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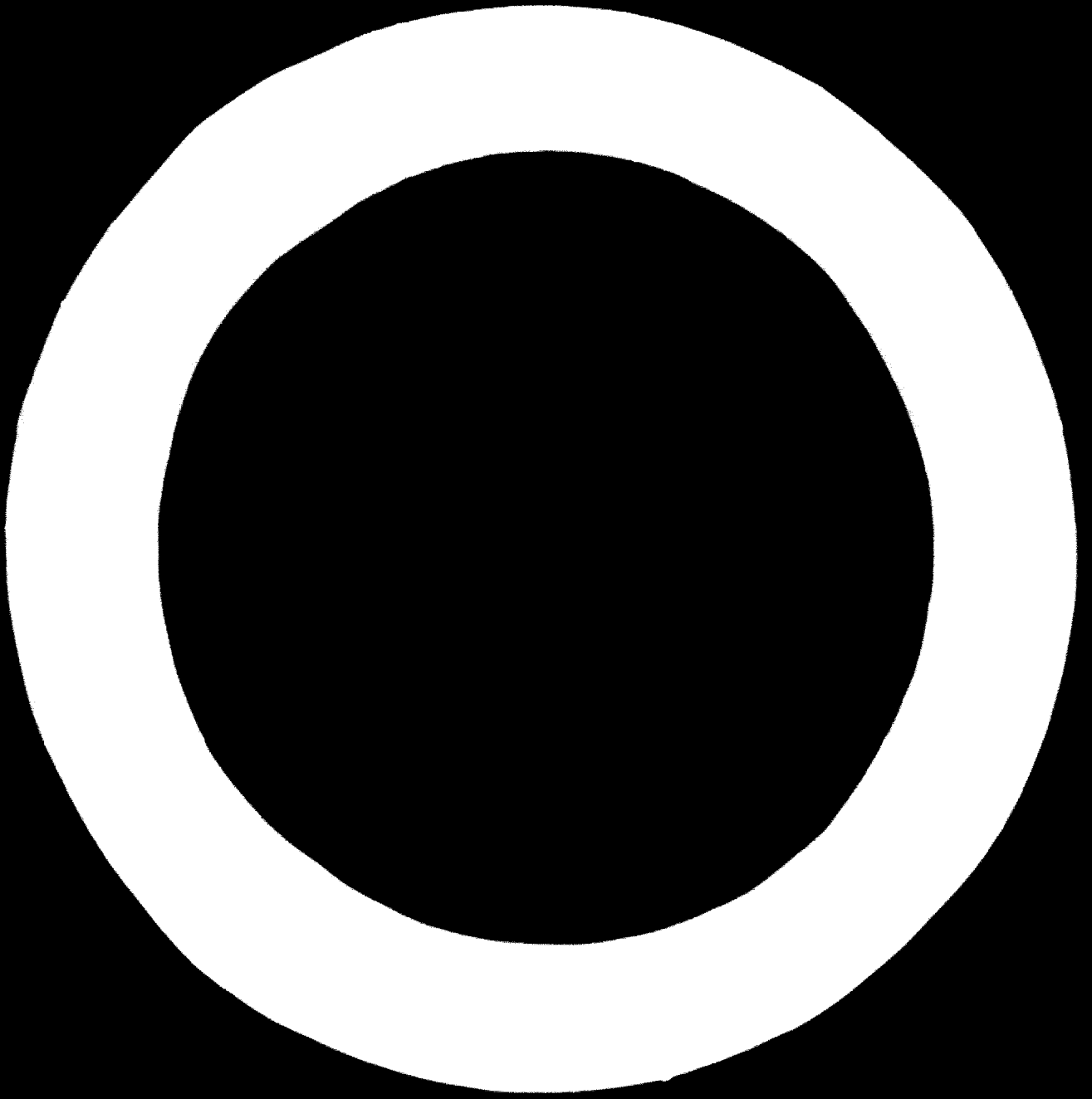
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THE FERTILIZER INDUSTRY OF LIBERIA

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## INTRODUCTION

Agriculture is the bulwark of Nigerian economy. It accounts for about 60 per cent of the country's Gross Domestic Product and provides employment for about 70 per cent of the working population. Nigeria has a wide scope for agriculture based industries such as veneer and plywood production, leather tanning and processing, coffee and tea growing and processing, textile spinning, weaving and finishing, alcohol distillation, yeast, cordage, rope and twine manufacture, sugar refining and rubber fabrications. Through careful planning and development citrus, pineapple, maize, cassava, tomato, cotton, sugar cane, sorghum, sorghum and wheat can be cultivated to support large processing industries.

This impressive position and outlook for Nigerian agriculture depend upon a wealth of agricultural resources. There is a vast area of state land on which almost all tropical crops could be raised on account of the varied climatic conditions. Statistics shows that out of the country's total land area of about 231 million acres, about 80 million acres, constitute arable land and land under permanent crops. With about 9 per cent of the country's area not presently used for any specific purpose, the percentage of land which can be available for agricultural purposes is about 40. Thus about 92 million acres of land in Nigeria can be used for agricultural purposes.

Before independence in 1960, Nigerian agriculture suffered from a general period of low productivity. Poor production techniques and low farm inputs resulted in low yields. Infrastructural, marketing, storage,

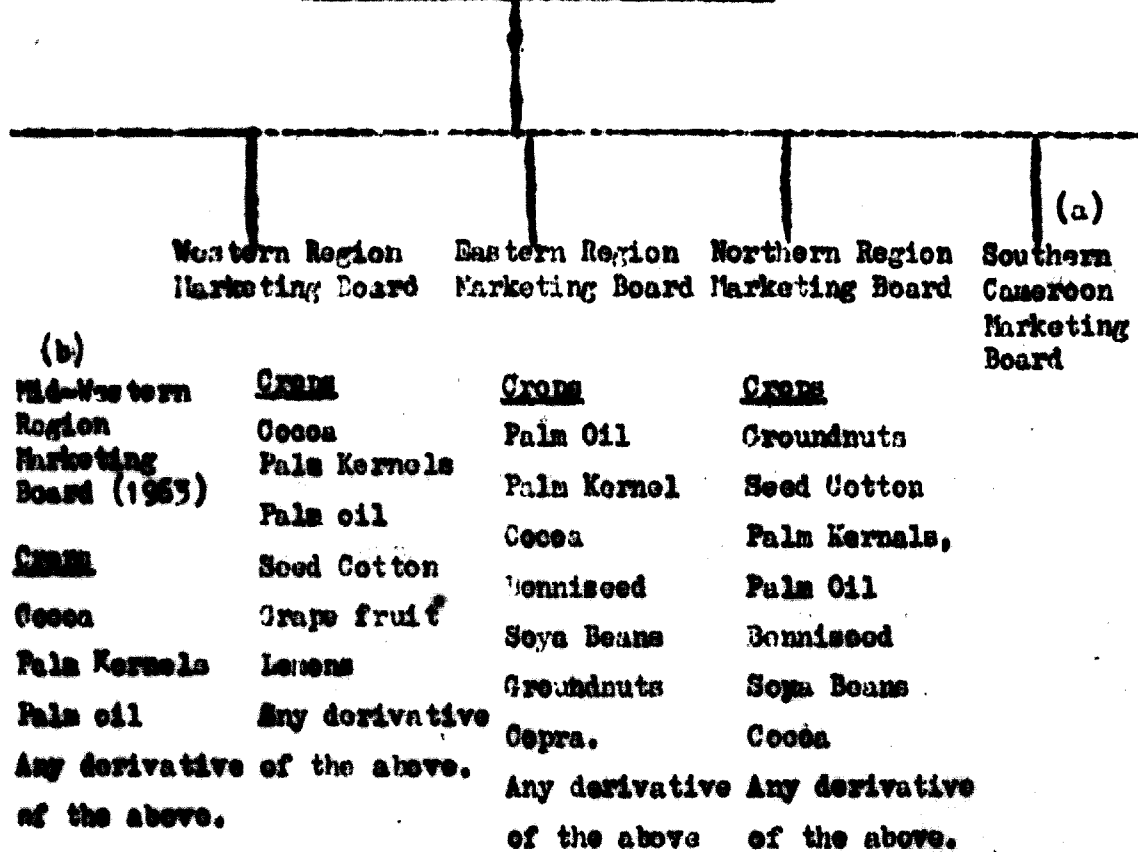
and the facilities were inadequate. The unique characteristics of the major crops were not properly articulated to provide a basis for developing detailed policy measures.

Following the attainment of independence and the introduction of the First National Development Plan 1962-1968, governmental interest in agriculture increased steadily. During this period, £22 million were allocated to primary production. About 34 per cent of this amount went to government directed projects such as farm settlements, plantations, irrigation schemes and research projects in the fields of forestry, fisheries, livestock, soil fertility and plant breeding. The former Regional Governments participated in this programme of assistance to agriculture through allocations for inputs such as extension services, fertilizer subsidy, hiring of machinery, rehabilitation and replanting of cash crops.

Along with Government's interest in increased agricultural yields was the desire to create sufficient incentives to producers. To achieve this, the Nigeria Produce Marketing Company Ltd., was incorporated in Nigeria in 1952 to take over the functions of the Nigerian Produce Marketing Company incorporated in England in 1947. In 1949 four Marketing Boards - the Nigeria Cocoa, Oil Palm, Groundnut and Cotton Marketing Boards - were organized as monopoly buying agents in Nigeria with the Nigeria Produce Marketing Company, Ltd. functioning as sole agent for the agent. But with the reorganization of the Nigeria Produce Marketing Company, Ltd. in 1958, the Produce Marketing Boards were reorganized as regional boards to purchase the principal cash crops in the region as indicated below:-

Nigeria Produce Marketing Company Limited

Incorporated in Nigeria, 1958



(a) When the Southern Cameroons became part of the Cameroon Republic in 1962, the Southern Cameroons Marketing Board severed its connections with the Nigeria Produce Marketing Company, Limited.

(b) With the formation of the Mid Western Region in 1953, a Mid-Western Marketing Board evolved.

The four regional Marketing Boards have since their incorporation provided a guaranteed market for Nigerian produce. They have also provided guaranteed prices for crops. These prices change from time to time according to world prices for the crops. The significant role of the Nigeria Marketing Board system lies in the provision it makes

for trading savings for the country's economic development plus an orderly marketing channel for export crops. There is still room for an equitable pricing policy which would ensure that primary producers receive fair prices for their produce. Each of the Regional Marketing Board made funds available to the Regional Government for economic development schemes. Regional Development Corporations were formed to spearhead developments primarily aimed at increased capital formation. Because of difficulties in recovering loans made to the primary agricultural sector the Development Corporations became lukewarm towards issuing loans to this sector. The Regional Governments then undertook to provide agricultural credits to farmers through fertiliser subsidy, hiring of machinery or extension service programmes. For the past five years, Government subsidy to fertiliser users has been about 50% of delivered cost. This subsidy has helped to promote fertiliser consumption in Nigeria as shown in the following table.



Table I

Fertilizer Consumption in Florida

1960 - 1970

(Long Tons)

Year	Phosphatic Fertiliser	Ammonium Sulphate	Potassic Fertiliser	NBS	TOTAL
1960	1,055	n.a.	1,704	6,123	10,942
1961	1,607	n.a.	1,401	1,061	4,299
1962	11,626	2,153	12,701	23,297	49,977
1963	7,269	3,040	675	3,426	15,290
1964	13,022	8,221	355	3,280	27,939
1965	10,492	14,601	3,222	6,915	34,930
1966	16,073	10,940	1,720	1,326	30,059
1967	27,305	20,914	2,173	3,279	64,705
1968	23,943	12,710	195	1,645	34,971
1969	25,073	600	457	11,790	39,100
1970	14,185	7,119	1,314	5,897	27,734

The fluctuations in fertilizer consumption between 1964 and 1970 can be best appreciated by considering the possible effects of the civil and political situations in the country during this period. From 1964 to 1967 there was a steady increase in fertilizer consumption. During the civil war period this trend towards increased demand changed. The phosphatic fertilizer imports fell from 27,305 tons in 1967 to about 24,000 tons in 1968 - a drop of about 10 per cent. Nitrogenous fertilizer imports for the same period fell from 23,014 tons

to about 13,000 tons - a drop of about 55 per cent. In the case of potassic and other fertilizers the drop was rather drastic. In 1970 the six Northern States imported fertilizers on the basis of individual state fertilizer requirements. The need to tailor orders according to available funds in each state and possible late orders greatly affected the level of fertilizer imports in 1970. Agriculture in the Eastern States and parts of the Midwestern State was not sufficiently rehabilitated to justify high importation of fertilizers into those areas in 1970.

Assuming that the pattern of fertilizer consumption for the period 1964-1969 will be resumed especially with renewed Government interest in providing more agricultural credits to the farmers it is logical to expect fertilizer demand to increase in the next few years. The Federal Government intends to spend about £27 million during the Second National Development Plan 1970 - 1974, as agricultural grants to priority areas such as improved extension services, provision of fertilizers and agricultural publicity information.

#### Development of Fertilizer Plants in Nigeria

The feasibility of mineral fertilizer manufacture in Nigeria has been studied since 1963 - some of the major studies are:-

1. L.F. Haselgarten and Partners, Ltd. "Report on the Feasibility of fertilizer and Insecticide Industries in Nigeria", Report to the Federal Ministry of Commerce and Industries, September 1963. The conclusions of this report were:
  - (a) Ammonium sulphate and superphosphate could be economically produced and used in Nigeria.

(b) The industry should be programmed in two phases with complexes at Port Harcourt and Kaduna as indicated below:

<u>Port Harcourt</u>	<u>Production Capacity - tons/yr.</u>	
	<u>Phase I</u>	<u>Phase II</u>
	<u>1967-68</u>	<u>1972-73</u>
Ammonium Sulphate	50,000	120,000
Single Superphosphate	30,000	60,000
<u>Kaduna</u>		
Single Superphosphate	50,000	120,000

Estimated capital expenditures were £4,020,000 for phase I and £3,160,000 for phase II.

It recommended continued importation of fertilisers to promote domestic demand to the projected production capacity.

2. Arthur D. Little, Inc. "An Evaluation of Mineral Fertiliser manufacturing Possibilities in Eastern Nigeria", Report to the Government of Eastern Nigeria, December 1963. This report concluded that ammonium sulphate and normal superphosphate were fertiliser materials best suited for manufacture in Nigeria. It warned, however, that market demand for ammonium sulphate then could not justify the establishment of a plant for it. Although it felt that a plant to manufacture 50,000 tons of normal superphosphate could be economical at a later date it recommended the establishment of a dry-mixed fertiliser plant of 10,000 tons a year capacity as being economically justifiable.

3. Tennessee Valley Authority, "Survey of Fertilizer Use in Nigeria" An Evaluation of Potential Demand and Methods of Supply. Report to U.S.A.I.D., June 1965.

This was an exploratory survey of fertilizer use, research, extension and demonstration programs, distribution methods and facilities and other factors affecting fertilizer use. Its projected fertilizer demand of 200,000 tons for 1970 was too optimistic. Total imports for 1969 were 39,161 tons. In the case of phosphatic fertilizer imports were 26,095 tons in 1969 and 14,103 tons for 1970.

It concurred in the opinions of other reports that demand for ammonium sulphate did not justify the establishment of an ammonium sulphate manufacturing plant.

Feeling that fertilizer use was related to prices received for their produce by the farmer it recommended that research be conducted to determine the effect of commodity prices on fertilizer consumption.

It called for a feasibility study on the economics of constructing and operating a bulk fertilizer mixing plant at Port Harcourt.

4. Arthur D. Little, Inc., "Report on the Feasibility of a fertilizer industry in Nigeria" Federal Ministry of Industries July 1963. This was an extensive feasibility study on fertilizer industry in Nigeria. Its projected phosphatic fertilizer demand by 1973 of 97,000 tons of single

superphosphate appears now to have been very optimistic. Demand for this fertilizer has been below estimated consumption for 1969 and 1970.

The report recommended the establishment of a 50,000 tons per year phosphatic fertilizer plant at an estimated capital expenditure of £1,181,071. It concluded that calcium ammonium nitrate industry could not be economically established until demand for it had reached the 50,000 tons a year level. Such complex would cost £2,775,400 to establish. Apart from its shoddy mathematical errors this was the most serious of all the reports.

5. The Japan Consulting Institute. "Report on the Industrial Survey for Fertilizer, Petroleum, and Petrochemical Industries in Nigeria" June 1969. The report recommended the establishment of a phosphatic fertilizer plant with a production capacity of 100,000 tons a year at Kaduna. The plant would require a fixed capital investment of £1,790,000. Two cases were studied for nitrogenous fertilizer production. Case I would produce 57,770 tons of urea and would require a fixed investment of £2,950,000. Case II would produce 339,900 tons of urea and would require a fixed investment of £10,130,000. Setting up Case II would depend upon ability to locate foreign markets for part the product.

**POTENTIAL DEMAND FOR FERTILIZERS IN THE NORTHERN STATES**

All the study programs contained in this report are based on a potential fertilizer market in 1960, which is large enough to justify the establishment of a local fertilizer industry. The Institute for Agricultural Research at Auburn, La., has predicted potential fertilizer demand for the Northern States based on 910,000 tons for Ammonium Sulphate (191,000 tons as nutrient) and 65,000 tons for single superphosphate (191,000 tons as nutrient). Table 2 shows the potential demand in the Northern States.

**Table 2**

**POTENTIAL DEMAND FOR FERTILIZERS IN THE NORTHERN STATES**

Crop	Acreage	Application Rate lb/acre		Tons	
		N	P <sub>2</sub> O <sub>5</sub>	N	P <sub>2</sub> O <sub>5</sub>
Soybean	6,674,000	24	20	95,000	79,000
Wheat	6,053,000	12	9	47,000	36,000
Rice	901,000	55	35	24,000	15,000
Cotton	1,327,000	24	20	14,000	12,000
Groundnuts	2,500,000	-	15	-	17,000
Yams	1,052,000	24	-	11,000	-
				191,000	159,000

If the available capacity were fully utilized for agricultural production for the five crops requiring phosphatic fertilizers - sorghum, millet, maize, cotton and groundnuts - a total of 193,000 tons of  $P_2O_5$  nutrients could be consumed. This is equivalent to 123,000 tons of single superphosphate. The envisaged capacity for the SSP plant is just about  $\frac{1}{4}$  of the potential demand in the Northern States alone. In the case of crops requiring nitrogen, the quantity of fertilizer capable of being consumed is about  $\frac{1}{4}$  of the envisaged plant capacity.

Crops like maize, rice, yam, okra, cotton and groundnuts grow well in the Southern part of the country which was not considered in the estimations of the Institute. Thus the fertilizer requirements for the whole country are by far greater than those estimated by the Institute. The main problem in Nigeria today, is that fertilizer consumption has never followed these indications. In my Report titled "Phosphatic Fertilizer Industry in Nigeria", made in December 1970, I made the following projections on the basis of the average annual consumption for the years 1964 - 1969 and also assuming that annual consumption growth rate could be maintained at 25%.

PHOSPHATIC FERTILIZER DEMAND PROJECTIONS 1970 - 1976

1970	-	25,000 tons
1971	-	31,000 "
1972	-	39,000 "
1973	-	48,000 "
1974	-	60,000 "
1975	-	75,000 "
1976	-	94,000 "

Fertilizer consumption in 1955 was 11,193 tons for 1956 fall for  
below the projected figure of 21,10 tons. The rate of increase  
of fertilizer consumption is 17% over 1954. The 1955/56  
figure of 11,193 tons is a record for the country. It has not  
been possible to trace a connection between the increase in  
the national economy and the development of local fertilizer  
industry. Several factors have inhibiting influence on the growth of  
fertilizer consumption in Nigeria. The major factors are:

1. Farm size is typically small and farming methods are still  
relatively primitive. Little cash is available for fertilizer  
purchase and in any case, additional yields resulting from  
fertilizer use are not readily apparent to the farmer.
2. Despite of subsidy programmes which reduce the cost of fertilizer  
to the farmer, the low value of many crops limits the  
financial advantages of fertilizer use.
3. Inadequate and unreliable data on the proper rates of fertilizer  
application for different crops on various soils, especially  
in the Southern part of the country, is lacking.
4. The number of effective agricultural extension workers relative  
to the large number of farms involved is inadequate.
5. Although there have been credit facilities to the farmer they  
have not been mainly to increase primary agricultural  
production.

(1) Commercial banks which offer agricultural credit services  
do so for profit. They do not extend credit to farmers.



because of the great risk involved. The village farmers  
cannot put savings and other assets as so unimportant  
to them as those of a thriving commercial bank loans are  
to the bank.

(ii) The village bank, the money lender, licensed buying agents  
and village banks are unable to operate their credit  
facilities under such conditions that place the farmer  
at a disadvantage.

(iii) The co-operative societies which operate agricultural  
credit systems are effective in making money available  
to farmers and traders. But most of the credit obtained  
from co-operatives is consumed thus leaving very little  
left for farm improvements and fertilizer purchases.

4. Distribution and distribution function of fertilizers is now  
handled by government agencies. This method of getting  
fertilizers to the farmer was necessary during the initial  
period of credit introduction. It has never been possible  
for the system to make fertilizers generally available to  
farmers. As the volume of fertilizer supply has  
increased and with staggered supply which a local fertilizer  
dealer will handle it will be necessary to hand over  
control of distribution of fertilizers to commercial  
enterprises.

7. The inadequacy of agricultural extension services personnel and the attitude of government workers towards fertilizer production campaigns have produced difficulties on attempts to overcome the wild and harmful rumours of farmers against the use of fertilizers. Even where such campaigns have succeeded as in the case in the Eastern Region in the 1950s insufficient funds for subsidization caused the campaigns to fail.

The Government of the Federation are aware of these limiting factors. While Government does not intend to cause a drastic disruption of the communal system of land tenure, persuasive efforts are being made to encourage co-operative farming activities. Farm Settlements have been established. Villagers have been helped to embark upon large plantation farms for cash crops. The long term advantage of this orientation will be the disappearance of tiny individual farm holdings and the emergence of large communal farms. The objective is to direct the peasant from his subsistence farming to modern commercial farms. All the State Governments are making it possible for farmers to hire farm machinery at low subsidized cost. Thus Nigeria's enormous land for farm use now scattered and spread out by traditional land tenure will be made available for large farms in the near future through education.

### PHOSPHATIC FERTILIZER PLANT

Based upon the findings and recommendations of the studies by Japan Consulting Institute and Arthur D. Little, the Federal Government has decided to establish a phosphatic fertilizer plant in Kaduna. The plant capacity will be 100,000 tons a year while production scale will depend upon a number of factors such as local demand and government support through subsidization, granting of pioneer status and tariff protections. The project is estimated to cost about £2.5 million made up as follows:

Machinery/Equipment cost	-	£1,210,000
Building cost	-	£250,000
Training and Start-up costs	-	66,000
Working Capital	-	<u>99,100</u>
Total	-	<u>£2,485,100</u>

The Federal Government has awarded a contract to Japan Consulting Institute to undertake a detailed project study to re-assess fertilizer demand patterns, determine cost estimates and recommend production scales. The study will be completed and report submitted by June 1972. It is planned to complete construction by the end of 1974.

Unless some export market is located by the time the plant goes into production it will be almost impossible to operate it at full capacity. From market projections it would appear that Nigeria will be able to consume fertilizer from the plant at the levels indicated below:

Table 2

**Plant Capacity for 1st 5th Year**

1st year	39,000 tons
2nd year	45,000 "
3rd year	60,000 "
4th year	75,000 "
5th year	94,000 "

In my Report of December 1970, I recommended that Government should be ready to subsidise fertilizer manufactured in Kaduna at the rate of £9 per ton SSP produced. If production scales are maintained at the levels projected above, the subsidy required will be as follows:

1st year	£351,000
2nd year	£405,000
3rd year	£540,000
4th year	£675,000
5th year	£846,000

Thus for the first five years of operation the subsidy requirements will cost £2,817,000. This, however, will be much more than the subsidy cost on imported phosphate fertilizers for the period 1966-1970. During this period, phosphate fertilizer subsidy amounted to £1,402,900, an average of £280,500 per year. Thus the Federal and State Governments have all along recognized the need to assist the farmer to realize high agricultural yields through fertilizer use. It has been shown quite clearly that the fertilizer plant in Kaduna

would bring back the 1955 or 1956 return on investment. This plan  
 must be established as a matter of national policy. The <sup>new</sup> project  
 based solely on profit incentives. The Joint Committee in 1955 and  
 Arthur D. Little studies concluded there on the basis of a cost of  
 20 per cent. This very favorable estimate of return on investment  
 was based upon actual demand projections which may be considered as  
 low. The total demand is 1-71 to equal capacity on the one. If the total  
 market is not sufficiently collected to ensure at least 25,000 tons  
 per year, these favorable return on investment will not be obtained.  
 If the plant operates at capacity levels above 50,000, it will run  
 at a loss during the first year and will pick up only modest profits  
 in the second and third years. Substantial profits will be obtained  
 as from the fourth year.

The primary role of the leader in viable phosphate fertilizer  
 industry in the state are numerous. The potential demand for any  
 plant the proposed is its capacity. It is certain that by the time  
 the detailed project study completed national policies and programs  
 will be so well defined as to create favorable climate and facilities  
 for a smooth and establishment of the industry.

The position with nitrogenous fertilizer industry development  
 is quite different from the one in phosphate fertilizer described  
 here. The average annual consumption of nitrogenous fertilizer for  
 the period 1950-1970 was 1,275 tons. The average annual  
 consumption for phosphate fertilizer for the same period was 11,000 tons.

It should be noted that the long-term use of phosphate bound for nitrogenous fertilizer is also a possibility; however, more phosphate fertilizers.

Another problem in the development of nitrogenous fertilizer industry is the availability of the type of fertilizer best suited for Florida soils. Ammonia Sulphate has been imported for some time but field workers are complaining about the effect of acidity on the continued application of this fertilizer. Units which contain more plant nutrient than ammonia sulphate has not yet been commercially tested as a product for Florida soils. A decision to establish a nitrogenous fertilizer industry will have to be based on the recommendation of field workers as to the type required by the local soils of Florida. Another factor may be the availability of export outlets to absorb the product.

A major drawback on the development of local nitrogenous fertilizer industry is the local demand for large production quantities to the industrial nations. The fertilizer manufactured in the industrial nations are reluctant to consider investing on fertilizer projects such as is planned in Florida. While a 600 ton a day ammonia plant capable of producing about 500,000 tons of urea a year is being set up, it is considered still the fact remains that over 500,000 tons of the product will be sold outside Florida. The cost of urea is about \$1.00 per ton. The U.S. Fertilizer Committee, Institute in 1950 are shown below:

Capacity of plant	339,950 tons/year (urea)
Total Capital Requirements	£13,000,000
Production cost per ton	£11.67
Ex-factory Price per ton	£18.00

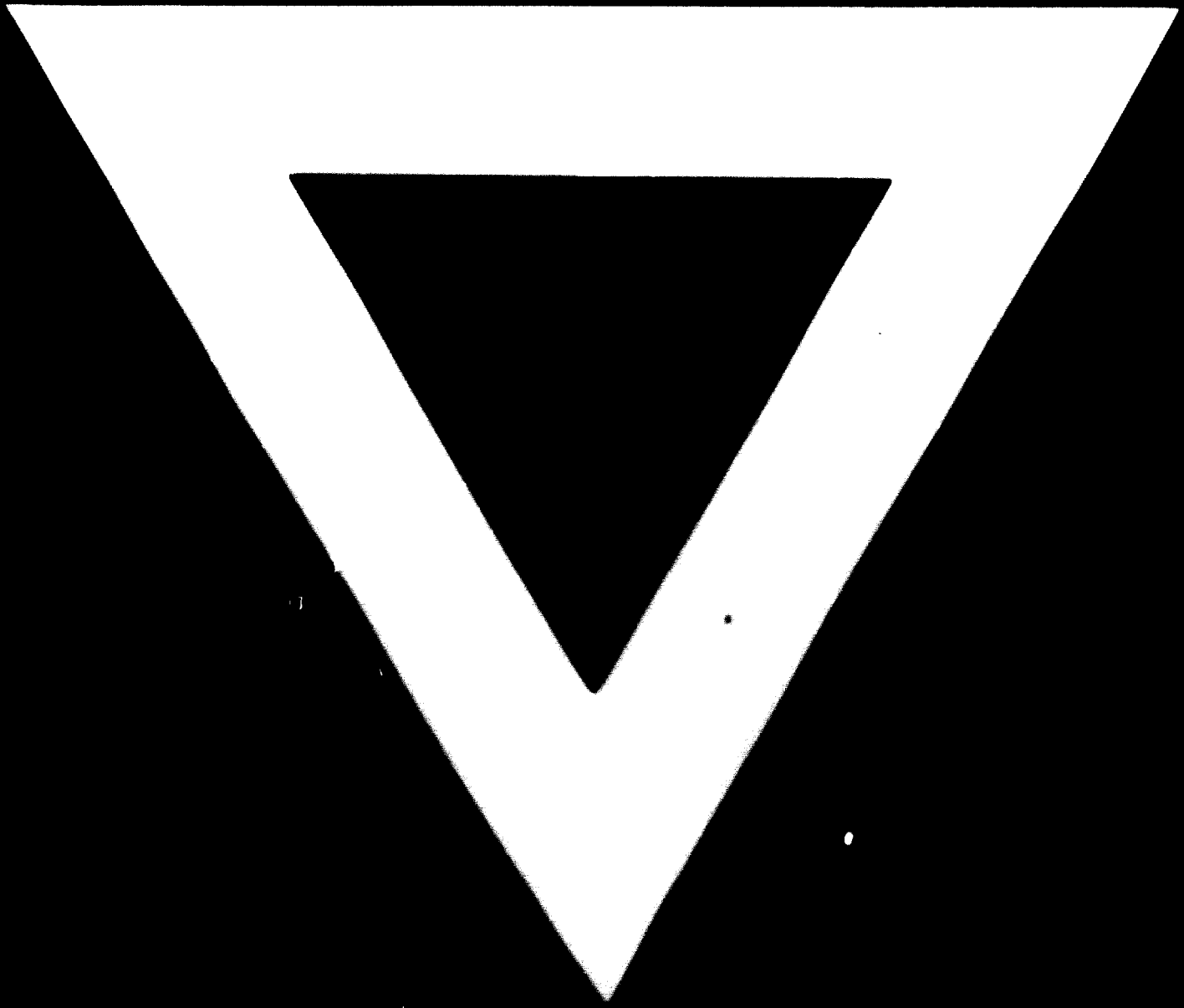
The Arthur D. Little Group in their study of 1960 considered that the establishment of a plant to produce 150 tons/day ammonia equivalent to producing 152,000 tons/year of Calcium ammonium nitrate would require total capital investments of about £6,652,000. Production cost per ton would be £10.69. At an ex-factory price of £21 per ton a return on investment of 20.6% would be obtained if based upon 100% equity investment with normal tax. With 50/50 debt equity ratio and with pioneer status a return on investment of 42.6% could be obtained.

These favourable estimates are based upon the assumption that it would be possible to locate markets for the products. So far no definite proposals have been received from foreign investors or machines and process concerns. Foreign investors consider the Nigerian opportunity though viable on paper to be less so in practice. With their gigantic nitrogenous fertiliser complexes now producing or which are being planned they are in a position to depress world fertiliser prices to their advantage thereby making it difficult for small plants such as is envisaged for Nigeria to be competitive. The ever ready and eager advice given to Nigeria by exports from fertiliser producing countries is to continue to import fertilisers until local demand can justify establishment of local manufacture.

I consider such advice to be most selfish since the time may never come when Nigeria can catch up with the giant manufacturers. As in the case of phosphatic fertilizer, Nigeria may well decide to establish a nitrogenous fertilizer industry as a matter of national policy.







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