigeria (Falusi and Adubifa, 1975; Sodangi, 1981).

2.6.8. Availability of moisture.

Unlike those discussed above, this factor is outside man's control, because, by virtue of climate, some areas, especially, in the Northern Guinea Savannah and Sahel Zones have less than five months of unevenly distributed rainfall. Lack of moisture is known to inhibit the economic application of fertilizers (Central Asian Treaty Organisation, 1974). This is because the absorbtion of nitrogen and potassium by plants is reduced under high moisture stress, while their utilization within plants depends on adequate water supply (Sodangi, 1981). About half of Nigeria is in the Northern Guinea and Sahel Zones. It is essential, therefore, to make alternative provision for water through irrigation schemes, if fertilizer use is to be encouraged in such areas.

This is why irrigation projects were given priority in the Third and Fourth Development Plans of Nigeria, while the Ministry of Water Resources was created to execute irrigation policies.

2.6.9. Lack of fertilizer responsive varieties

Although fertilizer application raises the yields of some traditional varieties by an average of 50 percent (Centre d'etude de L'Azote, 1967), Sodangi (1981) has cited some FAO field experiments in the 1960s in Nigeria, which showed that the traditional varieties of maize, millet, cassava and sorghum did not respond to fertilizer use, while the response of the traditional swamp and lowland rice and groundnut was impressive. On the other hand, yields increased by an average of 100 percent when used on improved seeds. To induce farmers to use more fertilizers will, therefore, require that fertilizer responsive seed varieties are made available to them as a complement. The federal government of Nigeria has taken a step in the right direction by setting up the National Seed Multiplication and Distribution Programme since 1976 (Olorunnipa, 1981).

2.7 Summary

The main concern of this chapter has been the review of literature on fertilizer distribution which would help, in focusing on the problem areas relevant to this research project and thereby provide a framework of analysis.

To this effect the chapter has discussed the fertilizer distribution programme in Nigeria in perspective, the sources of supply of fertilizers and the current level of knowledge of fertilizer use benefit by farmers. It was concluded from literature available that there is a high level of awareness of fertilizer use benefits by farmers in Nigeria, which indirectly implies that the present low level of use may be the result of limited fertilizer supply. The different institutional characteristics by which a fertilizer distribution system could be classified were then enumerated, and their merits and demerits discussed. It was pointed out that whether a country adopts the private, public or mixed systems of fertilizer distribution or not should depend on the levels of fertilizer use attained in the country and its social goals. The factors that affect the fertilizer procurement and distribution system, and those that influence fertilizer use by farmers in Nigeria were also discussed. It was concluded that factors such as the late award of fertilizer tenders, improper records of inventory, port congestion, inadequate storage facilities and high distribution costs affect the efficiency of the system. These problems have however decreased in intensity lately due to the Federal Government's efforts to solve fertilizer distribution problems. The factors found to influence farmers' use

of fertilizers on the other hand are, the educational level of farmers, availability of research and extension service, awareness of fertilizer use benefits, availability of credit and fertilizers and, agronomic factors like moisture and improved seeds availability. The practice of fallow cultivation which used to limit fertilizer use was found to be dying out due to population pressure on land.

CHAPTER III

METHODOLOGY

This chapter gives a brief description of the types and sources of data collected for the study and their limitations, method of data collection, location of area of study, sampling design as well as the method of data analysis. The information used for the study was collected during the months of October, November and December 1980 and covers a period of three years from 1978 to 1980.

3.1. The Study Area and Sampling Design.

The study covers three purposively selected Local Government Areas (LGAs) in Gongola State. These are Gombi, Ganye and Jalingo Local Government Areas. The selection of the three LGAs was partly based on the intensity of their use of fertilizers which was high, medium and low respectively, and partly on the more readily available information on fertilizer activities in these areas. The choice of the LGAs and their categorization were based on the information contained in Table 3.1. and partly on discussions with relevant state government officials. Two villages were selected from each of the LGAs based on distance from the nearest LGA fertilizer stores, after eliminating places with a population of 20,000 and above, which by classification are urban (Gleave, 1971). Hence a village that is relatively near the LGA store and one that is relatively far were selected from each LGA. Table 3.2. shows the distance of each selected village from the nearest LGA fertilizer store.

Table 3.1. Allocation and Distribution of Fertilizers in Gongola State, 1977/78 to 1979/80 Cropping Seasons in (Metric Tonnes).

	LGAs	Quantities requested from FPDD by Gongola State Govt.	Quantities approved by the FPDD	Quantities delivered by the FPDD	Proposed allocation to each LGA in 1978/79	Quantities actually delivered to each LGA in 1978/79
		1	2	3	4	5
1.	Michika	1977/78	1977/78	1977/78	2100	2100
2.	Mubi	37,210 tonnes	n.a.	6,161.05tonnes	2180	1607
3.	Gombi				2360	2756
4.	Song				1555	1363
5.	Yola				2050	861.45
6.	Fufore	1978/79	1978/79	1978/79	1555	435
7.	Numan	46,050 tonnes	25,000 tonnes	25,050 tonnes	1737	327
8.	Guyuk				1515	1865
9.	Mayo Belwa				1540	1419
10.	Ganye				1925	1759
11.	Jing				1540	1505
12.	K/Lamido	1979/80	1979/80	1979/80	1505	1305
13.	Jalingo	38,500 tonnes	25,650 tonnes	34,091.5 tonnes	1920	1926
14.	Bali				1575	1207
15.	Sardauna				1685	1199
16.	Takum				2000	1470
17.	Wukari				2060	2175
	Tea Project				400	n.a.
	Others				650	n.a.

1,2,3,4,5, 7,8 & 9 Compiled from Ministry of Agriculture and Cooperatives files. Note that the total proposed quantities allocated to all LGAs is larger than the total delivered by FPDD because LGA allocations are based on the unapproved quantities requested for from FPDD.

n.a. = figures not available.

Table 3.1 Cntd. Allocation and Distribution of Fertilizers in Gongola State, 1977/78 to 1979/80 Cropping Seasons in (Metric Tonnes).

Quantities actually consumed in 1978/79	Proposed allocation to each LGA in 1979/80	Quantities actually delivered to LGAs in 1979/80	Quantities actually consumed in 1979/80	Approximate hectarage of cropped land	Farmer population of each LGA	Approximate consumption of fertilizers per hectare of cropped land in kilogrammes
6	7	8	9	10	11	12
2018.95	2350	2410.00	1419.85	32000	315,689	53.75
1575.55	2450	2596.00	1710.80	46000	252,196	47.67
2683.00	3050	2699.35	1727.80	50000	191,904	54.11
1161.1	1950	920.00	669.35	32000	132,777	36.41
331.45	2840	545.55	231.40	19000	106,861	21.91
357.15	1950	2284.75	45.15	27000	132,736	23.90
236.7	1980	762.95	765.55	37000	181,067	13.55
1716.15	1950	1005.00	138.80	40000	202,434	20.16
1263.58	1950	1409.00	550.55	38000	161,034	19.20
1491.05	2050	2091.00	1119.25	51000	214,522	25.89
1226.80	1050	370.00	347.20	31000	105,959	25.40
812.75	1950	1345.00	357.10	49000	214,074	11.94
1730.15	1950	1519.00	365.10	83000	239,726	12.66
872.75	2450	2235.00	906.30	37000	218,607	25.11
794.45	2498	2263.65	2103.90	58000	164,976	25.26
1541.75	2600	2345.00	2426.30	60000	153,362	53.10
1790.95	2600	2161.50	593.10	53000	177,598	27.40
n.a.	n.a.	n.a.	n.a.	n.a.	-	-
n.a.	n.a.	n.a.	n.a.	n.a.	-	-

6. Calculated from the quantities of fertilizers actually delivered and physical stock balance of each LGA at the end of the year 1979.
10. Calculated from Table 2 page 45, of The Present Economy: General Economic Study, Vol. II Ministry of Economic Planning Bomass., 1979.
11. A 1978 Projection based on the 1963 census at 2.5 percent rate of growth.
12. Calculated from the 1978/79 and 1979/80 level of consumption of fertilizers in each LGA.

n.a. not available.

Table 3.2 Distance of Selected Villages from Nearest LGA Fertilizer Store.

LGA	Villages	Location of Store	Distance from Nearest LGA Fertilizer Store (km)
Gombi	Pella	Home	12
	Hildi	Home	98
Ganye	Mbulo	Ganye	22.0
	Pirohi	Ganye	15.0
Jalingo	Lankaviri	Jalingo	25.0
	Mallum	Jalingo	16.0

Source: Field Survey, 1980.

This gave a total of six villages namely, Pella, Hildi, Pirohi, Mbulo, Lankaviri and Mallum respectively. A complete list of farming households using the village tax list was then drawn up in each village during a preliminary survey. A farming household is classified by the presence of at least one farmer. From the list of farming households, a random sample of 20 farmers who used fertilizers was selected from each of the six villages giving a total of 120. After this, another sample of 10 farmers who did not use fertilizers were selected randomly from each of the villages. The selection of both users and non-users of fertilizer was done with a view to finding out

the factors that influenced the non-use of fertilizers and the limited use of the same by the users. Non-users of fertilizers here refers to farmers who have used less than one bag (50kg) of fertilizers or none at all during each year of the reference period. Table 3.3 shows the distribution of respondents among the sampled LGAs and villages.

Table 3.3 Distribution of Respondents by Sampled LGAs and Villages.

Type of LGA	LGA	Number of Respondents		Villages	No of Respondents	
		Fertilizer Users	Non-Users[1]		Fertilizer Users	Non-Users
High	Gombi	40	10	Pella	20	5
				Hildi	20	5
Medium	Ganye	40	3	Mbulo	20	0
				Pirohi	20	3
Low	Jalingo	40	19	Lankaviri	20	10
				Mallum	20	9
Total	3	120	32	6	120	32

1. It was difficult to get the required number of non-users in some villages, so the available population was taken.

Source: Field Survey, 1980.

In order to find out the operational and administrative constraints on the fertilizer distribution system, various categories of functionaries were also interviewed.

A random sample of five extension workers from each LGA, making a total of 15, 20 contract transporters of fertilizers and nine officials of the Ministry of Agriculture and Cooperatives (MAC) at both the States, Zonal,[1] Divisional and Local Government levels were also interviewed. Finally, the records of a sample of nine fertilizer stores serving the LGAs surveyed were also studied and the respective store-keepers interviewed. Apart from the government officials, these latter categories of respondents were also randomely selected from a complete list provided by the Ministry of Agriculture and Cooperatives. All the information was collected during single visits except in cases where Ministry files and other records had to checked to supplement the primary data. The primary data were collected with the help of three trained enumerators, one of whom was an extension worker.

3.2. Types and Sources of Data Collected.

Both primary and secondary data were collected through the administration of structured questionnaires to the relevant subjects, discussions with Ministry Officials and the cross-checking of official

1. Gongola State is divided by the Ministry of Agriculture and Cooperatives into agricultural zones for easy flow of information and administrative purposes. Each zone is headed by a zonal Agricultural Officer who is directly responsible to the state level Ministry of Agriculture and Cooperatives.

documents during the study. Primary data were collected from farmers, contractors, extension workers, government officials and fertilizer stores, while secondary data were collected from contractors government files and stores ledgers. Information was collected for a period of three years from 1978 to 1980.

3.2.1. Information from the state level.

At the state level information was collected from Government Officials on the organisational and administrative hierarchy of the State and Local Government Ministries of Agriculture and Cooperatives in-as-much as it was relevant to fertilizer distribution in Gongola State, and the decision making process in the Ministry relating to fertilizer distribution policy. Information was also collected on the reporting and information retrieval system of the Ministry, the proceedures involved in fertilizer procurement with regard to the decision-making process, the performance[1] of contract transporters of fertilizers in delivering fertilizers to the local government fertilizer stores, the quantity of fertilizers delivered by the Fertilizer Procurement and Distribution Division (FPDD) of the Federal Ministry of Agriculture to the State's fertilizer depot, the cost of fertilizer distribution to the state government, the pricing policy and subsidies on fertilizers, and finally the personnel involved in the fertilizer distribution system in the state.

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1. Performance here is measured by the extent to which contractors kept to the terms of their contracts.

3.2.2. Information from the selected LGAs.

Information was collected from extension workers and fertilizer stores in the sampled LGAs. Information was collected from extension workers on their extension activities, farmers' response to their activities, the problems they encounter, the part played by them in the fertilizer distribution programme and the time devoted by them to the fertilizer distribution programme on the one hand, and extension work on the other, and their opinion on the fertilizer distribution programme. Information was obtained from the fertilizer stores on the turnover of fertilizer by type, the geographical breakdown of fertilizer distribution, storage facilities and fertilizers supplied to them by the state government. Data were also collected on the staffing of the LGA fertilizer stores and their operational bottlenecks.

3.2.3. Information from the sampled farmers.

From the sample of farmers, information was collected, some on a recall basis on their socio-economic,status, crops grown and fertilized, on whether there were changes in crop yield due to fertilizer application, sources of financing fertilizer purchase, sources of information on fertilizers, amount of fertilizers required by them in each of the years being studied and the quantity they actually got, constraints on their purchase and use of fertilizers, their perception of the adequacy and inadequacy of the fertilizer distribution programme, reasons for not using fertilizers in the case

of non-users, and finally their suggestions for the improvement of the system.

3.3. Problems and Limitations of Data Collected.

A number of problems were encountered in the course of collecting data for this study. Ocassionally farmers exaggerated such socio-economic information as income level. This was minimised by cross checking the value of his stated farm output and comparing it with his stated income, especially if farming alone was his preoccupation.

Another problem encountered has to do with the lapse of memory of some farmers and contract transporters of fertilizers. This arose mainly because the response needed for some questions depended on recall. Such information included items like the quantities of fertilizers they actually bought and used especially during the two years before the survey year (1980), and quantities of fertilizers transported by some contractors as part of the terms of the transportation contract. This problem is, however, to be expected due to the fact that most Nigerian farmers are not literate and hence do not keep farm records.

Thirdly, due to time limitations, the size of farms of respondents was measured by the number of plots farmed. The sizes of these plots were not standardised either. Such results as fertilizer use per plot in the LGAs should, therefore, be interpreted with caution.

On the whole, a few items of documented information were missing here and there, due to either the mismanagement of files, or oversight on the part of the Ministry's filing clerks, while some fertilizer stores had records that were not up-to-date. Attempt was made during the field work to minimise these problems by cross-checking other secondary information available in the Ministry of Finance and Economic Development, and supplementing them with discussions with Ministry officials on the affected subjects. Questions, answers to which were suspected to be incorrect were repeated at one point or the other during the interview for cross-checking.

3.4. Data Analysis.

The empirical analysis in this study is mostly based on data collected from the field survey. The study is both descriptive and analytical. The techniques, employed in analysing the materials collected is fully discussed in chapters four and five of the thesis. Generally however, charts, totals averages and percentages are used in discussing the results of the study, while stepwise multiple linear regression analysis is used on the pooled data, LGAs, villages, and on the high, medium, and low classification of fertilizer users to find out if there is any statistical relationship between the quantities of fertilizers used and some socio-economic variables. Finally discriminant analysis was used to test the significance of the classification of farmers and LGAs into high, medium and low fertilizer users.

3.5. Background of the Study Area.

The study was carried out in Gombi, Ganye and Jalingo Local Government Areas of Gongola State. Gombi is located in the Northern part of the state and has a 1978 projected population of about 239,880 (Government of Gongola State Statistical Digest, 1979). The LGA comparises of Gaanda, Kiibu and Uba Districts. The administrative headquarters, Gombi, is about 105 kilometres from the state capital Yola. Roads in this LGA are more developed than in the others. Farming is the main occupation of the population, with the main crops grown as Guinea Corn, beans and groundnuts. The two villages selected for the study in this LGA are Pella and Hildi. Pella is in Kilba District. It has a 1978 projected population of about 11,644. It is situated 26 kilometres from the administrative headquarters of the LGA and about 15 kilometres from Hong, the district headquarters. The village is about seven kilometres off the main road, to which it is linked by a laterite road maintained by communal effort. Pella was a missionary settlement for a very long time, and, therefore, has a number of infrastructural facilities including three primary schools, a post-primary institution, dispensary/maternity hospital and a big market where all the villages around converge on market days. Hildi on the other hand is 96 kilometres from the administrative headquarters Gombi, and is on the Federal highway that links Gombi and Maiduguri

via Mubi. It is located in Uba District, about 8 kilometres from Uba town, which is the district headquarters. Its 1979 projected population was about 8,569. By way of amenities, it has a primary school and a dispensary. Gombi LGA lies in the Guinea Savannah climatic zone and is characterised by high hills which merge with the Cameroun Ranges. The climate is determined by the intertropical convergence zone of the North East Trade Winds and the South West Trade Winds. There are two seasons, namely the dry and wet seasons. Rainfall starts in May and ends in October with an annual mean of 900mm. Rainfall is the highest in August. The soils are predominantly leached feruginous tropical soils, often loamy and deep in most places, except on rock out-crops and slopes where the soil is skeletal. The vegetation is of the Sudan Savannah type with its characteristic grassland and shrubs and trees scattered here and there.

Ganye LGA lies in the South of the State and shares a border with the Cameroun Republic. It has a 1978 projected population of about 268,152 spread over an area of about 290 square kilometres (Ibid, 1979). Ganye town is the administrative headquarters of the LGA and is 148 kilometres from the State Capital, Yola. The LGA is made up of Sugu, Jada, Yelwa, Mbulo, Toungo, Leko and Koma Districts. Roads in this LGA are not well developed and hence, in addition to vehicles, donkeys and horses are also used as modes of transportation.

The main occupations of the population are farming and cattle rearing. Crops grown include guinea corn, groundnuts, yams, millet and rice. Cattle rearing is predominant in the Southern part of the LGA. The villages selected for the study here are Mbulo and Pirohi. Mbulo is the District Headquarters of Mbulo District with a 1978 projected population of about 7252. It is about 22 kilometres away from Ganye on the State road linking Ganye with Mayo Belwa. In terms of amenities, Mbulo has a primary school, a dispensary and a Ministry of Agriculture and Cooperative outpost. Pirohi is about 15 kilometres from Ganye to which it is linked by a laterite road hardly negotiable during the rainy season.[1] A majority of the people here are farmers. The village has a primary school (UPE) and a dispensary. Ganye LGA lies partly in the Northern Guinea climatic zone and the Southern Guinea climatic zone. The Southern end lies in the derived savannah and forest climatic zones (Ministry of Finance and Economic Development/ SOTESSA, 1979). There are two seasons in the year, the wet and the dry seasons. The wet season begins between March and April and ends late in October, after which follows the dry season which ends in March the following year. The average annual rainfall is about 1300mm per annum (Ministry of Agriculture and Cooperatives Gongola State, 1980).

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1. The Authors personal experience in September, 1980, while making a prelininary trip to the LGA.

The soils here are mostly of the deep tropical ferruginous type, both leached and non-leached, and some eutrophic soils to the North of the state. The vegetation is mostly woodland with forests, especially, [illegible] and thick grass. Some vegetation exists where mountains are found to the South. This local Government area is bounded to the South by the Gashaka Plateau which merges into the Mambilla Plateau.

Jalingo LGA with headquarters at Jalingo town is 161 kilometres from Yola and has a projected population of about 209,658. The Local Government Area is comparised Jalingo, Mummuye and Kwaji Districts. The main occupation in this area is farming with guinea corn, yam and groundnuts as the most commonly grown crops. A few people are engaged as blacksmiths and fishermen. Like Ganye LGA, this LGA also has badly developed roads, and hence, horses and canoes are used as alternative transport mode (Gongola State Government Ministry of Economic Planning, 1978). The villages selected in this LGA are Lankaviri and Mallum. Lankaviri has a projected population of about 4004 and is about 9 kilometres from Jalingo to which it is linked by a laterite road which is very inaccessible during the rainy season and the Federal Government highway from Calabar which passes by Jalingo town. There is one primary school in this village. Mallum on the other hand has a 1978 projected population of about 3682, is situated 15 kilometre away from Jalingo, to which it is linked by another barely usable road during

the wet season. Like its counterpart above, it has one primary school by way of amenities. Jalingo LGA also, lies in the Northern and Southern Guinea Savannah climatic zones. It is characterised by a dry and wet season with rainfall starting in April and lasting till October. The mean annual total is about 1200mm with considerable variation in both annual and monthly totals. The soils in this LGA are partly ferruginous tropical soils, vertisols and eutrophic soils. Alluvial soils are found along the river Benue and its tributaries. The vegetation is a transition between the Northern and Southern Guinea Savannah Zones with grassland and shrubs as the main vegetation. Tall trees are found here and there with pockets of forests along streams. In all three LGAs the types of soil and vegetation that are found show that there is need for increasing fertilizer use level in the state. Table 3.3 and figure 3.1. give more information on the study area.

Table 3.4. Some Socio-Economic Data on the Selected LGAs and Villages.

Item	Population[a]	Number of households	Number[b] of farmers	Number of cattle-rearers	Number of teach-ers	Number of traders	Number of black-smiths	Number of fishermen
Gongola State	3,797,805	N.a.	293805	38796	11973	N.a	N.a	N.a
Gombi LGA	239,880	"	191,904	N.a	884	"	"	"
Ganye LGA	268,152	"	214,522	"	1266	"	"	"
Jalingo LGA	299,658	"	239,726	"	445	"	"	"
Pella	116,44	1206	1071	3	25	102	5	"
Hildi	8569	1318	1222	2	23	69	2	"
Mbulo	7252	1116	1061	13	19	19	3	"
Pirchi	2768	426	396	6	9	11	4	"
Lankaviri	4004	916	862	-	17	24	14	3
Mallum	3682	867	800	-	12	31	9	15

a & b 1979 Projection based on, the 1963 census

n.a = Not available

Source: Gongola State Statistical Digest 1978, and District Tax Records 1979.

CHAPTER IV

THE FERTILIZER DISTRIBUTION PROGRAMME IN GONGOLA STATE: A SURVEY.

In fulfilment of objective one of the thesis, this chapter presents a detailed analysis of the organization of the fertilizer distribution programme as revealed by the study. This provides the background information against which problems faced by the distribution system are identified and discussed. The chapter is based on information obtained from six categories of respondents, consisting of 20 contract transporters of fertilizers, 15 extension workers (five from each study LGA) nine store-keepers, nine government officials including members of the Green Revolution Committee at State and LGA levels, 120 farmers who used fertilizers and 32 who did not.

The first section of this chapter identifies those who are involved in the fertilizer distribution programme and their functions. The subsequent sections discuss the existing fertilizer storage facilities, distribution channels, the relative efficiency of the distribution channels, the operational problems affecting the fertilizer distribution system and fertilizer distribution costs. Finally an attempt is made to identify cost components of the fertilizer distribution programme in the state.

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4.1 Participants in the Fertilizer Distribution Process and Their Functions

The main participants in the fertilizer distribution programme are the state level agricultural services division of the Ministry of Agriculture and Cooperatives, the State Green Revolution Council, the Local Government Agricultural Services Division, the LGA Green Revolution Committee, contract transporters, District and village councils, storekeepers and extension staff, and cooperative group farming societies.

4.1.1 The state level agricultural services division.

It was mentioned before that the procurement and distribution of fertilizers in Gongola State is the sole responsibility of this division. The Principal Agricultural Officer (P.A.O.) in charge of fertilizers, prepares the estimate of quantities of fertilizers required by the state for each cropping season, based on requests sent in by the LGAs and changes in cropping patterns as observed by extension officers in the LGAs. He is responsible for sending the estimate of requirements to the Fertilizer Procurement and Distribution Division, of the Federal Ministry of Agriculture in Lagos.

4.1.2. State green revolution council.

This Council comprises all the commissioners in the state, the Chief Agricultural Officer, a few other Government Officials. and a Chairman, who is the head. The Council is responsible for all policy matters relating to the Green Revolution Programme and especially fertilizer distribution. It has to scrutinize and approve all estimates of fertilizer requirements for the state before they are sent to the Fertilizer Procurement and Distribution Division. (FPDD) and all provisional allocations of fertilizers to LGAs before they are delivered.

4.1.3. The local government level agricultural services divisions

This institution which is headed by the Divisional Agricultural Officer (DAO) is concerned with fertilizer distribution at the LGA level to Districts and villages. It arranges for the transportation of fertilizers to districts, using contractors or Ministry vehicles where available. All information concerning fertilizers from the village level is compiled at the Local Government level through the use of extension workers, for onward transmission to the Ministry headquarters and vice versa.

4.1.4. The LGA green revolution committee.

The LGA Green Revolution Committee comprises heads of the Local Government Ministries, with the Secretary to the Local Government as its Secretary and the Divisional Agricultural Officer as Secretary.

This committee has to approve the provisional allocation of fertilizers made by the DAO to districts, before the distribution can start. The provisional allocation is usually based on population and cropping patterns.

4.1.5. Contract transporters.

In order to alleviate the problem of lack of vehicles, the Ministry employs contractors to haul the fertilizers from the state warehouse to LGA stores. During the reference period the Ministry engaged the services of about 200 contractors. The study shows that 80 percent of the contractors employed were not specialised in any one contract job. Some were building as well as supplies contractors. Infact 20 percent of the contractors interviewed had sublet their fertilizer transportation contract for that season to some other person at a profit.

4.1.6. District and village councils.

The notable thing about this group of participants is that they are influential with regard to district, village, and ward affairs respectively. The District Council is made up of all the village heads, with the District head as its Chairman and the District Agricultural Superintendent as its Secretary. The District Council shares out fertilizers allocated to that district by villages based on their population size.

The village council made up of all the ward heads with the village head as the chairman share the fertilizers by wards, where it is eventually sold to the farmers. The participation of this category of people in the distribution process has been identified only in Ganye LGA. This arrangement was officially made at the LGA level to deal with fertilizer distribution problems observed within the LGA. However, the State Government regulation insists that fertilizers must be sold by Ministry staff only.

4.1.7. Store-keepers and extension staff.

Apart from ward heads in Ganye LGA, Store-Keepers and extension staff are the major retailers of fertilizers in the Local Government Areas. The fertilizers are transported by the Local Government using contractors to district and village level stores, if such stores exist. Store-keepers then sell the fertilizers from the stores, while extension officers transport some to other villages for sale, especially, on market days. Extension workers also sell fertilizers and other inputs at the Agro-Service Centres. The store-keepers are expected to keep a record of all sales made both by them and by the extension officers, deliveries of fertilizers from the state government and the stock balance or inventory at the end of the season.

4.1.8. Cooperative group farming societies.

Farmers' societies also engaged in the fertilizer distribution activities. During the reference period, they received allocations of fertilizers directly from the state level through the Cooperative Division of the Ministry. This Division sold the fertilizers to group farming societies who in turn retailed the fertilizers to their members. As at 1980, there were 41 registered and 30 unregistered cooperative group farming societies in the state with an average membership of 83 people (Ministry of Agriculture and Cooperative, 1980). On the whole the cooperative societies were said to be suffering from lack of membership and the resultant lack of funds with which to purchase fertilizers from the Cooperative Division.

4.1.9. Selected farmers.

In addition to extension officers and the store-keepers selling fertilizers, Gombi, like Ganye LGA, created an additional fertilizer retailing channel. This entails the use of some selected farmers as salesmen by the Divisional Agricultural Officer. The farmers were selected on some criteria discussed later. Most of these participants in the fertilizer distribution programme were interviewed for the study. A detailed description of the existing fertilizer storage facilities is given in the next section.

4.2. Fertilizer Storage Facilities in the Study Area.

In order to distribute fertilizers adequately, the Ministry constructed a number of stores in each local government area. As at 1980 there were a total of 93 fertilizer stores, including the Federal Government's Agro-Service Centres in the States' LGAs, of which only 39 were standard structures with a capacity of 1,000 tonnes each. The rest were made of zinc or mud walls, with capacities ranging between 500 and 750 tonnes each. As of 1979, the total capacity of fertilizer storage facilities available in the state was 41,250 tonnes (International Fertilizer Development Centre, 1981). Table 4.1. lists the stores available in each of the study LGAs as at December, 1980. The table shows that in Gombi LGA there were a total of seven stores, five of standard structure and two small ones. Three of these belonged to the LGA, of which two are located in Gombi and one in Hong respectively. The other one located in Hong is the Federal Agro-Service Centre for the LGA, while the rest are district level stores, serving Hong and Uba District. Ga'anda District which is the third district in this LGA is served by the LGA stores in Gombi town which, as well as being the LGA administrative seat, is part of the district.

Table 4.1. Fertilizer Stores in the LGAs Studied and Their Locations as at October, 1980

LGA	Location of stores	Designation	No	Type of Structure
Gombi	Gombi	LGA	2	Standard
	Hong	LGA	1	Standard
	Hong	Agro-service centre	1	Standard
	Hong	District	2	Small Stores
	Uba	District	1	Standard
Total			7	
Ganye	Ganye	LGA	3	Standard
	Ganye	Agro-service centre	1	Standard
	Sugu	District	1	Small Stores
	Jada	District	1	Small Stores
	Yelwa	District	1	Small Stores
	Mbulo	District	1	Small Stores
	Tongo	District	1	Small Stores
	Leko	District	1	Small Stores
	Koma	District	1	Small Stores
Total			11	
Jalingo	Jalingo	LGA	2	Standard
	Pupule	LGA	1	Standard
	Pupule	Agro-service centre	1	Standard
	Panti Sawa	District	1	Small Stores
	Sun Kani	District	1	Small Stores
	Jalingo	District	1	Small Stores
Total			8	

Source: Ministry of Agriculture and Cooperatives, 1980.

In Ganye LGA, there were a total of 11 fertilizer stores. Out of these, four were standard stores, three belonged to the LGA level and one served as the Agro-service centre.

The remaining seven were small stores which served as district stores for each of the seven districts in Ganye LGA. Jalingo LGA on the other hand, had a total of eight fertilizer stores, four of which were standard structures. Three belonged to LGA level, one served as the Agro-service centre, while the three small stores served as district stores for Kwajji, Mumuye and Jalingo districts respectively.

The storage of fertilizers allocated to the LGAs are shared between the LGA level stores which, as we have seen, may be located in different towns. The table also shows the absence of any village level stores, in spite of the fact that there has been an increase in the number of stores available in recent years. The stores, in addition, are unevenly distributed such that they are mostly concentrated around two or three towns. This was characteristic of all the state LGAs. The Cooperative Division has a warehouse at state level, where the quantity of fertilizers allocated to cooperative societies are stored.

4.3. The Existing Channels of Distribution of Fertilizers.

The distribution of fertilizers during the period of the study was organised at three levels, namely, the Federal Government level, the State Government level and the Local Government level. These are discussed below.

4.3.1. The federal level.

The procurement of fertilizers was centralised by the Federal Government in 1976 in the Fertilizer Procurement and Distribution Division, headed by a Director under the Federal Department of Agriculture. The Fertilizer Procurement and Distribution Division first of all calls for estimates of fertilizer requirements for the season from the states. It then prepares the total nation-wide requirements, based on the requests from various states' Ministry of Agriculture, and past consumption of fertilizers. In Gongola State, these requirements are based on the requests from LGAs and Government Projects. The Fertilizer Procurement and Distribution Division then sends this estimate to the Federal Government Executive Council for approval. Thereafter, the Division puts out tenders for the supply of the approved quantities and types of fertilizers and processes the quotations from private importers who are to deliver fertilizers directly to pre-designated state warehouses (Sodangi, 1980). Super phosphate from the Federal Super phosphate Fertilizer Company in Kaduna is also pooled together with the imports for distribution to the states.

The procurement process normally starts around June so that deliveries can start before March of the succeeding year, or before the beginning of the planting season (Falusi, 1973). The contract dictates the size of package, packing specifications and date of delivery at the warehouse. The fertilizers are delivered in a coordinated and phased manner to avoid such logistical problems as port congestion and the resulting high demurrages and transportation bottlenecks, which used to plague the delivery process in the early and middle 1970s. The fertilizers are delivered to state depots based on the states' approved requests at 50 percent subsidy by the Federal Government. From this point on, fertilizer distribution becomes the responsibility of the individual states concened.

4.3.2. The state level.

In Gongola State, the state level Agricultural Services Division proposes quantities to be allocated to each LGA. The allocation is based on their estimate of requirements, utilisation, availability of storage facilities, type of crops grown, equity and political considerations. These proposals are then sent to the state level Green Revolution Committee which approves the quantities, or makes changes where deemed necessary. The approved LGA allocations are then delivered to them at 25 percent subsidy by the state government through the use of contract transporters. The contractors deliver the fertilizers to LGA depots usually situated in

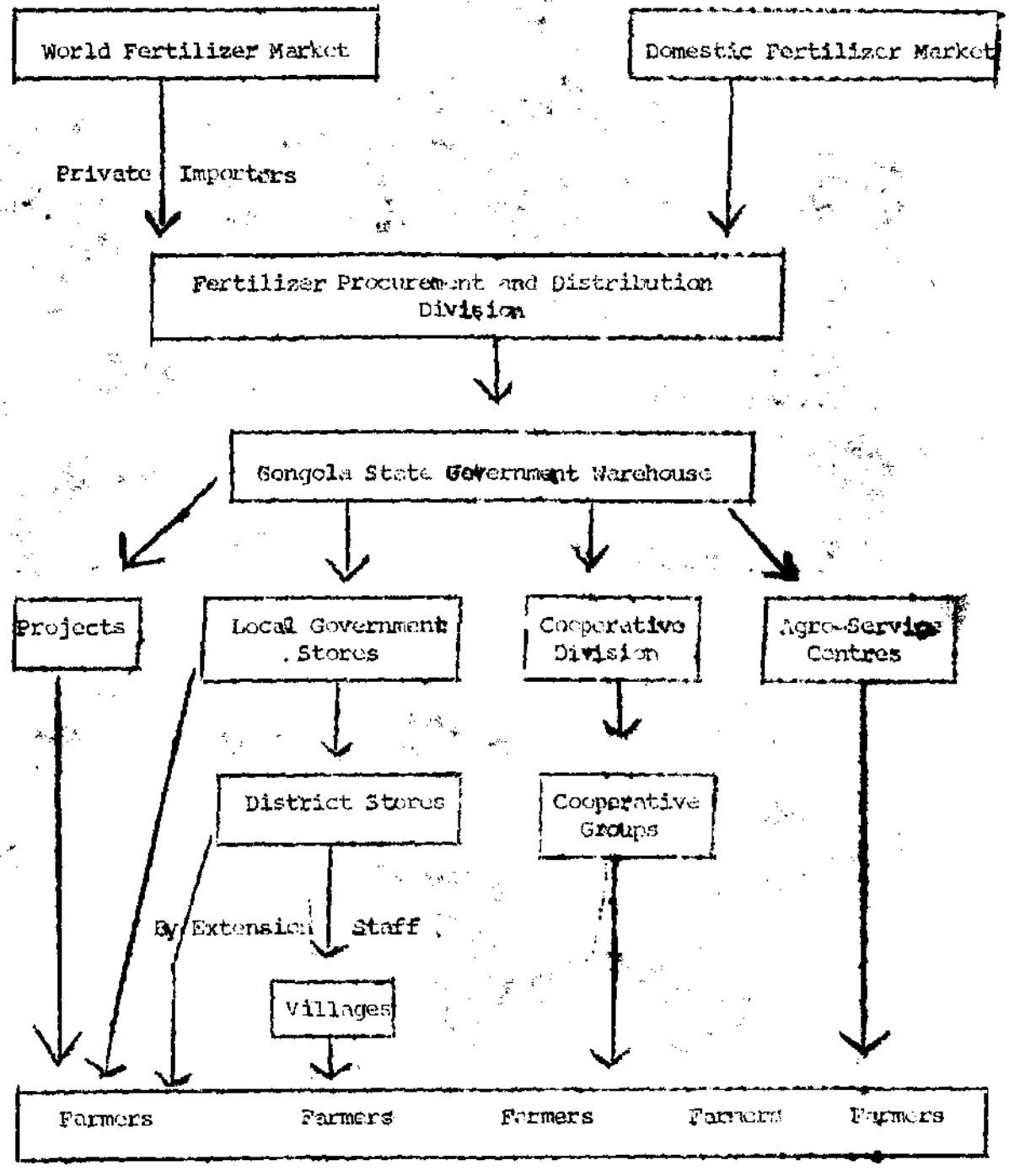
two or three towns including the LGA Administrative Headquarters (Gongola State Government Ministry of Agriculture and Cooperatives, 1980).

4.3.5. The local government level.

At the LGA level, fertilizers are allocated to the districts by the Local Government Green Revolution Committee with the Divisional Agricultural Officer acting as the Secretary to the Committee, and the LGA Secretary as Chairman. Here, the allocation is based on crops grown and population. The allocation for each district is then transported at the expense of the Local Government to the districts and villages, and sold by the Ministry of Agriculture and Cooperatives extension staff from small stores. The Local Government either uses its own vehicle or contract transporters to convey the fertilizers to districts and villages.

The State Government, however, allocates and delivers fertilizers directly to the Cooperative Division who sell them to member groups, and to agro-service centres, while projects are directly allocated, either by the Federal or State Government. Figure 4.1 shows the channels of distribution of fertilizers. As can be seen from the chart, farmers can buy fertilizers not only from the village level if it is available, but also from the district or LGA stores. The field survey, however, revealed that some of the study LGAs had deviced other ways of distributing fertilizers at village level, in addition to the distribution channels laid down by the state government. These are discussed in the next sections.

Figure 4.1. Official Fertilizer Procurement and Distribution Channels in Gongola State.



Source: Falusi and Adubifa, Economics of Fertilizer Distribution in Nigeria, NISER, Ibadan, 1975, Pg. 47 and, Ministry of Agriculture and Cooperatives, 1980.

4.3.4. The distribution channels in Gombi LGA.

In addition to the official channels of distributing fertilizers in the state, fertilizers in this LGA are delivered to some selected farmers in some villages. These farmers sell the fertilizers to other farmers and remit the revenue to the Divisional Agricultural Officer. Two criteria were used for the selection of the farmers by the Divisional Agricultural Officers:

i) The farmer must have storage facilities and

ii) He must agree to sell them at the government established price. In other words, the arrangement is not supposed to be profit oriented. The fertilizers were transported to the domains of the selected farmers at the expense of the Local Government, which also served as the guarantor of the selected farmers.

4.3.5. The distribution channels in Ganye LGA

Fertilizers allocated to this LGA were shared on district basis by the LGA Green Revolution Commiittee. The supply for each district was then delivered to it by Local Government vehicles or contract transporters. At the district level, the fertilizers were distributed to the villages by the District Council. The transportation of fertilizers to the villages was arranged by the village heads at the expense of the Local Government. Once in the village, the village head and the extension officer concerned called a meeting of all the ward

heads, where the fertilizers are shared amongst the wards. Farmers could then buy the fertilizers from their respective ward heads. Jalingo LGA on the other hand distributed its fertilizers in accordance with the channels laid down by the state government.

4.4. The Relative Efficiency of the Distribution Channels in the Study LGAs.

This section attempts to briefly compare the efficiency of each of the systems of distributing fertilizers used in the LGAs studied. The yardsticks used for comparison are the essential components of an adequate fertilizer distribution system already described in Chapter II. These components are the estimation of requirements, the procurement of supplies, primary and secondary supply movements, regional storage and retailing to farmers.

The estimation of demand, procurement and the primary movement of fertilizers are taken charge of by the Federal Government, while the State Government takes charge of regional storage and secondary and tertiary movement of fertilizers. Generally, the Federal Government has attempted to evolve an ideal distribution system by centrally coordinating the estimation, procurement and primary movement of fertilizers. However, the process is still bedevilled by problems such as lack of adequate information

on fertilizer inventory and needs, the late arrival of supplies and the lack of buffer stocks. In addition, the Federal Government uses road haulage, the more costly means of transporting fertilizers, rather than rail. This is due to the fact that rail transport is from station to station, and hence increases handling problems when transporting fertilizers from the railway station to the final destination. Besides extra handling which often results in fertilizer damage, the general shortage of rail wagon militate against the use of rail transport.

Regional storage and secondary and tertiary movements of fertilizers in the study LGAs are organized by the state government while retailing is organised at local government level. There is one regional storage or warehouse in the state where fertilizer supplies from Fertilizer Procurement and Distribution Division are stored which awaiting distribution to the state's local government stores. As at 1980, most of the fertilizers supplied to the state were stored in the open and covered with tarpaulin. This is because the capacity of the state warehouse was only 1,000 tonnes. The state government probably did not think it necessary to build more warehouses, because the fertilizers are distributed to the LGAs immediately, except when they are delivered by the Fertilizer Procurement and Distribution Division before or after the planting season. All the same, a 1,000-tonne-capacity store is too small to serve as the warehouse to a state that receives over 20,000 tonnes of fertilizers annually.

The storage situation at the LGA and district levels is little better, especially considering the spread of the stores. The problem of storage of fertilizers is discussed in greater details in section 4.5.5.

Retailing of fertilizers to farmers is the most crucial component of a fertilizer distribution system as it directly influences the level of use of fertilizers by farmers. The crucial factors to be considered in this respect are:

a) whether the prices of fertilizers are reasonable.

b) whether the personnel incharge of retailing institutions have some agronomic knowledge of fertilizer use in order that they can give farmers technical advice and

c) if the retailing institutions extend fertilizer credit to farmers to make it easier for them to buy fertilizers.

The proportion of fertilizers delivered to the LGAs and the quantities consumed (measured by fertilizer sales) is shown in Table 4.2.

Except for the 1978/79 season in which Jalingo LGA is supposed to have used 1,930.15 tonnes of fertilizers, the Table shows that Gombi LGA consumed a relatively higher amount of fertilizers, while Ganye consumed a bit less and Jalingo the least. The amount of fertilizers used in Jalingo LGA is that high, because some truck loads of fertilizers allocated to this LGA which could not be accounted for were presumed used. The truck loads are believed

Table 4.2 Quantities of Fertilizers Allocated, Delivered, and Used in The LGAs Studied (1978/79 and 1979/80) in Metric Tonnes.

LGAs	Quantities Requested for 1978/79	Proposed[1] Allocation 1978/79	Quantities Delivered 1978/79	Quantities used 1978/79	Quantities Requested for 1979/80	Proposed Allocation 1979/80	Quantities Delivered 1979/80	Quantities used 1979/80
Gombi	n.a.	2360	2756	2683	n.a.	3050	2699	2727.2
Ganye	n.a.	1925	1959	1491	n.a.	2050	2091	1119.25
Jalingo	n.a.	1920	1926	1930.15	n.a.	1956	1519	395.10

1 Very often, proposed allocations to LGAs did not tally with deliveries because the proposed allocations were based only on requests made to the FPDD and not the actual supplies, in addition to the fact that arbitary changes were sometimes made by the Ministry. Data for the 1977/78 season were not available.

n.a. = Not Available

Source: Ministry of Agriculture and Cooperatives, 1980.

to have been smuggled into the nearby Cameroun Republic (Gongola State Government Ministry of Agriculture and Cooperatives, 1980). Apart from causing inefficiency in the distribution of fertilizers, especially, by reducing the quantity available to farmers in the affected local government area and the state as a whole, the loss of fertilizers through smuggling constitutes an added cost, or a drain on the country's resources. On the other hand, the culprits enrich themselves at the expense of both the farmers and the level of agricultural output. Comparing the distribution systems that exist in the three LGAs to the ideal attributes of a fertilizer retailing system mentioned above, it can be seen that there are no facilities in any of the LGAs for farmers to buy fertilizers on credit from any of the retailers. The problem of the lack of fertilizer credit was expressed by some of the sampled farmers. In addition only the extension workers and cooperative groups have some agronomic knowledge of fertilizer use amongst fertilizer retailers in the LGAs studied.

The prices of fertilizers in all the LGAs in general were found to be those fixed by the Federal Government. In Gombi LGA, however, some farmers complained that some of the farmers selected to sell fertilizers increased fertilizer prices by about 20k. In other words, the selected farmers were making a profit on the sale of fertilizers contrary to the agreement.

On the other hand, they probably tried to make profit because they were not remunerated for their services unlike their ward counterparts in Ganye LGA. Other differences in fertilizer prices arose from the resale (illegal marketing) of fertilizers by some farmers to make gains, though such cases were very few.

The Ganye system of distribution of fertilizers on the other hand seems to get fertilizers to more farmers right in their villages and reduces storage problems. The quantity that a farmer can get at a time however is limited to one or two bags so that the available quantities can get to more people. A few farmers, however, complained that some of the village/ward heads discriminated in selling the fertilizers. Besides, the cost of distribution is heavy on the LGA due to the fact that the village and ward heads are remunerated for their part in distributing fertilizers. On the whole therefore it seems that none of the systems in the LGAs completely meets the attributes of a fertilizer distribution system.

4.5. Operational Defects of the Fertilizer Distribution System.

The study has identified the following constraints on the fertilizer distribution system in Gongola State.

i) The untimely arrival of fertilizers from Lagos.

ii) Transportation bottlenecks.

iii) Absence of storage facilities at village level.

iv) Poor records of fertilizer inventory.

v) Dearth of trained manpower.

vi) Use of extension staff to distribute fertilizers.

vii) Administrative delays.

viii) Farmers lack of knowledge of and unavailability of complementary inputs.

ix) High fertilizer distributions costs.

Each of these are briefly discussed below.

4.5.1. Untimely arrival of fertilizers.

The untimely arrival of supplies of fertilizers from Lagos was found to be one of the major problems facing the fertilizer distribution programme during the reference period. When/as the planting season starts around May/June, fertilizer deliveries from Lagos also commence around the same time. The study shows that deliveries from the Fertilizer Procurement and Distribution Division started in the month of June in 1978 and 1979 and in May in 1980. This problem was expressed by members of all the different samples notably the Ministry officials, extension workers, contract transporters, store-keepers and farmers. The deliveries were also staggered at intervals of about two to three weeks, such that the officials concerned with the distribution of fertilizers at the State Government level and transporters, could not carry out their duties, due to the fact that they were not available on time. Table 4.3 indicates the time of problem contractors faced in trying to fulfil the terms of contract with their contracts.

Table 4.3 Distribution of Contractors by Type of Problems faced while Transporting Fertilizers from the Ministry Warehouse to LGA Stores.

Problems*	No	Percentage
Bad roads	11	55
Delays at Ministry level	5	25
Non-arrival of fertilizers from Lagos	8	40
Lack of storage facilities	4	20
N =	20	-

* Includes multiple answers

Source: Field Survey, 1980.

Late arrival of fertilizers means farmers would be unable to buy fertilizers at the time they need them most. Some extension staff identified to be actively involved in fertilizer distribution, opined that if fertilizers were not applied at the right time to crops, the effect on yield might not be optimum. And if yield failed to increase after applying fertilizers the farmers might think it is ineffective and refuse to use it. Besides this, the late arrival of fertilizers at the LGA level results in excessive inventory in the LGA stores at the end of the season while farmers complain about their unavailability at the village level.

Three deliveries are usually made to the LGAs during the cropping season. Table 4.4. shows that fertilizers were delivered not earlier than June and as late as September during the reference period.

Table 5.1. Dates of Delivery of Fertilizers to the LGAs from 1978 to 1980.

Stores	Month of 1st supply			Month of 2nd supply			Month of 3rd supply		
	1978	1979	1980	1978	1979	1980	1978	1979	1980
Gombi	26th June	18th June	31st May	10th July	30th June	24th June	25th Sept	10th Aug.	11th July
Ganye	6th July	21st June	5th June	30th July	30th June	17th June	7th Sept	2nd Sept	6th Sept
Jalingo	6th July	17th June	6th June	31st July	15th July	21st June	18th Sept	30th Aug.	22nd Sept

Source: Field Survey, 1980.

4.5.2. Transportation bottlenecks.

There are two types of transportation problems faced by the fertilizer distribution programme. These are: (i) the lack of Ministry vehicles for transporting fertilizers from the state warehouse to LGA stores and villages and (ii) the lack of all - season motorable feeder roads to the villages.

The Ministry has attempted to solve the problem of lack of vehicles for transporting fertilizers to LGAs by using contractors. This is, however, a very costly venture. Table 1.5 below shows that, of the 15 extension workers interviewed, 54 percent said lack of transport, especially the four wheel drive type, prevented them from carrying out their duties during the rainy season. This was particularly the case for Jalingo and Ganye LGAs, where most of the feeder roads available are hardly motorable during this season in addition to their being few. These roads are often cut off by floods, which results in fertilizers being left at the roadside for weeks until the road is clear. Apart from the delay in delivery, this problem leads to fertilizer caking due to exposure to weather. The same problem was also cited by 55 percent of the transporters

Table 4.5 Distribution of Extension Workers by Types of Problems Faced.

Problems*	No	Percentage
Bad roads	8	54
Lack of Transport	8	54
Unavailability of fertilizer at Village level	9	60
Late arrival of fertilizers	2	13
N =	15	-

* Multiple answers included

Source: Field Survey, 1980

interviewed (Table 4.3). Discussions with four of the selected farmers who retailed fertilizers and seven LGA officials also showed that the problem of transportation affected their fertilizer distribution activities and fertilizer use by farmers.

4.5.3. Absence of storage facilities at the village level.

The storage facilities situation in the LGAs studied as of 1980 has been discribed earlier. Adequate storage facilities for fertilizers at all levels and, most especially, at the village level is a prerequisite for a successful fertilizer distribution programme. Table 4.6 shows that during the 1980 cropping season, the total capacity of LGA level stores in each of the LGAs studied was 3,000 tonnes. The total quantity of fertilizers proposed for the LGAs were 3050 tonnes 2050 tonnes and 1956 tonnes for Gombi, Ganye and Jalingo respectively. Comparing the capacity of the LGA stores with the quantities of fertilizers proposed for the LGAs, we find that, it is only in Gombi LGA that the quantity exceeds the capacity of stores by 50 tonnes. However, the quantity of fertilizers actually delivered was much less in the case of this LGA (2,699 tonnes) while Ganye and Jalingo received 2091 and 1519 tonnes respectively. Three deliveries of at least 500 tonnes each were made during the season to each LGA.

Table 4.5 Fertilizer Requirements, Deliveries, Stores Capacity and Inventory in the Three LGAs During the 1980 Cropping Season (Tonnes).

LGA	Quantity of NPK proposed	Quantity delivered	Total capacity of LGA stores	Quantity Consumed	Dates Fertilizers were delivered at the LGA Stores			Inventory 1979	Inventory 1980
					1st supply	2nd supply	3rd supply		
Gombi	3050	2699	3000	2777.80	31st May	24th June	7th July	73	44.20
Garkida	2050	2091	3000	1119.25	5th June	17th June	6th Sept	268	1180
Jalingo	1956	1519	3000	395.10	6th June	21st June	22nd Sept	196	1320

Source: Field Survey, 1980; Ministry of Agriculture and Cooperatives Files, 1978 and 1980.

Even with the previous year's inventory added, it can be seen from the foregoing discussion that there is no storage problem at the LGA level. Besides, as the fertilizers are being delivered at the LGA stores, arrangements are made, as much as possible, immediately, to distribute them to the District Level stores where they are also sold out to farmers more or less immediately after they arrive.

The problem of storage in the LGAs studied is quite acute at the village level. There is a complete absence of village level fertilizer stores in the study area, in spite of the fact that there has been a rapid increase in the number of fertilizer stores at other levels in the past few years.[1]

4.5.4. Poor records of fertilizer inventory.

Fertilizer inventory is defined as the unsold quantity at the end of the previous season plus the current seasons deliveries minus sales.

Whereas the improper control of fertilizer inventory was one of the serious problems faced by the distribution programme in the mid 1970s, which resulted in the erratic movement of fertilizers and fertilizer spoilage, this study shows that

1. The Federal Government gave ₦60,000 to each state in 1979 for building more fertilizer stores, while the state ADP and Agro-Service Scheme have built some stores and plan to build many more (Ministry of Agriculture and Cooperatives, 1980).

there has been considerable improvement in this respect in Gongola State. Fertilizers are delivered in a pre-arranged manner, based on the allocation of fertilizers to each LGA. However, record-keeping on fertilizer stocks still needs a lot of improvement. In two out of the three LGAs, namely Gombi and Jalingo, records on deliveries of fertilizers from the state warehouse, sales and inventory were not up-to-date. This is quite serious, in view of the fact that the Ministry Officials claimed that Gombi LGA fertilizer stores had one of the best kept records. This could be attributed to the lack of trained staff which is discussed below. Notable also is the fact that while there were large fertilizer inventories at the LGA level stores in the LGAs studied, there were none at the district stores such as in Uba, Mbulo, and Pantisawa in Gombi, Ganye and Jalingo LGAs respectively. The large inventories occured due to the untimely arrival of fertilizers at the LGA level, making it too late for their application to crops and hence they were not distributed to the district stores for sale.

4.5.5. Dearth of trained manpower.

Another constraint on the fertilizer distribution programme cited by the Ministry officials and also, identified by the study, is the shortage of trained personnel, especially of the intermediate category, consisting of extension workers and store-keepers who are the most preoccupied with fertilizer distribution. The Agricultural

Services Division of the Ministry had an estimated total number of staff of 925 at the end of 1980 (Gongola State Government Ministry of Agriculture, Land Management and Cooperatives, 1980). Of this number, 695 were field or extension staff of various categories. Each local government had between 30 and 35 extension workers. The Ministry also had 90 stores personnel, consisting of 80 stores attendants/assistants, eight store-keepers, one senior store officer and one senior store-keeper. The last two were employed at the state level. Since there were only eight store-keepers to 17 LGAs, some LGA fertilizer stores were manned by store assistants and attendants, some of whom were hardly knowledgeable in this field. All in all, each LGA had between four and five store-keepers/stores assistants/attendants taking charge of LGA fertilizer stores, while some extension workers took charge of district stores.

All the store-keepers interviewed agreed that the stores were understaffed. The adequate staff strength they suggested is shown in the last column of Table 4.7, which gives a total of 25 men. This is more than twice the available staff strength. Generalising for all the stores available in the state LGAs as a whole, it can be seen that four to five stores personnel for each LGA is grossly inadequate. In fact, some of the store-men claimed that the poor staffing situation led to overwork on the part of the available staff, and consequently essential duties such as the keeping of records of fertilizer movements were often neglected.

Table 4.7 Sample Stores Showing the Staff Strength at the Time of Study and the Adequate Staff Strength Proposed by the Store-keepers.

LGA	Gombi	Staff strength	Adequate staff/ Strength
Gombi	Gombi	2	2
	Kong	1	2
	Uba	1 (extension staff)	
Ganye	Ganye	2	3
	Jada	1	3
	Mbulo	1 (extension staff)	2
Jalingo	Jalingo	2	4
	Lupule	1	3
	Pantisawa	1 (extension staff)	2

Source: Field, Survey, 1980.

The study also revealed that a similar shortage of extension staff exists. Discussions with the Ministry Officials showed that, whereas ideally the ratio of extension workers to active farmers should at most be 1:300 as cited in the literature review, one extension worker in the study area is required to cover at least two villages, in addition to taking part in fertilizer or other input distribution activities.

4.5.6. Use of extension staff to distribute fertilizers.

The use of extension staff to distribute fertilizers, in addition to their professional duties, is another manifestation of the shortage of stores personnel in the LGAs studied. Of the 15 extension staff interviewed, 67 percent claimed active involvement in the programme. A breakdown of this number by LGA is shown in Table 4.8.

Table 4.8 Distribution of Sampled Extension Workers Involved in Fertilizer Distribution by LGAs

LGA	Extension staff involved in Fertilizer Distribution	Extension Staff not involved	Percentage involved
Gombi	3	2	60
Ganye	2	3	40
Jalingo	5	0	100
Total	10	5	67%

Source: Field Survey, 1988

The consequences of extension staff involvement in the sale of fertilizers have already been mentioned in the literature review. Their professional duties as the imparters of information to farmers on all modern agricultural practices cannot be fully attended to.

4.5.7. Administrative delays.

Administrative delay in decision-making also poses a constraint on the fertilizer distribution programme. This is because decisions on fertilizers, for example, have to pass through the hands of several officials and committees before the required action is taken. Administrative delays at the Ministry level was earlier cited by 25 percent of the sampled contractors as a constraint to the fulfilment of the conditions of contract for transporting fertilizers to LGAs.

4.5.8. Farmers' lack of knowledge of and unavailability of complementary inputs.

The study revealed that while farmers' knowledge of fertilizers is very good in the study area, complementary inputs such as herbicides, seed dressing and improved seeds are not very well known. Of all the farmers sampled (152) only 32 percent know about herbicides while 45 percent, and 38 percent respectively knew about improved seeds and pesticides. In addition, these inputs are not easily available to farmers, since they are sold either at the Agro-Service Centres or the LGA Agricultural Services Division stores.

4.5.9. High fertilizer distribution cost.

The last but not the least important problem faced by the fertilizer distribution programme was that of high distribution cost. Discussions with Ministry Officials and figures available for the three years of the reference period (Gongola State Government Ministry

of Agriculture and Cooperatives, 1980) show that fertilizer availability has improved in the study area. This improvement, however, is due to the general increase in Federal and State Governments' budget for the procurement and distribution of fertilizers. Fertilizer distribution costs are incurred at two levels, namely, the Federal Government and State Government levels. There are two broad categories of distribution costs, viz: (i) direct costs and (ii) indirect costs. The direct costs are those whose proportion vary directly with the volume of fertilizers distributed. These include the cost of procuring fertilizers such as, the import cost, C.I.F., port charges, customs inspection charges, stevedoring charges and the cost of transporting fertilizers from the ports to the various states. On the other hand, the indirect costs of fertilizer distribution consist of overhead costs, such as storage costs, administrative overheads, cost of fertilizer sales promotion programmes which are usually carried out by the Ministries of Agriculture, and cost of fertilizer damage and interest on capital.

Since this study is only concerned with fertilizer distribution costs at the state level, it would only be mentioned in passing that the Federal Government bears about 50 percent of the total cost of procuring and distributing fertilizers, while the State Government bears 25 percent. The rest (another 25 percent) is the cost borne

by farmers as the price of fertilizers. The main purpose of this section is to point out, that (i) the distribution cost of fertilizers is very high within the state and country as a whole. (ii) the opportunity cost of the very high distribution cost is reduced investment in other social sectors such as education, health, communications etc. and (iii) alternative ways of distributing fertilizers must be evolved if costs are to be minimized. Those alternatives include either a reduction of the subsidy on fertilizers so that more of the cost is shifted to farmers, or else, the responsibility of distributing fertilizers should be vested in a company with statutory monopoly of the trade. The latter is a possibility that the Federal Government is considering to adopt in the future, which might not only reduce distribution costs but also avoid becurocratic delays which are typical of public establishments.

4.6 Fertilizer Distribution Costs and Their Components in Gongola State.

A part of objective two of the thesis is to study the cost components of fertilizer distribution in the study area. It is important, however, to note the difficulties involved in ascertaining the real value of distribution cost components. This is because the cost of some overheads such as administration and fertilizer sales promotion, which make use of extension staff and

ther Ministry personnel [illegible] Ministry storage facilities, depreciation on Ministry vehicle used and interest on capital are difficult to [illegible]. The elements of distribution costs that are directly quantifiable are transportation and handling costs. Over 70 percent of intra-state distribution costs consist of transportation costs (Gongola State Government Ministry of Agriculture and Cooperatives, 1980). During the reference period, the Ministry rate for fertilizer transportation was 5k per tonne per kilometre, irrespective of the condition of the roads. Handling charges were fixed at one naira per tonne for loading and one naira per tonne for off-loading. Table 4.9 shows the estimated costs incurred by the state on only the transportation and handling of fertilizers during the 1978/79 and 1979/70 seasons.

Table 4.9 Estimated Cost of Fertilizer Transportation and Handling During the 1978/79 and 1979/80 Seasons.

Year	Quantity (Tonnes)	Cost of Transportation * ₦	Cost of handling ₦	Total cost ₦
1978/79	25,050	561,789	50,100	521,889
1979/80	34,092	7[illegible],330	68,184	832,514

* Based on the distance from the State warehouse, to all LGAs and the rate paid per tonne per kilometre.

Source: Field Survey, 1980

These cost are only indicative of the cost of fertilizer distribution to the state government because of the several other costs that have not been taken into consideration. Generally, however, there seems to be an increase in cost commensurate with the increase in fertilizer quantities, since handling and transportation rates paid by the ministry have not changed over the study period.

Considering the problems associated with the determination of cost components of fertilizer distribution, therefore, the writer can only attempt to impute them in this study. To this effect, the approximate cost components of distributing one tonne of fertilizers within the state to an average distance of 120 kilometres in Gombi LGA from the state warehouse, using 1979/80 prices of fertilizers given in Table 4.10, is presented in Table 4.11. It is to be noted that there has been huge fluctuations in fertilizer prices over the past decade. This means that the distribution cost components to be discussed, only reflects the situation in 1979/80 season when, there was a general fall in fertilizer prices. Hence the value of cost components can be expected to be much higher now.

Table 4.10 C.I.F. Import Prices of Major Fertilizer Types in Nigerian Ports 1970/71 to 1980/81 (₦ per Tonne)

Product	1970/71	1971/72	1972/73	1973/74	1974/75	1975/76	1979/80	1980/81
Amm.Sulphate	44	52	60	82	115	115	90	108
Urea	-	-	-	-	-	-	123	135
SSP	32	51	60	70	105	109	67	88
M.O.P.	41	59	64	66	94	125.1	84	115
15-15-15	60	70	75	130	145	166.5	117.7	152
25-10-0	60	66	66	104	120	164	-	-
20-20-0	-	-	-	-	-	-	116	149
12-12-12	-	-	-	-	-	-	123	156.7

Source: International Fertilizer Development Centre Bulletin - T. 18, Nigeria, Fertilizer Sector: Present Situation and Future Prospects, June 1981.

These costs were calculated based on information obtained from the Ministry of Agriculture and Cooperatives, Gongola State as follows:

a) Handling charges at one naira per tonne for loading and one naira per tonne for off-loading .

b) Road transportation at five kobo per tonne per kilometre.

c) Storage rent, given the cost of building one standard store of 3,000 tonnes capacity as ₦10,000, and a six percent return on capital invested per annum. The quantity of fertilizers stored for Gombi LGA during the year in question was 2,699 tonnes.

Table 4.11 Imputed Distribution Cost Components for One Tonne of Single Super Phosphate in 1979/80.

Direct costs	₦	K	Cummulative %
1. C.I.F. import price at Lagos	67	00	100
2. Primary movement to Gongola State warehouse in Yola	60	00	189.6
3. Handling charges(off-loading)	1	00	191
4. Secondary movement to LGAs over a distance of 120 kilometres	6	00	200.9
5. Handling charges (loading and off-loading)	2	00	203.9
6. Tertiary movement to districts and villages over an average of 25 kilometres	1	25	205.8
7. Handling charges (loading and off-loading)	2	00	207.8
8. Fertilizer damage calculated at 25 tonnes or 01 percent of the quantity of fertilizers handled	00	04	207.9
9. Total direct cost	139	29	207.9
Indirect Costs			
10. Storage rent per tonne for an average of 4 weeks in the state warehouse	0	02	0.029
11. Cost of maintenance per tonne for four weeks	0	01	0.044
12. Storage rent at LGA store for an average of three months	0	06	0.134
13. Cost of maintenance of LGA fertilizer store for three months	0	03	0.174
14. Depreciation on three Ministry vehicles used by extension workers and fertilizer store-keepers	2	10	3.31
15. Cost of administration and fertilizer sale promotion programmes per tonne	0	[illegible]	[illegible]

Table 4.11 Cont.

a)	Principal Agricultural Officer in charge of fertilizers	0	40	3.91
b)	Extension staff	0	18	4.18
c)	Store-Keepers	7	61	15.54
d)	Chief Agricultural Officer, Divisional Agricultural Officer, The State and LGA level Green Revolution Committees, District and Village Councils etc	n.a		-
	Total indirect costs,	10	41	15.54
	Total cost, of distributing one tonne of fertilizers	₦119	70	223.44

n.a. = not available - The cost of administering fertilizer activities by this group of officials cannot easily be calculated because they carried out several other activities at the same time.

Source: Field Survey, 1980.

d) The cost of maintenance of a standard fertilizer store was assumed to be five percent of the building cost, with the life time of the store as 15 years.

e) Depreciation on the three Ministry vehicle used by both extension staff and store-keepers during the whole week was based on a cost price of ₦10,000 each, a life time of five years, the salvage value of five percent and the quantity of fertilizers transported as 2,699 tonnes.

f) Cost of administration and fertilizer sales promotion was based on:-

a) the annual pay of the Principal Agricultural Officer in charge of fertilizers of ₦8,052, plus 25 percent for gratuity and the volume of fertilizers handled during the season, which was 25,150 tonnes.

b) the annual pay of ₦2,058 for each of the extension staff in the LGA plus 25 percent for gratuity, spending two days a week on fertilizer distribution, while the quantity of fertilizers handled was 2,699 tonnes.

c) the annual pay of ₦2,058 for each of the eight store-keepers or assistants in the LGA, plus 25 percent for gratuity, and working full time on distributing fertilizers. The volume of fertilizers handled was also 2,699 tonnes.

The exercise shows that the total cost of distributing one tonne of superphosphate fertilizers in 1979 from Lagos to the State Warehouse and the LGAs was about ₦149.70. Considering that one tonne of SSP fertilizers cost ₦67/tonne ex-Lagos in this year, it shows that the internal distribution costs alone accounted for ₦82.70 of the total cost, which is about 123 percent of the cost of the fertilizer itself. Transport cost seems to have taken the largest share of the internal distribution costs as shown by the table.

For reasons already mentioned, it should be noted that, the cost components are mere imputations and can only be used as a pointer to the general trend in fertilizer distribution costs within Gongola State. A comparison of the fertilizer distribution cost components imputed in this study and those of the U.A.R. and the Phillipines, cited in the literature review (See Table 2.5) shows that only, 35.6 percent increase in distribution cost per tonne of low concentrate fertilizers is incurred in the U.A.R. and 22.9 percent in the Phillipines, as compared to over 100 percent in Gongola State. The same can be said also for the high concentrate fertilizers. Only 5.3 percent increase is incurred as distribution cost in the U.A.R., while in the Phillipines it is much higher - 32.6 percent. It has been mentioned, however, that the differences in these cost components are attributable to the differences in distribution systems and in their institutional characteristics.

4.7 Summary

This chapter has attempted to give a detailed description of the organisation of the fertilizer distribution programme in the state and the LGAs studied. Against this background information, the problems faced by the fertilizer distribution programme in the study area were identified as:

i) the untimely arrival of fertilizers from Lagos

ii) transportation bottlenecks

iii) absence of village level fertilizer stores

iv) poor records of fertilizer inventory

v) dearth of trained manpower

vi) the use of extension staff to distribute fertilizers

vii) administrative delays

viii) lack of knowledge of complementary inputs by farmers, and their unavailability

ix) and finally high distribution costs.

The chapter concludes with a study of fertilizer distribution costs which were found to be very high in the study area.

CHAPTER V

AN ANALYSIS OF FACTORS AFFECTING FERTILIZER USE IN GONGOLA STATE.

The main objective of this chapter is to discuss and analyse the factors revealed by the study to affect fertilizer use in the study area in accordance with objectives number three and four of the study. The results are based on the analysis of data collected from 152 farmers in the LGAs studied. Response was ascertained and studied on opinion nature from the sample, and on the socio-economic characteristics of the farmers and their influence on the access to and use of fertilizers. Farmers' opinions were sought relating to their problems of adoption and use of fertilizers and the fertilizer distribution system in Gongola State in general.

In the first half of the chapter the tools of analysis used are mainly frequency tables, percentages and averages. In the second half, a statistical analysis using the stepwise multiple linear regression is used to determine the socio-economic variables that account for the variation in quantity of fertilizers used by the pooled sample of users, by each LGA, each sampledvillage and by three predetermined classes (high, medium and low) of users.

The statistical significance of the stratification of both the LGAs and farmers is also tested using discriminant analysis and chi-square tests. A socio-economic profile of the farmers that

fell into each category was then drawn up based on the regression and discriminant analyses. Apart from this, the level of awareness of fertilizer use by farmers, their sources of information on fertilizers, farmers' level of demand and their reasons for using them, some socio-economic characteristics of users and non-users, fertilizer use practices of farmers and crops fertilized in the study area, and farmers' opinion of the problems associated with using fertilizers are briefly discussed.

5.1 Level of Awareness of Fertilizer Use by Farmers and Adoption of the Practice.

Table 5.1 presents the distribution of the sampled farmers according to the awareness and use of fertilizers.

Table 5.1 Distribution of Farmers by Awareness of Fertilizers and Use

LGA	Description	No of farmers	Percentage*
Gombi	Sampled farmers	50	-
	Heard of fertilizers	50	100
	Seen fertilizers	48	96
	Used fertilizers	40	80
Ganye	Sampled farmers	43	-
	Heard of fertilizers	43	100
	Seen fertilizers	43	100
	Used fertilizers	40	93
Jalingo	Sampled farmers	59	-
	Heard of fertilizers	59	100
	Seen fertilizers	53	90
	Used fertilizers	40	68
Total	Sampled farmers	152	-
	Heard of fertilizers	152	100
	Seen fertilizers	144	95
	Used fertilizers	120	79

* Figures are rounded to the nearest numbers

Source: Field Survey, 1980.

The table reveals that all the sampled farmers in the study area (152), had heard of fertilizers at the time this study was carried out, while a total of 144 or 95 percent had seen fertilizers. Out of this number 120 or 79 percent of the total sample had used fertilizers. The trend is similar in the LGAs. This, together with the information on the length of exposure of the respondents to fertilizer use shown in table 5.2 shows farmers in the study area to be highly aware of fertilizers and their use. This is in conformity with Daniels (1966) Laurent (1968) and Kidd (1968) cited in the Review of Literature.

Table 5.2 Percent Distribution of Farmers by Length of Exposure to Continous Fertilizer Use.

Number of Years farmers had used fertilizers	LGAs/Percentages		
	Gombi	Ganye	Jalingo
1 to 2 years	0	13	25
3 - 5 years	20	25	30
6 - 10 years	54	30	27
Over 10 years	27	35	20

Source: Field Survey, 1980.

5.2 Sources of Information on Fertilizers.

Respondents were asked to list their sources of information on fertilizers. Table 5.3 shows that, in general and in all the study LGAs, the most important source of information on fertilizers was the extension staff of the Ministry of Agriculture and Cooperatives with an overall percentage of 58 percent and 68, 50 and 60 percent respectively in Gombi, Ganye and Jalingo LGAs. The next most important source of information quoted was other farmers with an overall percentage of 25 percent and 30, 25, and 20 for the three LGAs in the same order, followed by the mass media. The only LGA, however, where ward and village heads are important informants on fertilizers is Ganye LGA with an affirmative response of 20 percent. This amounts to about nine percent of the total sample.

Table 5.3 Sources of Information on Fertilizers

Source[1]	Total sample	Gombi	Ganye	Jalingo
Extension Worker	50	60	50	60
Demostration trails	16	20	13	15
Other farmers	25	30	25	20
Mass media	21	5	25	30
Farmers cooperative union	11	13	10	5
Village or ward heads	9	-	20	-

1. Some farmers quoted mulitple sources of information on fertilizers.

Source: Field Survey, 1990.

5.3. Farmers Reasons for Using Fertilizers and Their Demand for them.

The farmers' reasons for using fertilizers are given in Table 5.4

Table 5.4 Distribution of Farmers According to Reasons for Using Fertilizers.

Reasons	No of farmers	Percentage
1. For better yields	66	55
2. For more income	49	41
3. For testing	5	4
Total Respondents	120	100

Source: Field Survey, 1980.

The Table shows that 55 percent of the respondents use fertilizers to get better/higher crop yields while 41 percent used it to increase their farm income. Since better yields means more income, the two can be assued interchangeable and, hence, amount to 96 percent. Only four percent of the respondents said they were using fertilizers for testing purposes as they had only used it for two seasons. All the users interviewed said that fertilizers had actually increased their yields. The magnitude of increase could, however, not be reliably determined.

An attempt to find out the quantities of fertilizers the farmers were able to buy during the reference period shows that during 1978 90.8 percent of the respondents were able to get between one to eight bags of fertilizers only, while 7.5 percent got between eight and 15. The corresponding figures for 1979 and 1980 show a gradual decrease in the number of farmers who bought less than eight bags and a gradual increase in the number of those who bought more bags. This is revealed in Table 5.5 and can be said to be a measure of the improvement in fertilizer availability and use over the period of study.

Table 5.5 Distribution of Farmers According to the Number of Bags of Fertilizers Applied During the Reference Period.

Year	Number of bags bought	Number of farmers	Percentage
1978	Less than 8	109	90.8
	8 - 15	9	7.5
	Over 15	2	1.7
1979	Less than 8	80	67.0
	8 - 15	35	29.0
	Over 15	5	4.2
1980	Less than 8	79	65.8
	8 - 15	26	21.8
	Over 15	15	12.6

N = 120.

Source: Field Survey, 1980.

The study went further by trying to establish whether the quantities of fertilizers bought by the farmers were sufficient for them. Their answers are tabulated in Table 5.6 both by individual local governments and by the total sample.

Table 5.6 Distribution of Sampled Farmers According to Statisfaction with Quantities of Fertilizers Bought.

Description	LGA	No	Percentage	Yes	Percentage
Were the quantities of fertilizers you bought sufficient?	Gombi	21	18	19	16
	Ganye	28	23	12	10
	Jalingo	40	32	0	0
Total sample	N = 120	89	74	31	26

Source: Field Survey, 1980.

The results show that 74 percent of the total respondents did not have sufficient quantities of fertilizers while only 26 percent got the quantities they required. This means that a demand for fertilizers exists in the study area, while the supply is seemingly short.

5.4 Some Socio-Economic Characteristics of Users and Non-Users of Fertilizers.

The study attempted to find out any differences that might exist between the users and non-users of fertilizers with regards to their socio-economic characteristics. No differences were observed as regards the patterns of land ownership and the amount of family labour used in cultivation. About 87.5 percent of the non-users and 81.5 percent of the users acquired their land through inheritance. The rest were acquired through buying or hiring. Only about six percent of the non-users and about 19 percent of the users expressed land shortage as a problem . Both users and non-users used family labour to the tune of 78 and 80 percent respectively. The survey also reveals that both users and non-users of fertilizers in the study LGAs grew similar crops. These, in order of importance, were sorghum, groundnuts, maize, rice, cowpeas and assorted vegetables in Gombi LGA. In Ganye LGA, sorghum, groundnuts, yam, millet, rice and vegetables were grown, while in Jalingo LGA the most important crops were sorghum, yam, groundnuts, sugar cane and vegetables, all in order of importance. The distribution of plots among users and non-users shows insignificant differences. The number of plots cultivated by farmers was used here as a proxy for the size of farms, since an accurate measurement was not possible within the period of the study.

5.7 Reasons why Some Farmers failed to Use Fertilizers.

In spite of the high level of awareness of the benefits of fertilizer use, 21 percent of the total respondents (152), did not use fertilizers. The reasons given for this are discussed below. Table 5.8 shows the percentage distribution of the reasons as given by the respondents.

Table 5.8 Distribution of Farmers According to Reasons for Non-Users of Fertilizers.

Reasons[1]	Number of farmers	Percentage
No money to buy fertilizers	9	28
Not readily available when required	17	53
Do not know how to use it	5	16
Poor response on my neighbours farm	1	3
Don't need it	2	6
N =	32	-

1 Some farmers gave multiple answers.

Source: Field Survey, 1980.

A majority of the respondents (53 percent) said that they did not use fertilizers because they were not readily available when required. This may be partly as a result of the transportation bottlenecks discussed earlier on in Chapter IV and the fact that respondents

Table 5.7 Average Level of Nutrient Use Per Plot by Sampled Farmers in the Three Local Government Areas.

LGA	Total Average quantity of fertilizers used in bags from 1978/80	Total No of respondents' plots	Consumption per plot (Bags)
Gombi	374	100	3.74
Ganye	280	120	2.33
Jalingo	160	120	1.33

Source: Computed from Field Survey, 1980.

5.6 Crops Fertilized and Pattern of Fertilizer Utilization.

The study identified crops fertilized by farmers as mainly food crops in all the LGAs studied. These in order of importance, were grains such as sorghum, maize, millet and rice, followed by groundnuts, cowpeas and yams. The most commonly applied fertilizers were superphosphate for grains and groundnuts, and urea or other nitrogenous fertilizers for yams, rice, cowpeas and millet, while vegetables like okro, peppers etc. were sparingly fertilized except with farm yard manure when available. In some of the years studied, especially in 1978, some farmers said they did not apply fertilizers to some plots because of severe fertilizer unavailability, while plots were left fallow in some other years.

It was found on the other hand that the users of fertilizers spent more on hired labour than the non-users. Average hired labour expenditure was ₦33.50 for the users, and ₦26.8 for the non-users. The difference in the expenditure on hired labour is probably due to the increase in the amount of labour required, as a result of increases in farm operations like weeding and increased harvest resulting from fertilizer use. The income and yield level of the sample of fertilizer users was higher than that of the non-users. The crop yield for the users ranged between five and fifteen 100 kilogrammes bags, as compared to that of the non-users which ranged between four and seven. The average income of users and non-users was ₦947.0 and ₦600.9 respectively. None of the non-users of fertilizers sampled belonged to the farmers' cooperatives, while only 11 percent of the total sample of users or about thirteen farmers were members. Contact with extension staff was more frequent amongst the users.

5.5 Level of Nutrient Use Per Plot.

The average level of nutrient consumption per plot was calculated and is shown in Table 5.7. Consumption per plot in Gombi was 3.74 bags, 2.33 bags in Ganye and 1.33 bags in Jalingo. These are, however, only indicative as it was impossible to know the actual size of plots, which, in addition, were not standardised.

had to travel out of the village if they wanted to buy fertilizers. The need to travel out of the village in order to get fertilizers arises from the fact that storage and retail facilities at the village level are inadequate. This calls for more village level fertilizer stores in the state, if fertilizer use is to be encouraged. The next important constraint expressed by the non-users of fertilizers was capital. 28 percent said lack of money to buy fertilizers resulted in their inability to use fertilizers. This means that the importance of credit to enable farmers to meet their requirements during the growing season cannot be overemphasized. All the respondents, except two from Jalingo, who thought their land was fertile enough, said they would use fertilizers if given free, on credit, or if prices were reduced. Another 16 percent of the respondents claimed that lack of information on how to use fertilizers prevented them from using them. This was especially so in Jalingo LGA, where the situation has been made worse by bad roads during the rainy season and lack of vehicles. The lack of information is not surprising considering the inadequate number of extension staff that is available not only in Gongola State but in the country as a whole. Only 30 percent of the 10 non-users in Gombi LGA and 21 percent of the 19 in Jalingo had seen an extension staff before. All the three non-users in Ganye LGA had seen an extension staff. The low number of non-users and the fact that all of them had seen extension staff is probably

because extension staff in this LGA have more time to attend to farmers.

5.8 Factors that Influence Level of Fertilizer Use in the Study Area.

It was revealed in section 5.1 that most farmers in the study area are aware of the benefits of fertilizer use and do want to use them. However, in spite of the fact that the level of consumption per hectare in Gongola State is about 30.43 kilogramme of fertilizer materials per hectare,[1] which is high as compared to the national 3.1 kg per hectare (International Fertilizer Development Centre, 1981), the demand for fertilizers by most farmers does not seem to have been met. Besides, the general level of use is still low compared to research recommendations. This section has attempted to determine the factors which hinder increased fertilizer use in the study area. The factors found to be significant are listed below in order of importance.

a) Availability of fertilizers.

b) Distance from fertilizer stores.

c) Capital constraints.

d) Availability of complementary inputs.

e) Cost of applying fertilizers.

f) Fertilizer prices.

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1 Fertilizer use per hectare in the study LGAs was calculated to be approximately 54.11kgs in Gombi, 25.89kgs in Ganye and 12.86 in Jalingo. See Table 3.1 P. 52 and 53.

5.0.1. Availability of fertilizers.

This factor, which was earlier found to have prevented 53 per cent of the non-user respondents from using fertilizers also constitutes the greatest barrier to increased fertilizer use especially in two out of the three LGAs studied, namely, Ganye and Jalingo LGAs. Table 5.9 shows the distribution of farmers according to their reasons for not using more fertilizers than they actually did during the study period.

Table 5.9 Percentage Distribution of Respondents Using Fertilizers, Citing Various Constraints on Fertilizers Use.

Reasons[1]	Local Government Area/Percentage			
	Total sample	Gombi	Ganye	Jalingo
No money to buy fertilizers	33	20	35	40
Unavailability of complementary inputs	8	13	9	5
Fertilizer prices too high	3	-	5	10
Fertilizers not readily available wher required	44	30	48	55
Fertilizer stores too far	34	30	27	45
That was all I could manage	8	8	3	13
Others	-	-	-	-
N =	120	40	40	40

1 Some farmers gave multiple reasons.

Source: Field Survey, 1980.

The Table shows that 55 percent of the respondents in Jalingo, 40 percent in Ganye and 30 percent in Gombi LGAs cited unavailability as their constraint to [illegible] using more fertilizers. From the investigations carried out at the fertilizer stores, it seems that the problem of unavailability of fertilizers arises not because the quantities of fertilizers delivered to the LGAs were inadequate. Rather, it is because much of the fertilizers were delivered to the stores when the time most farmers needed them had passed. Table 5.10 shows that whereas 63 percent of the farmers apply fertilizers between the second week and fourth week of planting and 25 percent at planting time, much of the fertilizers especially the second and third deliveries,[1] were received when crops would have passed this stage of growth.

Table 5.10 Percent Distribution of Fertilizer-Using Respondents By Time of Fertilizer Application to Crops.

	Local Government Area/Percentage			
Time	Total sample	Gombi	Ganye	Jalingo
At planting	25	13	15	35
2 - 4 weeks after planting	63	80	85	50
8 Weeks after planting	13	8	7	15
N =	120	40	40	40

Source: Field Survey, 1990.

1 See Table 5.3.

5.8.2 Distance from fertilizer stores.

Very closely connected with the problem of unavailability of fertilizers is the distance between fertilizer retail stores and the farmers. Fertilizers could be unavailable to farmers if not delivered to places within their reach, or, if quantities delivered are inadequate. The shortage of retailing points at the village level was found to be so acute that only 34 percent of the total sample of fertilizer users bought fertilizers within their place of abode. The percentage breakdown is given in Table 5.11. This shows that Jalingo LGA seemed to suffer most from this factor as 45 percent of the respondents there bought fertilizers from another town followed by Gombi (37 percent) and Ganye (27 percent).

Table 5.11 Percentage Breakdown by Place where Fertilizers were Bought.

	Local Government Areas/Percentage		
Place	Total sample	Gombi	Ganye	Jalingo
In this village	34	28	42	29
In another village	29	35	30	26
In another town	38	37	28	45
N =	120	40	40	40

Source: Field Questionnaire, 1986

Ganye LGA had the highest percentage of farmers who bought fertilizers from within their village of residence. This could be attributed to their system of distribution of fertilizers. Long distances between retail points and farm gates can influence fertilizer use negatively. This is because fertilizers are bulky, especially a 50kg bag. If a farmer has to transport this over a long distance to his farm, then the probability of his buying more than two bags at the most is reduced, especially when transportation problems are taken into consideration. The study showed that farmers mostly used either bicycles or head porterage and donkeys to transport their fertilizers from the point of retailing to their farms, especially, in Ganye and Jalingo areas, while in Gombi LGA comparatively greater use was made of road transportation. It is important, therefore, to make fertilizers available to farmers at the right time and place if the level of their use is to increase. The significance of this is shown by the fact that 78 percent of the total fertilizer using respondents claimed that they would use more fertilizers if fertilizer retail stores were closer to their farms or villages.

5.8.3. Capital constraints.

After unavailability of fertilizers and the distance to fertilizer stores the next most important hindrance to increased use of fertilizer found in the study area was lack of cash with which to buy the input. This constraint was reported by 32 percent

of the total sample and 28 percent, 35 percent and 40 percent of the sampled farmers in Gombi, Ganye and Jalingo LGAs respectively. This problem is to be expected because of the fact that, generally, most farmers in the study area operate small holdings of less than two hectares and produce primarily for subsistence. Whatever they sell out is a residue. It is the income from these that farmers use to cover other expenses as well as for purchasing inputs as Table 5.12 shows.

Table 5.12 Percentage Distribution of Sources for Financing Fertilizer Purchases.

Source	Percentage
Sale of farm products	52
Borrowing from friends	30
Income from other occupations	18
Agricultural loan scheme	-
Cooperatives	-
N = 120	100%

5.8.4. Availability of complementary inputs.

Although the application of fertilizers alone on traditional seeds can increase yields, when complementary inputs such as high-yielding seeds, pesticides herbicides etc. are used, yield increases of 100 percent can be expected. The study reveals that eight percent of the total sample did not use more fertilizers because complementary inputs were not available to them, while 13 percent, nine percent and five percent of the samples in Gombi, Ganye and Jalingo LGA gave the same reason. It is not surprising that this factor constitutes a barrier to increased use of fertilizers, because they are sold only at the LGA stores and the Agro-Service Centres, which are not within the reach of most farmers. In fact, most of the respondents did not know about herbicides for example. One is tempted to conclude that even though extension workers have managed to create a high level of awareness of fertilizer use among farmers in the study area, they seem to have given less attention to complementary inputs. This shows that there is need for more extension work in the study area as regards the spread of information on complementary inputs. These inputs also need to be brought closer to the farmers by making the existing marketing channels more broad based.

5.8.5. Cost of applying fertilizers.

The use of fertilizers is accompained by extra expenses. These include the cost of application, weeding as a result of increased weed growth, and the cost of managing increased harvest. This is proved by the fact that, the average cash expenditure on hired labour by the users of fertilizers was ₦38.2, ₦30.0 and ₦31.0 in Gombi, Ganye and Jalingo LGAs respectively while corresponding figures for the non-users was ₦30, ₦30.50, and ₦26.0 respectively. In view of the fact that capital constraint has already been identified as a hindrance to increased fertilizer use, it follows that the cost of applying fertilizers is also a hindrance to its increased use. This constraint was reported by eight percent of the total sample, and eight percent, three percent, 13 percent of the samples in Gombi, Ganye and Jalingo LGAs respectively.

5.8.6. Fertilizer prices.

Government policy on the pricing of fertilizers was discussed in Chapter IV. Fertilizers are sold at 50 percent subsidy by the State Government with prices ranging between ₦1.80 and ₦2.25 since 1977. One of the factors that affect the adoption of an innovation by farmers is its profitability especially when price relationships are considered. The fertilizer subsidy by the State Government has

created an atmosphere for farmers to make profit especially with the high prices of agricultural products. It is not surprising hence that the price of fertilizer does not seem to constitute much of a problem to increased fertilizer use in two out of the three LGAs studied. Table 5.9 (pg123) showed that only three percent of the total samples, zero percent of Gombi, five percent of Ganye and 1% percent of Jalingo LGA samples said fertilizer prices constituted a problem to them.

5.9 Statistical Analysis of the Relationship Between some Socio-Economic Variables and the Quantity of Fertilizers Used.

This section attempts to identify and estimate the relationship between some socio-economic factors and the level of fertilizer use by farmers in the study area. The step-wise, multiple linear regression technique, which is a statistical method of analysing which explanatory or independent variables, based on theory, account for the greatest variation in the dependent variables, was used to obtain the results. The average quantity of fertilizers used by each farmer over the period 1970 to 1980 was used as the dependent variable .

The independent variables and reasons for their inclusion in the regression function are as follows:

i) Age: It is hypothesised that younger farmers are more likely to use more fertilizers than the older ones.

ii) Farming as a primary occupation: This is believed to positively affect the level of fertilizer use.

iii) Income level: This is hypothesised to positively influence the quantity of fertilizers purchased and used by farmers and vice versa, in other words a collinear relationship exists between income level and quantity of fertilizers used.

iv) Number of plots owned by the farmer: This is hypothesised to affect negatively the quantity of fertilizers used in that the more the number of plots, the more likely it is for the farmers to decided on plot fallowing in order to maintain soil fertility rather than use fertilizers.

v) Family size: A larger family labour supply might positively influence fertilizer use, since fertilizer use is a labour intensive agricultural practice.

vi) Number of years of exposure to fertilizer use: This is also hypothesised to influence positively the level of fertilizer use.

vii) Availability of credit to finance the purchase of fertilizers: This is hypothesised to increase the level of fertilizer use.

viii) Distance from the nearest LGA fertilizer store: A short distance is assumed to affect positively the farmers level of use of fertilizers and vice versa.

ix) Means of transportation of fertilizers: This variable is theorised to determine the quantity of fertilizers purchased and used by the farmer in that, the easier the method of transportation, the more likely he is to buy and use more fertilizers, and vice-versa.

x) Frequency of contact with extension staff: This is hypothesised to positively determine the quantity of fertilizers used by farmers.

xi) Membership of farmers' cooperative union: This variable is theorised to positively determine the quantity of fertilizers used by farmers

xii) Availability of fertilizers is hypothesised to positively determine both the adoption and quantity of nutrients used by farmers

xiii) Availability of complementary inputs - such as improved seeds, herbicides and pesticides - is also theorised to positively determine the quantity of fertilizers used by farmers. This is because yields are greater, everything being equal, if fertilizers are used together with these inputs.

Apart from the age, income level, number of plots owned by the farmer, family size, number of years of exposure to fertilizers and the distance to the nearest LGA store, which were actually quantified in the study, all the other variables were scored as zero for all negative responses and one for all positive responses.

The data were analysed according to the following groups:

i) pooled sample of users .

ii) local government areas.

iii) villages .

iv) high, medium and, low level users of fertilizers.

v) pooled sample users and LGAs .

The analysis were done on step wise basis to reduce the magnitude of multicollinearity or interrelationship among the explanatory variables. This means that variables which were suspected to be highly collinear were entered into the regression programme at different levels. Multicollinearity normally hinders sensible investigation of the relationship between the independent and dependent variables, especially, when a large number of socio-economic variables are involved in the analyses (Shetti, 1969). It is considered a problem theoretically, when there is a correlation value of 0.75 and above between two or more of the variables being estimated.

In this study, a high multiple correlation coefficient was expected between income and the level of use of fertilizers, and between availability of fertilizers and the distance to the nearest fertilizer stores. Throughout the analyses, however, the coefficient of collinearity between the two pairs of variables as shown by the coefficients ranged between 0.37 and 0.58, which means that although the interrelationship exists to an extent, it does not pose a problem in the real sense. This is probably because in addition to the step wise analyses, fertilizer use level among the sampled farmers was not sufficiently different in physical and hence biological terms to result in high collinearity between income and level of fertilizer use. The results of the analyses are discussed below.

5.9.1. Regression results for pooled data.

The overall regression on the pooled data is significant at .01 level as shown by Table 5.13. The regression fit itself is poor as only about 41 percent of the variation in the quantity of fertilizers used by the total sampled farmers is explained by all the explanatory variables combined.

Table 5.13 Regression esults by Pooled Data.

Variable	Mean value	Regression coefficient	Standard error
Age	38.1	.0059	.0081
Farming as a primary occupation	-	.4209*	.2141
Income level	₦947.0	.4399*	.2212
Number of plots	2.83	.0913	.0589
Family size	5.0	.1060	.0969
Number of years of exposure to fertilizer use	6.0	.2393*	.1050
Distance to nearest LGA store[1]	13.8	.4849*	.1278
Means of transporting fertilizers		.4524*	.1967
Frequency of extension visits	3.0	.3503*	.1016
Membership of farmers' cooperative	0.11	.0240	.0056
Expenditure on hired labour	53.5	.1010	.0612
Availability of credit		.1411	.1634
Availability of complementary inputs		.0573	.0123
Availability of fertilizers		.6448*	.2235
Constant		1.6867	
Average quantity of fertilizer used	6.8[2]		
Sample size		120	
R^2		.4144	
Standard error of estimate		1.9324	
F - ratio		7.99	

Overall regression significant at .01 level.
* significant at .05 level.
1. Kilometres.
2. In bags of 50 kilogrammes weight.

The results show that availability of fertilizers, distance from the nearest LGA stor:, the means of transporting fertilizers, level of income, farming as a first occupation, frequency of extension visits and number of years of exposure to fertilizer use account for most of the variation in the quantity of fertilizers used by the sampled farmers. The positive sign associated with the coefficient for the number of plots owned by farmers probably disproves the hypothesis that more plots will cause the farmer to practice fallowing rather than increase the level of fertilizer use.

5.9.2. Regression results by LGAs.

The sampled farmers were next categorised by LGAs and a stepwise regression based on the same variables was run. The results of these are presented in Table 5.14. The overall regression is significant at .01 level for Gombi, .01 for Ganye and .01 for Jalingo LGAs. The fit of the regression is better than that of the pooled data in the sense that 47 percent, 64 percent and 55 percent of the variations in quantity of fertilizers used by farmers in the respective LGAs is explained by the independent variables.

However, for Gombi LGA the variables that account for most of the variation include level of income, distance to nearest fertilizer store, frequency of extension visits, number of years of exposure to fertilizer use and the means of fertilizer transportation. In Ganye LGA, the significant variables are means of fertilizer transportation, number of years of exposure to fertilizer use, availability of fertilizers, level of income, and distance to the nearest LGA fertilizer store.

Table 5.14 Regression Results by LGAs

Location	Gombi LGA			Ganye LGA			Jalingo LGA		
Variable	Mean value	Regression coefficient	Standard error	Mean value	Regression coefficient	Standard error	Mean value	Regression coefficient	Standard error
Farming as a primary occupation		.2934	.3000		.3101	.1998		.2519	.2056
Level of income	₦1155	.6722*	.2405	₦1080	.3995*	.0598	₦885	.1730*	.0084
Number of plots	2.5	.0311	.1387	3.3	.1227	.2621	3.0	.2734	.1694
Family size	5.9	.0857	.0353	4.8	.0500	.1212	5.0	.0597	.0488
Distance to nearest LGA fertilizers store	10.0	.5918*	.1021	18.5	.3976*	.1064	12.75	-.6841*	.1373
Availability of fertilizers		.1605	.1109		.6917*	.2092		.4191*	.1040
Means of fertilizer transportation		.5207*	.2131		.2076*	.0068		-.5205*	.1927
Number of years of exposure to fertilizer use	10.7	.1450*	.0244	6.7	.4594*	.1467	4.5	.2972*	.0736
Frequency of extension visits in a year	3.(	.4807*	.2192	4.6	.1903	.1929	1.4	.2319	.2006
Constant		5.3867	2.5660		1.2087	.4935		2.5962	.9701
Average quantity of fertilizers used	9.35			7.0			4.0		
Sample size	40		40	40		40	40		40
R^2			.4793			.6432			.5655
Standard Error of estimate			3.7777			5.3439			1.5634
F - ratio		4.20			6.76			5.04	
Overall significance of regression			.01			.01			.01

* Significant at .05 level

In Jalingo LGA the most important determinants are distance to the nearest LGA stores, means of fertilizer transportation, availability of fertilizers level of income and number of years of exposure to fertilizer use. Variables that were included in the pooled data analysis, but, excluded from the subsequent ones were found to be insignificant.

5.9.3. Regression results by villages.

The sampled farmers were classified according to villages for further analysis in order to determine the effect of distance from the villages to the nearest fertilizer stores, on the level of fertilizer use. The results are given in Tables 5.15a to 5.15c. In Pella village in Gombi LGA, all the variables explain only 47 percent of the variation in quantity of fertilizers used. Distance to fertilizer stores, means of fertilizer transportation, level of income, and availability of fertilizers account for most of the variation. The regression on the second village (Hildi) in the same LGA, is significant at .01 level. Over 85 percent of the variation in quantity of fertilizers used here is explained by the variables, with distance to fertilizer store, availability of fertilizers number of years of exposure to fertilizer use and means of fertilizer transportation accounting for most of the variation.

Table 5.15a Regression Results by Villages.

Gombi LGA	Village: Pella			Village: Hildi		
Variable	Mean value	Regression coefficient	Standard error	Mean value	Regression coefficient	Standard error
Level of income	₦1199	.4457*	.1146	₦1110	.2114	.3700
Number of plots	2.8			2.5		
Family size	5.2			6.0		
Distance to nearest fertilizer store	12.0	.5411*	.1536	8.0	.6040*	.2070
Availability of fertilizers		.4072*	.0124		.8641*	.3290
Means of fertilizer transportation		.5631*	.1282		.4126*	.1100
Number of years of exposure to fertilizer use	11.5	.2740	.0976	9.9	.2040*	.0571
Frequency of extension visits in a year	2.3	.3111	.1020	3.7	.2691	.2301
Constant		.6395	.3894		3.9203	1.8589
Average quantity of fertilizers	9.9			9.50		
Sample size		20			20	
R^2		.4706			.8589	
Standard error of estimate		.8550			.5890	
F. ratio		1.65			9.56	
		not significant.			.01	

* Overall significance of regression.
• Signifinact at .05 level.

Table 5.15b Regression Results by Villages.

Ganye LGA	Village: Mbulo			Village: Pirohi		
Variable	mean value	Regression coefficient	Standard error	mean value	Regression coefficient	Standard error
Level of income	₦1016	.3740*	.1505	₦1160	.1239	.1875
Number of plots	2.7			3.0		
Family size	5.4			4.2		
Distance to nearest fertilizer store	22.0	.2914*	.0612	15.0	-.2487*	.0956
Availability of fertilizers		.3110*	.1011		.3094*	.1138
Means of fertilizer transportation		.4110*	.1318		-.1096*	.0030
Number of years of exposure to fertilizer use	8.0	.2711*	.0964	5.7	.2591*	.0904
Frequency of extension visits in a year	4.0	.2238*	.1000	5.2	.2589*	.1104
Constant		.5684	.3689		1.5431	1.1617
Average quantity of fertilizers	6.9			6.6		
Sample size		20			20	
R^2		.4011			.3742	
Standard error of estimate		.5643			.2738	
F-ratio		7.04			.8970	
Overall significance of regression.		not significant.			.01	

*Significant at .05 level.

Table 5. 15c Regression Results by Villages.

Jalingo LGA	Village: Lankaviri			Village: Mallum		
Variable	Mean value	Regression coefficient	Standard error	Mean value	Regression coefficient	Standard error
Level of income	₦905	.1399	.1875	₦865	.2633	.1271
Number of plots	2.4	.1475	.1845	3.6		
Family size	4.0			6.0		
Distance to nearest fertilizer store	16.0	-.5963*	.2148	9.0	.3914*	.1033
Availability of fertilizers		.1963*	.0123		.3158*	.1410
Means of fertilizer transportation		.5769*	.2095		-.6014*	.2271
Number of years of exposure to fertilizer use	6.0	.1956*	.0611	3.0	.0988*	.0108
Frequency of extension visits in a year	1.3	.1306	.2419	1.5	.1909	.0672
Constant		1.5431	.6171		3.387	.9668
Average quantity of fertilizers	4.6			3.4		
Sample size		20			20	
R^2		.3421			.7721	
Standard error of estimate		.6182			.7436	
F-ratio		9.11			5.08	
Overall significance of regression.		not significant.			.01	

*Significant at .05 level.

In Mbulo village in Ganye LGA where about 40 percent of the variation is explained, the most significant variables include frequency of extension visits, level of income, means of fertilizer transportation and availability of fertilizers. In Pirohi in the same LGA, the most significant variables of the regression were availability of fertilizers, frequency of extension visits, distance to fertilizer store, means of transporting fertilizers and years of exposure to the use of fertilizers.

The overall regression for both Lankaviri and Mallum in Jalingo LGA were significant at .01 and .05 levels respectively. While only 34 percent of the variation in the level of fertilizer use in Lankaviri was explained, however, 77 percent was explained in Mallum giving the regression a good fit. Significant explanatory variables in Lankaviri include the availability of fertilizers, the number of years of exposure to fertilizer use, means of fertilizer transportation and distance to fertilizer store. In Mallum, number of years of exposure to fertilizer use, availability of fertilizers, means of transporting fertilizers and distance to the nearest fertilizer store account for most of the variation in quantity of fertilizers used.

5.9.4. Regression results based on classification of farmers into High, medium and low users of fertilizers.

This classification was made in the following manner using the principles of the mean, median and the mode. The high level users were classified as those that used more than 15 and less than 25 bags. The median level users used more than eight and less than 15 bags, while the low level users used more than two and less than eight bags of fertilizers.

The results in Table 5.16 show that the regression analysis on the high users was significant at .01 level the most important variables being level of income, number of years of exposure to fertilizer use, expenditure on hired labour, availability of fertilizers, frequency of extension visits, means of transporting fertilizers and distance to nearest fertilizer store .

The regression on the medium level users of fertilizers was not significant. However, the variables which explained most of the variation in the level of fertilizer use for this group included the level of income, number of years of fertilizer use, frequency of extension visits, distance to nearest fertilizer store, means of transporting fertilizers, membership of farmers cooperative unions, expenditure on hired labour, and availability of fertilizers.

Finally, the regression analysis on the low level users of fertilizers, showes the most important variables affecting fertilizer use level among this group, as distance to the nearest fertilizer store, means of fertilizer transportation, the availability of fertilizers, income level, farming as a

Table 5.16 Regression Results by High, Medium and Low Classification of Fertilizer Users

Variable	High level users			Medium level users			Low level users		
	Mean value	Regression coefficient	Standard error	Mean value	Regression coefficient	Standard error	Mean value	Regression coefficient	Standard error
Age	38	.0343	.0309	36.8	.0314	.0192	39.5	.0097	.0114
Farming as a primary occupation	0.41	.0094	.0717	0.65	.0311	.1076	0.05	.3002*	.1612
Income level	1300	.3500*	.2760	1100	.4949*	.1020	940	.2619*	.1014
Number of plots	2.4	.0614	.0371	3.0	.0359	.1702	3.0	.1313	.1036
Family size	5.2	.0977	.0720	5.5	.0172	.0615	4.9	.0499	.5100
Number of years of exposure to fertilizer use	9.5	.2500*	.0118	7.9	.1245*	.0591	4.5	.3093	.2076
Distance to nearest fertilizer store	8.5	.5881*	.1236	12.8	.4710*	.1434	20.4	-.7748*	.2685
Means of transporting fertilizers	-	.6250*	-.2760	-	.4935*	.2054	-	-.3053*	.1061
Frequency of extension visits	6.0	.2625*	.1201	5.0	.2101*	.1170	2.0	.1282*	.0117
Membership of farmers' cooperative union	0.21	.0361	.0213	0.41	.1074*	.0180	0.02	.0097	.0566
Expenditure on hired labour	48.4	.0662*	.0254	42.1	.1461*	.0214*	28.9	.0782*	.0058
Availability of fertilizers	-	.4910*	.1936	-	.3871*	.1092	-	.4950*	.1988
Constant	-	3.4375	.0174	-	6.9458	2.8377	-	5.0562	1.4644
Average quantity of fertilizers	70.0	-	-	11.2	-	-	3.3	-	-
Sample size		17			17			86	
R^2		.6270			.7261			.6860	
Standard error of estimate		.4006			.2149			.6169	
F - ratio		8.56			3.41			1.83	
Overall significance of regression		.01 .			not significant.			not significant.	

* Significant at .05 level.

primary occupation, expenditure on labour and the frequency of extension visits.

5.9.5. Results of significance test on the classification of farmers and LGAs, into high, medium and low level users of fertilizers.

This analysis was carried out using the discriminant analysis technique. The technique statistically distinquishes between two or more categories of cases using a given set of discriminating variables, or characteristics by which the different categories are expected to differ or compare. These variables were age, farming as a primary occupation, level of income, number of plots farmed, distance to LGA fertilizer store , availability of fertilizers, number of years of exposure to fertilizer use, frequency of contact with extension workers and means of transporting fertilizers to the farm. The quantity of fertilizers used was the bases for initially categorising farmers into high, medium and low groups of users, resulting in the classification shown in Table 5.17.

Table 5.17 Results of Discriminant Analysis on Categories of Fertilizer Users.

Group	Number in initial group	Predicted clusters Group 1	Group 2	Group 3
High user (1)	17	13 76.5% of initial group 1	2	2
Medium users (2)	17	2	11 64.7% of initial group 2	1
Low users (3)	86	20	8	58
				68.1% of initial group 3

Known cases correctly classified 70.6% .
Chi-square 74.324 .
level of significance .01.

The table shows that 70.6 percent of all the known cases were correctly classified. Statistical test of significance of the clusters resulted in a chi-square value of 74.324, which means that, based on the discriminant variables, systematic differences exist between these clusters at .01 level of significance. Based on the regression analysis on the initial categories of users and their frequency distribution, the socio-economic profiles of farmers in the different classes showing these differences are presented in Table 5.18

Table 5.18 Socio-Economic Profiles of High, Medium and Low Level Users of Fertilizers.

Characteristics	High	Medium	Low
1. Number of farmers	17	17	86
2. Percent engaged in farming as a primary occupation	41	65	95
3. Average age	38	36.0	39.5
4. Average income (₦)	₦1300	₦1100	₦940
5. Average number of plots	2.4	3.0	3.0
6. Average family size	5.2	5.5	4.9
7. Average cash expenditure on hired labour (₦)	₦48.4	₦42.1	₦28.9
8. Average number of seasons of fertilizer use	9.5	7.9	4.5
9. Average number of bags of fertilizers used	20	11.2	3.3
10. Average expenditure on fertilizers at approximately ₦2 per bag	₦48.00	₦22.40	₦6.6
11. Average distance of fertilizer stores (kilometres)	8.5	12.0	20.4
12. Per cent experiencing unavailability of fertilizers	8.7	31.3	93.0
13. Means of fertilizer transportation	Mainly motor vehicles	Mainly bicycles/ motorcycles and some motor vehicles	Mostly bicycles head and animal porterage and few motor vehicles
14. Average frequency of extension contacts in a year	6	5	2
15. Percentage belonging to farmers' cooperatives	23.5	41.2	2.3

Source: Field Survey, 1980.

It can be seen from the Table that, 95 percent engaged in farming as a primary occupation among the low users, while 71 percent and 65 percent engaged in farming as a primary occupation among the high and medium level groups respectively. This goes to point out that to a certain extent, the availability of off-farm income increases the level of fertilizer use, since farm income alone is generally low. The difference in the level of income of the three categories also goes to confirm this statement. Average cash expenditure on fertilizers and hired labour also differed accordingly. Generally, the high level users of fertilizers are closer to LGA fertilizer stores, have good access to them in terms of roads, have more extension contacts in a year, and have used fertilizers for a relatively longer number of years. The average age of farmers in the three categories, the number of plots farmed and the average family size were not, however, significantly different. Finally, though most of the farmers that belonged to farmers' cooperatives fell among the medium level fertilizer users followed by the high level users, it could safely be concluded that the level of use of fertilizers did seemed to be associated with membership of farmers' cooperatives.

Adopting the level of use classes already mentioned and the same variables, a test of significance was done on the initial classification of the LGAs studied into high, medium and low users, based on Ministry figures of different tonnages consumed within them. The results are shown in Table 5.19

Table 5.19 Results of Significance Test on the Classification of LGAs into High, Medium and Low Users of Fertilizers.

Initial class of LGA and number of cases.	Predicted classes		
	High	Medium	Low
1. High (Gombi) 40 cases	7 (18%)	3	30
2. Medium (Ganye) 40 cases	3	6 (15%)	31
3. Low (Jalingo) 40 cases	3	5	32 (80%)

Known cases correctly classified	37.7
Chi-square	28.90
Level of significance	.01

A chi-square value of 28.90 obtained showed at .01 level of significance, that the initial classification of LGAs into high, medium and low users of fertilizers was not statistically significant. This means that all the LGAs can be said to be low users of fertilizers given our criteria for classification.

5.10 Summary.

The main preoccupation of this chapter has been an analysis of the factors that affect the adoption of fertilizer use and the level of use by farmers in the study area. The level of awareness of fertilizer use by farmers, their sources of information on fertilizers, their reasons for using fertilizers, the fertilizer use situation in the study LGAs, cropping and fertilizer utilization patterns, the socio-economic characteristics of users and non-users and farmers' opinion of the problems connected with the use of fertilizers are among the issues discussed.

The Chapter was concluded with a statistical analysis of the relationship between some socio-economic variables and the level of fertilizer use in the study area using the stepwise linear multiple regression technique. This analysis was carried out at four levels: (1) on the pooled data (2) on each sampled LGA (3) on each of the six sampled villages and (4) on the high, medium and low categories of sampled farmers. The analysis was concluded with a significance test on the initial classification of the study LGAs and sampled farmers into high medium and low users of fertilizers.

The last Chapter summarises the findings of this research and makes recommendations for the improvement of the fertilizer distribution system in the study area.

CHAPTER VI

CONCLUSIONS OF THE STUDY AND RECOMMENDATIONS.

7.1. Conclusion

By virtue of the fact that agriculture in Nigeria is mainly carried out by peasants using traditional methods and practices, it has become increasingly impossible to keep up with the present day requirements of food, especially, in the face of a rapidly growing population. Consequently several strategies have been evolved by the Federal Government to boost agricultural production in the past few years. One such strategy is the fertilizer distribution programme. However, in spite of the Government's efforts to promote fertilizer use in the past years, its level of use has remained low, increasing from 0.62kg per hectare in 1969 to 3.1kg per hectare in 1980.

While several studies have been carried out at the national level to identify the problems associated with the procurement distribution and use of fertilizers, this study is confined to the state level, and has attempted to study the distribution arrangements, their adequancy, operational problems, and the hinderances to increased level of use of fertilizers peculiar to farmers in Gongola State. These findings are summarised in the following subsections.

9.1.1. The organisation of fertilizer distribution.

The study reveals that fertilizer distribution in the state, just as is true of Nigeria as a whole, is a statutory public concern. The state's requirements of fertilizers, based on approved requests from LGAs and government projects is sent to the Agricultural Services Division of the Ministry of Agriculture and Cooperatives by the Fertilizer Procurement and Distribution Division (FPDD). Once the fertilizers are delivered to the state warehouse, the distribution process becomes the responsibility of the state government. Fertilizers are then allocated to the LGAs based on their requests and delivered to LGA stores by contractors at the expense of the State Government.

Although, only extension staff and store-keepers should sell the fertilizers to farmers in their villages, or from the stores respectively, it was revealed in the study that two of the three study LGAs in Gongola State deviced other means of getting fertilizers to farmers. In Ganye LGA., fertilizers were distributed to districts by the LGA Green Revolution Committee. Each district's share was then delivered to it at the expense of the Local Government. At the District level, the district council allocated the fertilizers to villages based on population. Each village head then arranged for the transportation of his share of

fertilizers back to the village where the village council allocated them among the wards. Finally, each ward head became the retail outlet for fertilizers. It was also revealed that this distribution arrangement was made at the LGA level and hence the participants were on government payroll. In Gombi LGA, the Divisional Agricultural Officer (DAO) selected some farmers to retail fertilizers, in addition to the approved government channels. Unlike in Ganye LGA, however, the selected farmers in Gombi LGA were not remunerated.

The study revealed that in all the LGAs, farmers could not buy fertilizers on credit, and the only retailers that could give farmers technical advice on fertilizer use were the extension workers. Hence the ward heads and the selected farmers failed in this respect. The Ganye system of distribution was, found to bring fertilizers to more farmers at their door steps even though the quanty a farmer could get at a time was limited. Complaints of discriminatory acts on the part of the ward heads was common. In the case of Gombi LGA, some of the selected farmers who retailed fertilizers were found to increase the price contrary to the regulation. This action in itself could discourage farmers from buying fertilizers, and hence it is a defect in the system.

Apart from these channels, farmers can also buy fertilizers from cooperative group farming societies if they are members of such societies. The study revealed that 71 such societies, 41 registered and 30 unregistered, existed in the state in 1980, with an average membership of 83 people. Because of limited membership, however, the societies suffered from lack of funds which also limited their impact on the fertilizer distribution programme. For example, they were expected to deposit money in return for fertilizers from the Cooperative Division of the Ministry. If they failed to do this, they would not get fertilizers for their members. They also did not sell fertilizers on credit for the same reasons.

6.1.2. Operational problems of the distribution system.

The study has identified a number of obstacles facing the fertilizer distribution programme in Gongola State. One of these, is the untimely arrival of fertilizers in the state. The result of this is that the transport contractors could not transport fertilizers in time to the LGAs. Nor could farmers obtain fertilizers at the time they required them. This was especially true of the second and third deliveries from the Fertilizer Procurement and Distribution Division. Another problem facing the programme was transportation bottlenecks. This consisted not only of the shortage of ministry vehicles for extension staff

and store-keepers to use in conveying fertilizers to villages for sale and for extension activities, but also the lack of all - season motorable feeder roads to the villages and fertilizer stores. The latter bottleneck was revealed to have caused the non-fulfilment of the terms of contract by some contractors, as truck loads of fertilizers were abandoned by the roadside for weeks until the road was clear, resulting in fertilizer loss through spoilage. Jalingo and, to a lesser extent, Ganye LGAs suffered most from this problem. The third problem identified by the study is the absence of fertilizer storage facilities at the village level. The study showed that of the 93 fertilizer stores (with total capacity of 41,250 tonnes) available in the state, none was situated at the village level. The location of fertilizer stores within access of farmers has been revealed in this study, to be important in the promotion of fertilizer use. Apart from the absence of village level stores, the study also revealed that many of the available stores are not standard structures. They are either too small in size or made of non-durable materials. The study has also identified poor records of fertilizer inventory as one of the problems faced by the fertilizer distribution programme in the study area. In most of the sampled stores, delivery, sales and

spoilage records were not up-to-date due to the lack of trained store-keepers. Poor records of fertilizer inventory contributes to unreliable fertilizer and agricultural statistics, on which the requirements of fertilizers are based. The study also identified the shortage of trained manpower such as extension workers, store-keepers and store-attendants as one of the obstacles to smooth fertilizer distribution. This problem is directly responsible for the use of extension workers to take charge of fertilizer stores and to sell fertilizers, in addition to their professional duties. Other problems identified include administrative delays in decision-making inadequate knowledge of complementary inputs on the part of the farmers and their unavailability, and the very high costs of fertilizer distribution which is partly attributable to government monopoly of the fertilizer distribution system. About 75 percent of the price of fertilizers is subsidized by both the Federal and State Governments. The study reveals that procurement and distribution costs have increased tremendously over the past years, especially for the Federal Government, though availability of fertilizers also improved as a result within the study area. Over 70 percent of distribution costs is accounted for by transportation costs alone, while administrative costs, handling, cost of fertilizer sales promotion, interst on working capital, etc. account for the rest. An attempt to impute fertilizer distribution cost components in the study area showed that, whereas

in the U.A.R. and the Philli;ines, such cost range between eight percent and 35 percent, over 100 percent distribution costs are incurred in the study area.

6.1.3. Fertilizer use and factors that determine the level.

The study reveals that there is a high level of awareness of fertilizer use and its benefits in the study area, as all the respondents in the three LGAs had heard of fertilizers before. Almost an equal number had also seen fertilizers, but only 80 percent, 94 percent and 66 percent in Gombi, Ganye and Jalingo LGAs respectively had used it.

The most important source of information on fertilizer use identified by the study was extension workers, followed by other farmers. It was also revealed that only 31 percent of those using fertilizers were satisfied with the quantities they could buy during the years of study. A comparison of socio-economic characteristics of users and non-users of fertilizers showed that, there were no differences between them as regards the pattern of land ownership, the amount of family labour used on the farms, distribution of plots and cropping pattern. Significant differences existed, however, with regards to their use of hired labour, yield, income, membership of farmers' cooperative unions and, the frequency of extension contacts in a year.

With respect to the farmers' opinion of the problems connected with the use of fertilizers, the greatest hinderance to the adoption of fertilizer use identified was their unavailability in time. This reason was cited by 53 percent of the non-using respondents, followed by capital constraints and lack of knowledge of the methods of application. For farmers that had already adopted fertilizer use (users), however, the greatest cited problems were unavailability of fertilizers in time, distance to fertilizer stores, means of transporting fertilizers, capital constraints, and cost of fertilizer application.

A statistical analysis of the relationship between some socio-economic variables and fertilizer use in the study area based on the pooled data, LGAs, villages and the high, medium and low categories of users also confirmed the afore-named variables to be significant in affecting the use and non-use of fertilizers. Other significant variables were the level of income, number of seasons of fertilizer use, and frequency of extension contract in a year. The degree of intensity of the significance of each of these factors, however, varied within the local government areas, and villages, depending on their peculiarities. Membership of farmers' cooperative unions was found to be a significant factor, only among the medium level users of fertilizers.

Finally, tests of significance using discriminant analysis and chi-square tests, carried out on the classification of the LGAs studied and the sampled farmers into high, medium and low users of fertilizers, revealed the latter to be significant while the former was not. A socio-economic profile based on the classification of farmers into high, medium and low users was then drawn up. The profiles showed that systematic differences exist between the three categories of users with respect to occupation, income, cash expenditure on hired labour, number of years of fertilizers use, distance to fertilizer stores, the means of transporting fertilizers to the farm, and membership of farmers' cooperative unions. There were no differences identified with respect to age, number of plots owned and family size.

6.2 Recommendations.

Since the production of an adequate food supply for Gongola State, and the Nation as a whole is of paramount importance, the need to promote the application of fertilizers in the recommended quantities, using improved management practices cannot be over-emphasized. To achieve this objective, the following suggestions, based on research findings in the study area are put forward.

1. The inadequacy of the fertilizer distribution programme starts with the untimely arrival of fertilizers in the state and consequently at the LGA and village levels. It is suggested that the Fertilizer Procurement and Distribution Division should endevour to deliver all the needed fertilizers and not just part of it before the beginning of the planting season in each year.
2. The distance between the villages and the fertilizer stores was found to be one of the greatest hinderances to increased fertilizer use, especially where the use of commercial vehicles is rendered difficult by lack of motorable roads. It is, therefore, suggested that village level storage facilities must be constructed to ease this problem. This will, however, increase the cost of distribution as storage costs will rise.
3. Inadequate facilities for financing agriculture was discovered to prevent many farmers from either adopting the use of fertilizers, or increasing the level of use. It is suggested that the state Ministry of agriculture and commercial banks review their credit policies, and give agricultural loans to more small farmers, who should be guaranteed by their local governments. At the moment the richer farmers who can guarantee themselves benefit more from the existing agricultural credit schemes.

4. Farmers' cooperative societies, which were among the channels of distributing fertilizers and other inputs in the state was found to be riddled with lack of membership and hence funds for operation. It is suggested that the State Ministry of Agriculture and Cooperatives should aid those societies by providing them with part of the funds they require for operation on credit, until such a time when they can stand on their own. Extension workers resident with farmers in the villages should encourage membership in such unions. Once the cooperatives are well established, they would be an excellent fertilizer distribution channel.

5. One of the reasons given by farmers for low fertilizer use was the unavailability of complementary inputs. Since the Agro-Service Centres built by the Federal Government in each state is meant to stock and sell all agricultural inputs in a package form, and give credit and technical advice to farmers (Williams, 1978), it is suggested that, more of such Centres be built in the state immediately, so that complementary inputs, especially, are brought closer to the farmers and at the right time. At the time this study has carried out there was one Agro-Service Centre in each of the LGAs in the state. Complementary inputs should also be made available for farmers to buy not only at the LGA stores and Agro-Service Centres as the case is now, but also at the village level.

6. Another problem facing the fertilizer distribution programme was that of shortage of trained manpower, especially of the intermediate category. These include extension staff and store-keepers. It is suggested that more of this category of staff be trained formally or informally on the job. An increase in the number of trained store-keepers and extension staff would mean better fertilizer statistics, while many more farmers could be enlightened on the use of agricultural inputs and other improved practices. This would go a long way in increasing the level of fertilizer use and hence agricultural output.

7. Transportation was also found to be an operational bottleneck of the fertilizer distribution programme. There was a dearth of motorable all season feeder roads to the villages and fertilizer stores and also, Ministry vehicles for extension staff and store-keepers to use. It is suggested that the State Government should make available an adequate number of vehicles at LGA level for this purpose. Feeder roads which are the responsibilities of the State and Local Governments should also be continously maintained to make them usable throughout the seasons.

8. Administrative delays at the ministry level was cited, especially by the contract transporters of fertilizers, as being one of the problems facing the distribution system. This resulted, many a time, in delays in awardding the fertilizer transportation contracts

and in turn delays in the arrival of fertilizers at LGA level. It is suggested that Ministry Officials concerned with the distribution of fertilizers should deal piece meal with matters concerning it, to avoid unnecessary delays.

9. As is true of the nation as a whole fertilizer distribution is controlled by the State/Federal Government. The initial aim of this was to allow farmers to buy fertilizers at subsidized prices, ensure profitability and hence encourage their use. While this has been achieved to a large extent, the cost has been enormous on the Federal and State Governments. It is suggested that since farmers have now realized and accepted the importance of fertilizer use, the government could either shift some of the distribution costs to the farmers, thus decreasing the amount of subsidy, or allow private participation in the distribution system especially at retail level. This means that the public and private sector will retail fertilizers side by side, such that if the private sector neglects the supply of fertilizers to remote areas due to unprofitability, the public sector which is service oriented can supply to such places.

10. Last but not the least, it was revealed that the State's requirements for fertilizers were based on no concrete, information such as edaphic properties and cropping patterns in the state. The consequence of this is that the wrong fertilizers could be requested for, and in inadequate quantities. It is suggested that data on cropping patterns within the state, types of soils and their fertility status, should be collected by the Ministry using extension workers, so that this will become the bases for formulating the fertilizer requirements of each district, each LGA and the whole state.

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