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UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION
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Tel: (+43-1) 26026-0 · www.unido.org · unido@unido.org

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DEVELOPMENT OF FERTILIZER INDUSTRY

IN

NIGERIA

FINAL REPORT

Prepared by

George D. Honti

consultant.

UNIDO

Dec.1989.

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CONTENTS.

1./INTRODUCTION

During the visit of M. Siazon. Director General of UNIDO. to Nigeria in January 1989 it was agreed that UNIDO would field a consultant to conduct preliminary investigation on the viability of expanding the existing nitrogen*us fertilizer plant at Onne and the establishment of new units in the country.

The Terms of Reference asked the consultant in particular to verify and assess existing and projected demand for nitrogenous fertilizer, review and asses Government policies, plans and programmes for agricultural development. His task included collection and analysis of data and information on fertilizer; prepare a report on his findings with recommendations to the Goverment.

The mission consisted of a briefing in Vienna (Nov 12-14), a field mission to Nigeria (Nov 14-Dec 2.) and a debriefing in Vienna (Dec 17-22). An interim report was presented to Ms. M. H. Mathey-Boo, Senior Industrial Development Field adviser in Nigeria, to M. A. Ella, assistant Director, Federal Ministry of Industries and M. G. L. Polley, managing director of NAFCON. The interim report was discussed with them, and full agreement was reached on the findings.

Timetable of the mission is presented in Annex No.1 and list of persons and organisations consulted in Annex No.2.

2./SUMMARY. CONCLUSIONS AND RECOMMENDATIONS.

2.1./ CONCLUSIONS.

1./ Nigeria with its population of over 110 million people. an agricultural area about 25 million ha, a population growth rate of 3,8 %, 2050 calories/cap/day food consumption and foreign trade depending mostly on oil export faces two major problems: food and foreign currecy. The government policy of industrialisation, structural adjustment, agricultural development are aimed mainly at these two goals.

2./ Fertilizers play a major role in the agricultural development necessary for solving the food problem. Actual application rate is very low, around 10 kg/ha total nutrient as peak consumption against 58 kg/ha for the developing countries (average) and a world average of 128 kg/ha. Studies demonstrated,that in order to meet the growing population's food demand at present level, at least 50 kg/ha fertilizer application would be necessary, corresponding to 1,250,000 t of nutrients against the average of last years of around 250,000 t. The calculations made, taken into consideration all factors influencing future fertilizer use, came to the conclusion, that for the year 2000 a minimum level of 1,000,000 t should be set as target.

3./ This huge amount of fertilizers - if no investment for domestic production were made - would expose the foreign currency balance of the country to heavy burden: for the years 1991-2000 a total of 1,8 billion US$ would be needed, alone in 2000 more than 300 millions, against a total Nigerian export volume of around 7-8 billion US$. So great emphasis should be laid on sound, economically justified projects for domestic manufacturing of fertilizers.

4./ For the Nigerian soil, the most important nutrient is nitrogen. Fortunately, all conditions for the expansion of domestic nitrogenous fertilizer production are favorable. Raw material (natural gas) is available at (for this purpose) unlimited quantity and at low cost. NAFCON I is a technical and economic success, forming an excellent base for future developments (experience, traning, personnel, etc). The policy followed by the Federal Govermnent in building this plant led to excellent results, it has to be applied to the future developments. All conditions are favorable for an extension of the domestic manufacturing not only for home consumptionm. but for export too. as the example of NAFCON I shows.

5./The Federal Govermnent and NAFCON made serious and deep preparatory work for future investments in this field. An overall development plan and two feasibility studies were made, using outside expertise too. Based on these works, this report elaborated four alternatives for the development of the nitrogen industry:

- A./ no further investment at all;
- B./ doubling the existing NAFCON I plant at the same site in 1990-92 (NAFCON II);
- C./ alt. B. + building a new plant (NAFCON III) at a new site with the same capacity and with a delay of about one year(1991-93);
- D./ The same as alt. C, but NAFCON III built in 1994-96.

6./ Analysis of these alternatives showed, that alternative C. would give the best results for the Nigerian economy from all aspects; natural gas utilization, agricultural development and foreign currency balance.

7./Financing investments for alternative C will be geatest problem to solve.

8./ For NAFCON III, further preparatory work is necessary: site selection, decision on the capacity, gas pipeline definition.

9./ NAFCON prepared diversification development projects (e.g.methanol). These merit further analysis for technical and economic feasibility.

10./ Although these projects seem to cover the whole period up to 2000, this report refrained from making recommendations for further investments which eventually could be planned after NAFCON III in the second half of the decade 1990-2000. It was estimated, that forecasts are not reliable enough regarding neither domestic consumption, nor world market development to justify such long term propositions and there is no need for them: decision is not necessary before 1994. This question should be investigated in the years 1992-93, when experience on the proposed investments and market development will be available.

11./ For the development of phopsphorous fertilizer production, the conditions are less favourable. At the moment neither phosphate rock, nor sulphure are available from domestic sources. For sulphure, only import can provide adequate sources. Phosphate rock deposits have been found in the country, but no geological survey was conducted and so the question of commercial exploitability is open.

12./ Domestic manufacturing from imported raw materials gives a foreign currency saving of only about 100 US$/t, while from domestic rock with imported sulphur the saving would be nearly 400 US$/t. It was considered, that under these conditions the development projects would have to depend to a great extent on the results of the geological survey.

13./ In this field, the geological survey has the first priority.

14./ Commercial expoitation of these deposits, even if their viability will be proven, will not be possible (mine opening, beneficiation plant building) before 1996. So for the first half of the period considered, the development projects of this industry should be evaluated with imported raw materials only. The single superphosphate plant (FSFC) at Kaduna has proven, that (correction made for the difficulties, wich should not be repeated) this product and proces is viable under Nigerian conditions at that capacity, considered generally as a miniplant (100,000 t product/year).

15./ Potash deposits have also been found, but here too, no geological survey was conducted. Since potassium fertilizer manufacturing consists only of mining and beneficiation, all eventual domestic production depend on the results of this survey.

16./ Very advantageous conditions for nitrogen production and lack of phosphorous and potash resources (at this moment) create favourable conditions for regional cooperation. Several countries (Senegal, Togo, Marocco) have aboundant phosphate resources and some have well developed phosphate industry, some are developing it. For nitrogen, only three countries in Africa have potentialities for greater development: Algeria, Egypt and Nigeria. Exchange of products and raw materials will be advantageous for all interested.

17./ The whole distribution system from the seaside and manufacturing plants to the farmers is a great challenge. The much higher quantities involved, the supply constrained situation, which will still prevail, the necessity for government subsidies create a situation very hard to solve with simple methods. A deep study would be necessary to define the factors, their effects and the technical, investment, organizational and policy measures needed.

2.2./RECOMMENDATIONS.

1./ The Federal Government has applied a wise policy in technical, economic and financial fields with the NAFCON project. This policy should pursued in the preparation and implementation of future development projects.

2./ High priority should be given to the development of the nitrogen industry, which is expected to give the best results for foreign currency saving, agricultural development and natural gas utilisation.

3./Alternative C. of this report is proposed for the development up to 2000.

4./Further preparatory work on NAFCON III. should be made. For site selection further study is necessary. Decision on capacity is also urgent.

5./ New endeavours could be made, especially for NAFCON III, for financement. Higher equity participation, both from external and domestic souces would greatly improve financial results. Great international fertilizer manufacturing companies should be approached for equity participation. Nigerian firms intersted in fertilizer transport, import and other fields connected should also be involved, making them interested in the project.

6./Diversification projects of NAFCON should be encouraged. Feasibilty study for methanol production should be made for the special conditions encountered.

7./ High priority should be give to geological survey of phosphate and potash deposits.

8./ Revamping of FSFC plant should go ahead.

9./ Attending the results of geological surveys, further superphosphate manufacturing plant are advisable, mainly based on local and if possible on private initiative, including foreign capital (like F&C, although this is a bulk blending plant).

10./ Depending on the results of the geological surveys, plans should be worked out for the development of these industries.

11./ High priority should be given to the exploitation of the possibilies offered by regional cooperation.

12./ In order to find a favourable solution to the distribution problem, a comprehensive, deepgoing study is necessary to prepare government decision and action.

13./ The Federal Goverment should make good use of the possibilities given by the international agencies. UNIDO and FAO could give assistance in preparation of studies and surveys figuring in the recommendations.

3./OVERVIEW OF THE ACTUAL SITUATION.

3.1./NIGERIA - GENERAL FEATURES.

Nigeria, the most populous country in Africa, is located in the west of the continent. It has a coast line of about 800 km. the largest distance from east to west is over 1100 km and from north to south over 1000 km. The total land area is 923769 sq/kms and the official estimate of population at the beginning of 1986 was 116.2 million.

Nigeria is a Federation of 21 States and a Federal Capital Territory (Abuja). The Federal States are divided into local government areas. Executive power is wested with the President, and is exercised in consultation with an Armed Forces Ruling Council (AFRC). The 21 States are administred by Governors, appointed by the AFRC. A Political Bureau was established in 1986 to prepare a timetable for the restauration of democratic rule, the target date being 1992.

Nigeria is a non-aligned country, a major power in Africa. Foreign relations are good. Debt rescheduling, negotiations of new credit facilities and attract.on of foreign investment are on the fore of the foreign policy agenda.

Economically, in spite of abundant natural resources, (agricultural land, climat, oil), Nigeria is relatively week. GDP/capita is low, around 300 US$ and was declining constantly in the 80's. So in 1987, it was in real terms 21 % below the level achieved in 1980 However, the economic reforms carried out under the Structural Adjustement Programme (1986-88) seem to have had a cumulative positive effect. According to the President's 1989 budget adress, GDP was N 142,180 billion in 1988 and is expected to grow to N 1o7,023 billion in 1989, corresponding to a growth rate in real terms of 4.01%. Manufacturing sector is expected to achieve 8%, agriculture 4% and transport 3.3% growth. The share of agriculture in the GDP declined in the seventies from nearly 40 % to about 20 %, but in the eighties rose again to 25 %. Manufacturing industry has little impact, only around 5% of GDP comes from this sector. Capacity utilization is low, around 40 %. mainly due to high dependance on imported materials and parts.

External debt was nearly 26 billion US$ at the end of 1988. A debt rescheduling program initiated in 1986 relieved the situation in order to allow financement of development projects. For 1989, the following figures were anticipated:

-foreign exchange inflow:	8.679	billion US$
-debt service:	2.004	"
-for domestic use:	3.157	"

From published figures it seems that in this field somewhat better results, than forecasted can be achieved.

3.2./AGRICULTURE.

The main figures characteristic for the Nigerian agriculture are summarized in Table 1. The yields are low. and reflect the methods used, the lack of modern agricultural practices, first of all in fertilizer use. Livestock head number is also very low. These figures show at the same time the very important role of this sector in the national economy, the acuteness of the food problem, and the necessity as well as the possibility of great developments in this field.

Table No.1.

Agriculture in Nigeria

Main statistical data

	1972	1977	1982	1987
Agricultural area(1000 ha)	21657	22690	23912	24462
Irrigated area (1000 ha)	806	816	835	855
Agricultural population	47068	54800	63000	67050
Total population	67670	80555	95200	101870

	1986			1987			1988		
Crops	Area 1000 ha	Crop 1000 t	crop/ha kg/ha	Area 1000 ha	Crop 1000 t	crop/ha kg/ha	Area 1000 ha	Crop 1000 t	crop/ha kg/ha
Cereals	10117	11392	1126	9435	11869	1258	9880	11975	1212
Wheat	7	15	2143	15	30	2000	40	75	1875
Rice	720	1430	1986	730	1566	2145	650	668	1027
Maize	14	10	689	9	9	989	9	9	1000
Rye	3900	4111	1054	3700	3904	1055	3900	4001	1026
Millet	4800	5664	1180	4200	5183	1234	4500	4860	1080
Yam	1500	19751	13167	1500	16001	10667	1500	16001	10667
Root crops	3173	36800	11598	3173	31533	9938	3173	32101	10117
Soya beans	210	68	324	215	75	349	215	75	349

Livestock	1000 heads	1000 heads	1000 heads
Horses	250	250	250
Cattle	12262	12690	12200
Sheep	4050	4100	4100
Machinery	**Pieces**	**Pieces**	**Pieces**
Tractors	10300	10500	10800

Source:FAO data.

The main farming areas are situated in the northern states. Individual peasant farming constitutes the most important part of the agriculture, although plantations, medium and big farms using more up to date methods are gaining momentum. The Federal Government has recently announced its decision to work out a 15 year plan for agricultural development. It will certainly lay the biggest emphasis on yield increases and as means to implement these goals, the introduction of modern agricultural methods, among others, the use of fertilizers at a much higher level.

3.2.1./Fertizer consumption.

Although the different statistics show rather differing figures (Table 2.), the overall picture is clear: the fertilizer consumption is among the lowest in the world and also in Africa. We listed two sets of figures, the first from FAO statistics, the second from data of the Federal Ministry of Agriculture, Fertilizer Procurement & Distribution Division (FPDD). The latter are consistently higher and reflect rather important fluctuations. It seems, that the stock changes and the sometimes late arrival of imported fertilizers can explain the differences between the smooth development of FAO data and fluctuating FPDD figures. The factors used in calculating the nutrient content of individual fertilizers can also be one source of discrepancy. Fig.1. Shows the behaviour of these trends.

Table No.2.

Fertilizer consumption in Nigeria

(1000 t nutrient)

	Nitrogen		Phosphorous		Potash	
	1	2	1	2	1	2
1981	97	169	79	117	37	46
1982	92	99	67	63	43	39
1983	77	95	58	53	31	36
1984	103	121	77	97	41	45
1985	100	185	76	141	35	79
1986	150	114	76	90	43	34
1987	121	152	92	112	50	70
1988	121	90	79	77	53	31
Total	821	1025	598	750	333	380

Remark:
1=FAO statistics
2=FPDD data

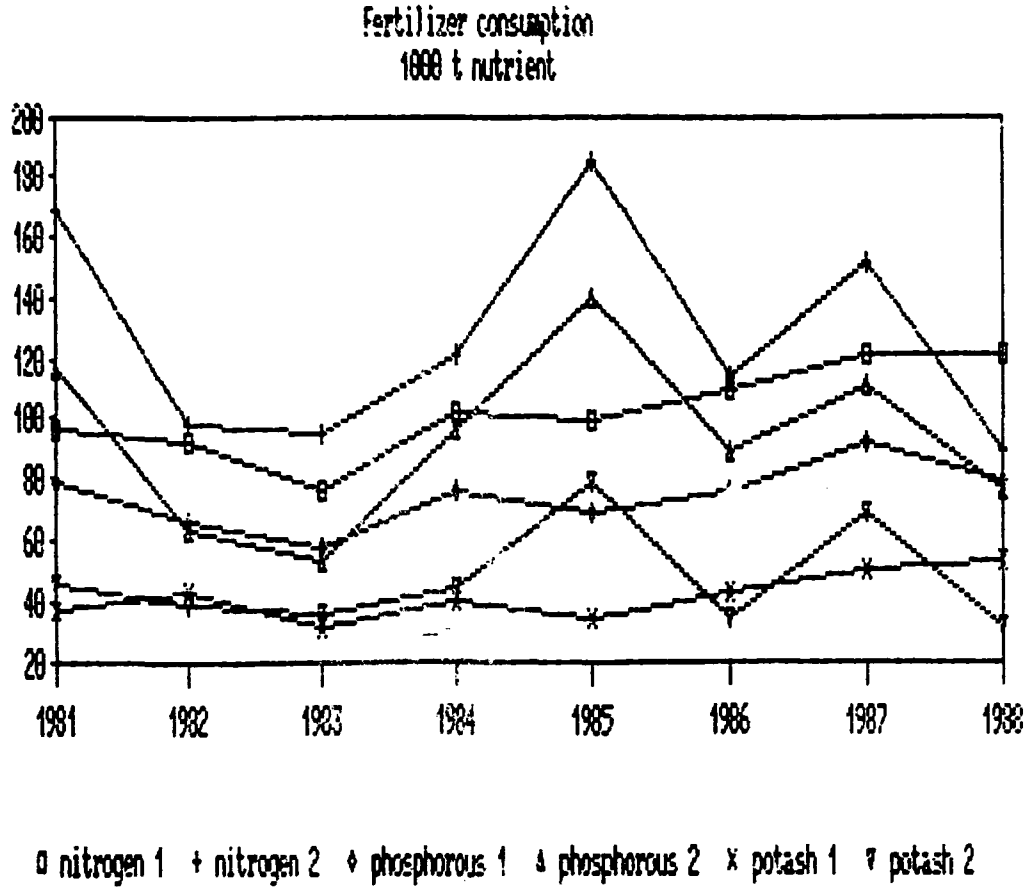


Fig.1.

Analysis of above figures demonstates, that the fluctuation is real and reflects the constraint imposed on fertilizer use by limitations of available foreign currency (beside the above mentionned delays caused by administrative problems). So the comsumption, which reached in 1987 (peak) 263,000 tons of nutrients (N+P2O5+K2O) corresponds to somewhat over 10 kg nutrient/ha (counting 25 million ha). For comparison, Kenya in 1980 comsumed already more than 35 kg/ha, the world average was 121 kg/ha and that of the devloping countries 58 kg/ha in 1984.

It is clear, that even at the actual level of agriculture, real demand would be much higher and consumption is limited by availabilty. This is supported also by the existence of a black market, where a bag sold officially at 15 N can cost 50-60 N.

A study of FAO : Land, Food, People (1984) evaluated the potential population supporting capacity of developing countries. Taken into account the population, its expected growth on the one hand and the possible development of the food production and the necessary calories per capita on the other, it calculated the potential population supporting capacities of developing coun-

tries. Two cases were considered: one with no fertilizer use and another with 80 ko nutrient use per ha. In the case of Nigeria, the study showed, that using no fertilizers, only 37 % of the expected population could be supported. With 80 kg/ha, the food produced could support 139 % of the expected population, which means, that a substantial improvement could be achieved over the present low calories level (2050/day/cap). Based on this, linear interpolation gave 50 kg nutrient demand per ha necessary to feed 100 % of the expected population in 2000 at the present intake level. That would correspond to 1,250,000 t/y nutrient use for the country, roughly five times of its peak consumption in the past.

The general conclusion is therefore, that agricultural needs would justify fertilizer use up to five times of the actual utilization, provided of course that all the other conditions for its efficient application (education, training, seed development, soil preparation, crop protection etc.) would be implemented. It could be considered from the need side as a minimum, but it is clear, that other constraint (both financial as technical) will not allow to reach this level until 2000.

Nutrients.

Regarding individual nutrients in the framework of total demand, the following situation has been found (data from FPDD and prof Yayock):

Nitrogen.

The soil is extremely poor in organic matter (1-2%). Nearly the totality of the vegetation is taken away from the fields. Natural fertilizers are in short supply, cannot be considered as major sources. Therefore nitrogen fertilizer is of primary importance. Even for leguminous plants a starter nitrogen application is necessary. This explaines the higher ratio of this nutrient as usual.

Phosphorous.

Also necessary for all crops and soils, mainly in order to maintain its level in the soil.

Potash.

Its importance is less than that of the others, but still necessary, although at a somewhat lower level.

Micronutrients.

The importance of the micronutrients is paramount. The soils have a strong deficit in sulphur, so it must be added at a rate of 5-7% of the fertilizers applied. This is especially important for leguminous plants.

Zink is another important microelement.It is particularly needed for mais.

Magnesium is needed by permanent crops.

Boron is an important microelement for cotton.

Composition. Crops.

The following fertilizer composition was suggested for different crops:

cereals:	2-1-1+Zn
leguminous plants	1-2-i
permanent crops:	1-1-i+Mg

Products.

Nitrogen. Urea was recommended as the most convenient form, both for transportation, handling, application, blending and efficiency reasons. Only for yam and swamp rice production, A/S is preferred.

Phosphorous. All soluble forms are acceptable, but the sulphur deficiency gives advantage to products containing this element (E.g. SSP)

Potash. Muriate is the preferred form.

Regional distribution.

The main consumer areas are in the North. 8 northern states consume about 80% of the fertilizers.

3.3.THE FERTILIZER INDUSTRY.

The Nigerian fertilizer industry has at the moment one nitrogenous fertilizer plant, which manufactures also NPK formulations using imported phosphoric acid and muriate (NAFCON), situated at ONNE, Rivers State, near Port Harcourt; one single superphosphate plant (FSFC), situated at KADUNA, where also a bulk blending plant operates (F&C).

3.3.1.National Fertilizer Company of Nigeria Limited (NAFCON).

History

Based on a feasibility study made by Scientific Design Company, U.K., the Federal Government of Nigeria approved a project to build a nitrogenous fertilizer plant with a capacity of 1000 t/day ammonia at Onne, River State, near Port Harcourt. The project was awarded to The M.W. Kellogg Co, USA. Completion was foreseen for 1983. But contract was signed between Nigeria and a five-company consortium headed by Kellogg only in 1981 and became effective two years later, in June 1983, when, according to the original timetable, completion was expected.

Delays were due to many causes, among them the most important two group of difficulties were opposition of vested interest in the country and financing problems

Creation of an indigenous fertilizer capability was opposed by those who benefited from the existing system of importation and distribution of fertilizers and also by foreign suppliers. A media and lobbying campaign was launched to thwart the project.

Financing agreements, in spite of good economic and financial prospects for the viability of this project were difficult and lengthy to realise. Nigeria's debt situation and opposition to the project were the main causes of these difficulties.

Finally financement was secured from US Eximbank and a Japanese consortium. A joint venture agreement created NAFCON, owned conjointly by the Government of Nigeria and Kellogg (30%).

Construction began in mid-1983. The plant was comissionned in 1987 without any trouble and runs since with full capacity. Traning, comissionning, operation was directed and is up to 1984 in the hands of Kellogg.

Description of the plant

The plant consists of three major manufacturing units, some minor process units and the necessary utilities and infrastructure, these latters with a capacity enabling them to serve the projected duplication of the process plants too.

Ammonia plant is capable to produce 1000 t/day ammonia, a standard size used in most units built in the last fifteen years.

Natural gas for ammonia production comes by pipeline from the nearby Alakiri field (non associated gas). This field alone is capable to deliver gas for the complex over 30 years. Total natural gas reserves are estimated at around 4,500 billion m3.

Most of ammonia produced is combined with by-product carbon dioxide to give 1500 t/day urea, a high-grade fertilizer, in granulated form.

Remainder of ammonia can be exported in liquid form, and/or is converted using imported phosphoric acid to diammonium phospate, a high-grade phosphorous fertilizer which is used in the granulation plant giving directly NPK complex fertilizers. Potash is imported for this purpose.

A small unit (UF 85) produces urea-formaldehyde resins.

Port facilities enable the plant to handle efficiently all these imports and exports. Domestic delivery of fertilizers is possible only by road, no railway connection yet exists, but is planned.

Power is generated by two gas turbines, the plant is independent from the network, although connected to it. Steam and water supply is also self -supplied.

Storage, handling facilities, maintenance workshop, hausing estate and all the other necessary auxiliary units complete this site .

Results and achievements

The plant reflects a policy and philosophy seldom encountered in developing countries. Concept, process and design are basically oriented towards meeting local conditions, ensure a reliable and steady operation. No fancy solutions to stress energy conservation to the extreme, leading to oversophysticated plants, costly and difficult to run and maintain, can be found. Computer control, which would add only little to the efficiency of the plant was also left our of consideration. Well proven classic design and operating parameters were chosen. Granulation, instead of the ususal prilling, for the end products was also a wise choice. Instead of being a showcase for the latest fashion, the plant so conceived is a showcase for safe, efficient, continuous and succesful operation.This is due equally to the wise policy of the Federal Government, who decided in favour of an efficient joint venture with an experienced contractor and for the concept outlined above, as well as to the comittment of M.W. Kellogg to the operation and management of the plant, to the training of personnel.

Today the plant has a record of continuous operation above nameplate capacity for over two years. All operating parameters are constantly within target limits. From its staff of 1600, only 100 are now expatriates and the takeover of the remaining posts is a continuous process.

This project, with all his initial difficulties and ultimate achievements can serve as example for other developing countries and their prospective partners. It is now the cornerstone of the future development of the fertilizer industry's development in Nigeria.

3.3.2./ Federal Superphosphate Fertilizer Co. Ltd (FSFC) Kaduna.

History. Description of the plant

The plant was built in 1980 By Hitachy (Japan). It is fully state-owned. It consists of a sulphuric acid plant (nominal capacity 42000 t/y) and a superphosphate unit (nominal capacity 100000 t/y). The sulphuric acid plant was never able to reach nameplate capacity.Maximum output was around 30000 t/y. This fact limited the output of the superphosphate unit, which by itself would have been able to run at full capacity. A recent study undertaken with outside help defined the defaults in the design and construction of the sulphuric acid plant and an international tender document was issued for the revamping of this unit. This project will restore it to its planned capacity and thus allow full utilisation of downstream units.

The two process units are completed by the necessary storage, handling and utility facilities.

A rough calculation confronting the material costs at the plant site with that of imported SSP at the same site leave an added value of 500-700 N/t SSP. Working at full nominal capacity, this amounts to 50-70 million N /y. Production costs consist nearly exclusively of capital related and manpower costs and their sum cannot excede 30 million N/y. As the actual plant experience and these approximate figures show, SSP production from imported raw materials can be a financially rewarding operation.

The plant is in reality a miniplant and as such, has proven the viability of this type of plant within local conditions. This type presents a real alternative for future development projects.

3.3.3./ Fertilizers and Chemicals. (F&C) Kaduna.

This is a bulk blending plant, a private enterprise, owned by M. Kansagra(U.K.) The plant was built using IFDC (USA) process know-how. Starting with ready-made individual fertilizers, this unit provides the region with complex fertilizers having compositions requested by the buyer. A small, compact, efficient plant serves as local storage and distribution center too. Yearly capacity can attain 100,000 t product.

The plant is good example for future similar plants.

3.4./DISTRIBUTION.

All imported and domestically manufactured fertilizers for internal use are bougnt and distributed by the Fertlizer Procurement and Distribution Department of the Federal Ministry of Agriculture (FPDD). NAFCON originally had the intention to engage in this field, but his intentions were not realized.

FPDD distributes through 14 ADP's (Agricultural Development Project), two import supply companies and the River Basin Development Autority (RBDA), through agroservice centers and agents, sales points and Primary Distribution Points (PDP).

All costs between seaports, or plant gates and farmers are summed and distributed evenly on all fertilizers. So a unique price is fixed, (one for high grade and one for low grade) for the whole country. The subsidy is deducted and the price for the farmers is fixed.

The supply constraint and heavy subsidy make the monopolistic system mandatory.

Transport is mainly by road. Nigeria has 124,000 km road, 28% of it paved. Rail connections are south-north with 3523 km.total length. Water transport is practically inexistent.

4./DEVELOPMENT POSSIBILITIES FOR THE NIGERIAN FERTILIZER INDUSTRY.

4.1./MARKET.

4.1.1./Domestic.

Forecast for domestic consumption up to 2000 were not made by the competent authorities. The feasibility studies made by Dalton Eng. Ltd. for NAFCON II AND NAFCON III contain forecasts.

The figures worked out for NAFCON II are based on a study made by FMA together with IFDC and sponsored by IBDR (1984). For 1988, a total consumption of 469,000 t nutrient was calculated. Actual consumption was below 300.000. For 1986, 190,000 t N was projected. Actual consumption was 114,000. The study stated, that actual 1986 consumption was 221,00 (this was approximately the figure for all nutrients) and on this basis extrapolated a demand of over 1,500,000 t total nutrient consumption for 2000. Although this is in good agreement with the need calculated for 50 kg/ha consumption for 30 million ha land as seen in the precedent chapter, in view of the actual consumption figures well below the forecasted ones for 1984-88, this extrapolation has not been justified.

The study for NAFCON III uses the FAO statistics which, as we have seen in previous chapter, although not in full agreement with the Nigerian statistics, are in geneal below them. The forecasts based on this figures have been checked and compared with extrapolations from the FPDD data, with the following results.

Linear regression of FPDD data gives very poor correlation coefficient and cannot be used for extrapolation. This is due to the great fluctuations in demand, reflecting the true situation, but blurring the prospects. A linear regression of the peaks only gives of course wonderful correlation (near to 1), and in view of the constraints imposed, seem to reflect more closely the real development trends. It is in relatively good agreement with the NAFCON III study's forecasts.

After having considered all factors, this report opted for the forecast in Table 3., where the figures for 1995 and 2000 are identical with those of NAFCON III, but for the two periods a rather linear evolution was supposed. This gives for 2000 a total consumption of over 1,000,000 t nutrients, wich can be considered as the lowest goal for any agricultural plan (40 kg/ha). (See Fig.2.)

Nitrogen consumption would reach nearly 500,000 t in 2000 with a total for 10 years around 3.5 million t. For phosphorous, the same figures are around 340,000 t, and 2.4 million t, respectively. Potash would arrive at near to 200,000 t in 2000 and 1,3 million t for ten years.

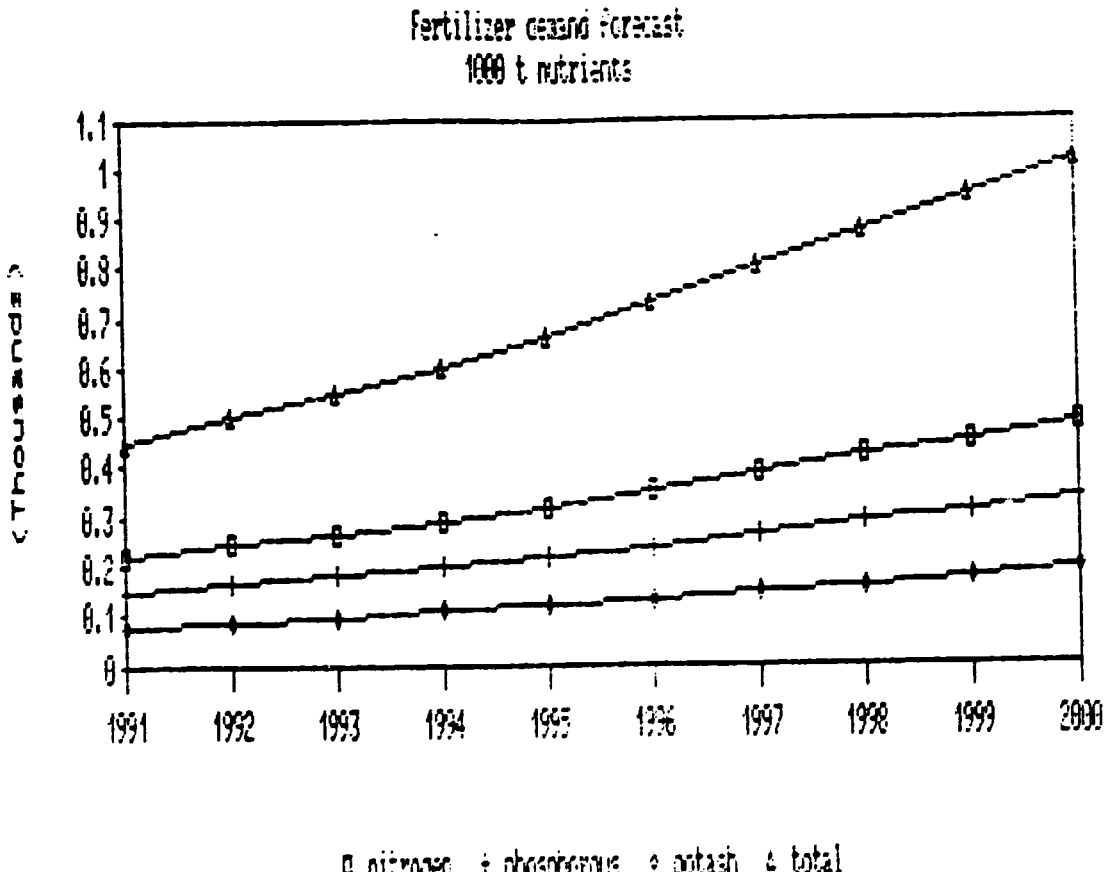
Table No.3.

Fertilizer demand forecast for Nigeria

1991 - 2000

(1000 t nutrients)

	Nitrogen	Phosphorous	Potash
1991	220	150	82
1992	244	166	92
1993	270	182	102
1994	295	200	112
1995	321	218	122
1996	355	242	135
1997	390	266	148
1998	424	290	162
1999	455	314	176
2000	491	338	191
Total	3465	2366	1322



This forecast seems rather low when compared to the objective needs derived in para. 3.2.1. But even these seemingly modest goals can be achieved only at rather high costs either in investments or import burdens. Table 5. and Fig.3. represent the foreign currency requirements needed for the forecasted fertilizer consumption , if no further investment in domestic manufacturing were made.

The biggest item is phosphorous, import rises from 75 million US$ in 1991 to 164 M. in 2000, with a total for ten years of 1178 M. Nitrogen asks for smaller sums, due to the rather important domestic production: in the early years, even surplus is available for export. Potash import rises from 23 m. in 1991 to53 M. in 2000. The total sum required for fertilizer imports rises from 81 M in 1991 to over 300 M in 2000 and this signifies an overall expense over ten years of more than 1800 million US$.

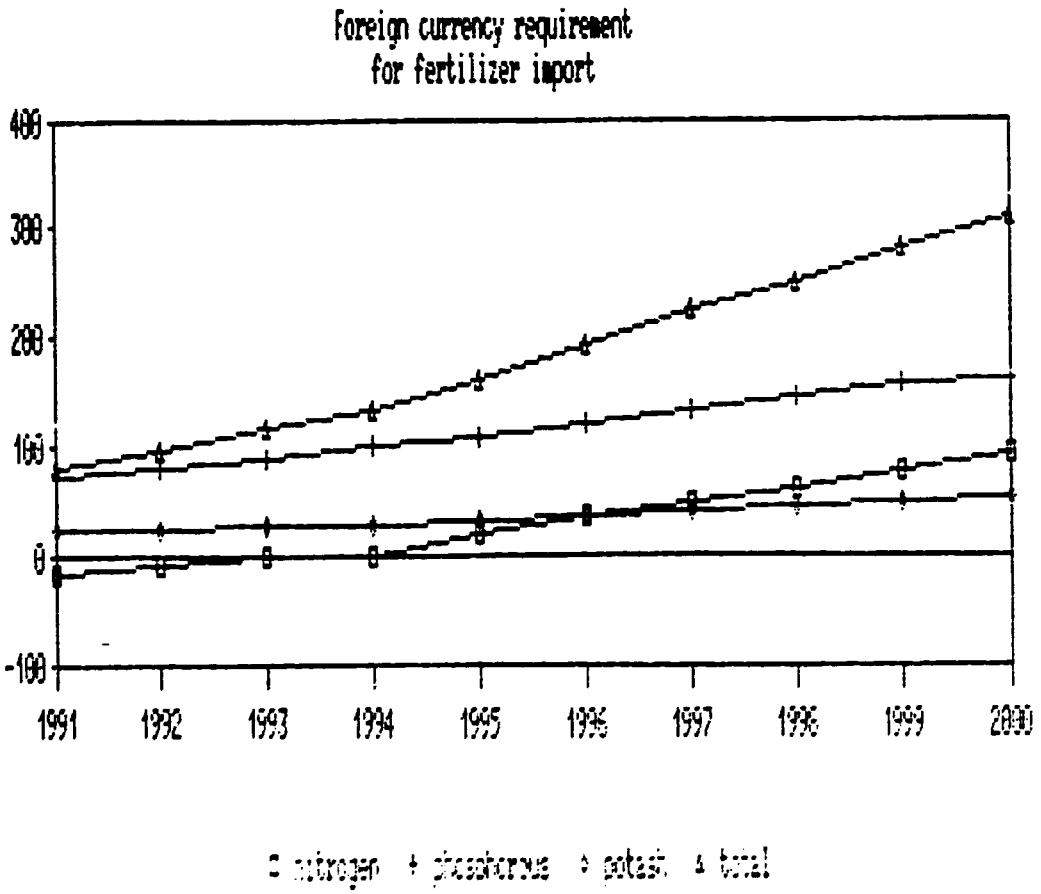


Fig.3.

Table No.5.

Foreign currency requirements
for
Fertilizer import
1991-2000
Million US$

Year	Nitrogen	Phosphorous	Potash	Total
1991	-17	75	23	81
1992	-9	83	25	99
1993	-1	91	28	118
1994	1	100	31	132
1995	21	109	34	164
1996	37	121	37	195
1997	51	133	41	225
1998	61	145	45	251
1999	79	157	48	284
2000	94	164	53	311
Total	317	1178	365	1860

Remarks:

Quantities taken from Table 3.
For Nitrogen, balance from domestic consumption - domestic production was taken
No investment in new fertilizer plants was considered
Prices:

- It N=430 US$ (for import)
- it N=320 US$ (for export)
- it P205=500 US$
- It K20=275 US$

4.1.2./Regional.

This market should be investigated for two aspects, both in view of cooperation possibilities among African countries. First, the export possibilities for nitrogen, where, due to the great capacity jumps in the production, and the continuous development of demand, temporary surpluses must find outlets. Second, import opportunities for phosporous raw materials and products, for potash should be looked upon.

A FAO paper prepared by M.COUSTON, (1988) foresees for 2000 a threefold increase of nitrogen and phosphate consumption and a twofold for potash in the Subsaharan region. The figures forecasted are: N = 1,500,000 t; P205 = 900,000 t; K20 = 400,000 t.

The following picture can be drawn:

For nitrogen, in Africa there will be only three countries having the necessary raw material and intention to build up substantial capacities: Egypt, Algeria and Nigeria. The short shipping distances place Nigeria in a very advantegous position. Even with consumptions well below the forecasted level, the regional market seems giving opportunities beyond any expected devlopment.

For phosporous, Senegal, Togo, Morocco among others are well placed to provide Nigeria with either raw material or products.

Potash seems be in deficit for the region in the long run, but is a commodity easily available on the world market.

The region is particularly well suited for a cooperation between nitrogen and phosphorous fertilizer producers.

4.1.3./World.

Nitrogen. Actually, overcapacity is claimed. Forecasts see a shortage in supply for the 90's. In spite of growing demand, relatively few plants are in construction or envisaged. The world market will certainly not be sensible in the 90' to a few 100,000 t of N in a total consumption around 100 million t.

Phosphorous. For rock and products equally good availability is expected, in spite of declining quality of rocks. No difficulty can be foreseen in purchasing either of them.

Sulphur. The market is for decades easy, with rather high price fluctuations.

Potash. Available from many sources.

It can be safely concluded, that market conditions will not pose constraints on the development of the fertilizer industry in Nigeria, neither from import, nor from export side.

4.2./RAW MATERIAL SITUATION.

4.2.1./ Nitrogen.

The only raw material for nitrogenous fertilizer production is natural gas. From the estimated world reserves of over 115 trillion cubic meters Nigeria has about 2.1 trillions. This huge quantity, waiting for utilisation, gives practically unlimited supply for this industry, even when considering all other possible utilisations. Fertilizer manufacturing is beyond any doubt one of the best possible processing routes of natural gas utilisation: 1000 m3 gas, transformed to urea earns 256 US$ if the product is exported, or 336 $ if it is used for import substitution. The necessary investment is one of the lowest possibles: around 1500 US$/1000 m3 gas processed.

Fertilizer production, as shown, gives outstanding results for natural gas processing. The reserves however are so important, that practically no competition for gas utilisation can be foreseen - all viable alternatives should be implemented in order to make good use of this national wealth.

4.2.2./ Phosphorous.

Deposits were found in two different places in the country.(Ogun and Sokoto States). Some investigations are under way at different University laboratories, but no geological survey has been initiated yet. Opinions on the importance of these deposits and on their composition vary widely, but no factual evidence can support either view. Only a full geological survey could definitively settle this question. This survey is highly necessary, but costly. Since its results could give a big impetus to the development of the phosphate industry in this country and contribute to its industrialisation, founding of this survey by international organisations would be recommendable.

4.2.3./ Sulphur.

Natural gas and crude oil found in Nigeria are sweet, do not contain sulphur compounds. Only one of the refineries has a desulphurisation unit, but it produces 7 t/day, an insignificant quantity. Tar sand deposits, with high sulphur content have been found. They are however not explored at all. Even the best exploration result possible could hardly justify the exploitation of these resources in the next decade. Therefore we must consider sulphur as a raw material to be imported in the period considered.

4.2.4./Potash.

Deposits have been found in Borno State, but no exploration was conducted. Here also, a geological survey would be most recommendable. For the next decade, however, import will be practically the only solution.

4.3./EXPANSION PROGRAM FOR FERTILIZER DEVELOPMENT.

As we have seen in previous chapters, the challenge of the food problem creates a big demand at the domestic market for fertilizers. Supply at the present situation asks for either huge imports costing over two billion US$ up to 2000 (total) or big investments in new manufacturing capacities - or a combined application of both methods. The investigations initiated by the Federal Ministry of Industries and made by NAFCON involving outside expertise led to the conclusion, that the best solution will be the manufacturing or import of individual single nutrient fertilizers (MAP and DAP are considered in this respect as phosphorous fertilizers) and create separate units for chemical or bulk blending. In view of the prevailing conditions this seems to be the technically and economically best solutiom.

This approach permits us to investigate the problems of domestic manufacturing possibilities individually for each of the nutrients.

4.3.1./Nitrogen

Development of nitrogenous fertilizer manufacturing in Nigeria has three distinct goals:

- supply the domestic market with the necessary fertilizer
- provide export possibilities generating foreign currency
  for -repayment of loans
  -import of other fertilizers
  -improve the balance of payment of the country;
- make the best use possible of the abundant natural gas reserves of the country.

4.3.1.1./ Development projects.

Future development plans of this industry are based on:

- the positiv and encouraging results of NAFCON I;
- the feasibility studies for NAFCON II and NAFCON III.

They foresee;

- doubling the capacity of NAFCON I at the same site;
- a new plant on a new site.

First a separate analysis of the two studies led to the following conclusions.

NAFCON II is an economically and technically well founded proposition. All the infrastructural, training, personnel, experience and other factors are given. So in these respects it can be accepted without any modification.Commercially and financially, however, serious problems arise.

The proposed financial program foreseen exportation of all the products, leaving nothing for domestic use. Since the expected consumption by this time will be higher than the capacity of NAFCON I, and in this study NAFCON III is not considered, the domestic demand would be either left unsatisfied with all the consequences on the food situation, or the difference would have to be imported at a much higher price. It is true, that even so, with all the product exported, domestic market would be better off, since all fertilizer from NAFCON I would remain in the country. Nevertheless this solution seems not recommendable. A complex analysis together with NAFCON III would be different, but in this case the financing burden of NAFCON III should also be taken into consideration.

NAFCON III.

This study poses several problems.

Capacity.

The study concludes in favour of a capacity of 750 t/day ammonia (75% of the first two plants).This seems highly questionnable for the following reasons:

- The basis for this conclusion is exclusivly the very small and doubtful difference in economic rate of return. This calculation is based on forecasts with a rather high probability of error. Decision on a difference of 0.3 percentage points (1.3 % relative difference) based on data with at least 10-20 % error margin seems not very well founded.

- All the other factors not included in this calculation point toward the same capacity as the two others. The invaluable advantages of identical process, equipment, spare parts etc would outweigh by far the advantages shown by the economic return calculation even if they were true. This is especially valid, if NAFCON II and NAFCON III would be realised with one year delay only. In this case the savings in engineering, procurement and in equipment costs would alone justify the higher capacity.

- Economic calculations based on the data taken from the study show claerly, that the additional investment from 750 to 1000 t/day capacity shows exceptionally good results. Table 5. below demonstrates clearly the situation:

Table 5.

	1000 t/d	750t/d	+250t/d
Specific investment (US$/t ammomia capacity/year)	1580	1760	1030
Production cost (750t/d=1000)	88	100	66

The last column shows the values for the additional investment from 750 to 1000 t/day capacity.

It is absolutely clear, that a decision in favour of a 750t/d plant would inflict a permanent economic and financial burden on the new project, which is hard to justify.

- In such decisions one should consider that this will be not the last investment in Nigeria's nitrogen industry. Consumption will grow beyond the capacity of the three plants and the higher production costs of the smaller plant will be an eternal burden.

- On the export market a difference of 65,000 t/y N will make no difference, if not in the marketing costs (more favourable per ton).

Conclusion: NAFCON III should have the same capacity as NAFCON I and NAFCON II in ammonia production. Since neither phosphoric acid transport far in the country from the port nor export of liquid ammonia from this site cannot be justified economically, the whole ammonia production should be processed to urea, leading to a capacity of 1720 t/day urea

Pipeline.

The study foresees an extension of the existing gas pipeline from Ajaokuta to the site to be selected, either in Kaduna or in the Federal Capital Territory. It is proposed to continue the 24'' pipeline capable to carry 200 MM scf/day with a smaller one, capacity 60 MMscf/day, not very much above the quantity needed for NAFCON III. In Ajaokuta, the consumption is only 10 MMscf/day.

The extension of the pipeline should give the possibility to provide and promote the use of natural gas for industrial and domestic uses, be a motor of development for the region. It seems a rather shortsighted proposition to renounce to this advantages. Even the initial cost of the pipeline could be kept by proper design relatively low, installing the full 24' diameter pipe, but with no or less booster compressor stations at the beginning, when less gas is transported with lower pressure drop.

NNPC is currently making an in-house study for the extension of the pipe-line up to Kaduna. The only alternative considered will be a pipe-line with 24 " diameter.

Site.

The study exposes two alternatives and do not take position in favour of either.Available data are clearly not sufficient for a decision.A further detailed study is necessary to evaluate the costs incurred for each site, the transport and distribution consequences, the advantages and disadvantages of each of them.

Timing.

The study foresees half a year difference between NAFCON II and NAFCON III, starting the investment in mid-1990. In view of the actual stand of the preparatory work it is not sure that this schedule can be realised. The implementation of the two identical investments could bring great advantages and savings, if well coordinated. The difference in timing should allow the engagement of the same specialist working teams to begin work at one site and move gradually, in due time to the other location. The time difference necessary for this kind of coordination should be defined in close cooperation with the contractor, but is seems that this will be more close to one year. That will facilitate the completion of preparatory works for NAFCON III.

Financing.

No financing proposition was prepared.

4.3.1.2. Development alternatives.

Based on the above considerations four alternatives were elaborated in this report for further consideration and comparison:

- A./No investment at all.
- B./ NAFCON II only.
- C./ NAFCON II and NAFCON III (same capacity), 1 year difference.
- D./ NAFCON II and NAFCON III (same capacity), 3 years difference.

Table 6./ shows the quantities produced for all alternatives and the balances against the projected domestic demand, available for exportation - or necessary to import. Fig.4. shows graphically the same data.

Alternative A. gives deficit growing from nearly 50,000 t in 1995 to over 200,000 t in 2000.

Alternative B. presents constant export possibilties diminishing steadily to about 50,000 t in 2000.

Alternative C. gives high export possibilities with a peak in 1995, near to 500,000 t.

Alternative D. gives less export, but more evenly distributed.

Table No.6.
Nitrogen balance
1000 t/y

Year	Domestic demand	NAFCON I		NAFCON II		NAFCON III/1		NAFCON III/2	
		Product	Balance	Product	Balance	Product	Balance	Product	Balance
1991	220	272	52	272	52	272	52	272	52
1992	244	272	28	272	28	272	28	272	28
1993	270	272	2	372	102	372	102	372	102
1994	295	272	-23	544	249	644	349	544	249
1995	321	272	-49	544	223	816	495	544	223
1996	355	272	-83	544	189	816	461	644	289
1997	390	272	-118	544	154	816	426	816	426
1998	424	272	-152	544	120	816	392	816	392
1999	455	272	-183	544	89	816	361	816	361
2000	491	272	-219	544	53	816	325	816	325
Total	3465	2720	-745	4724	1259	6456	2991	5912	2447

Remarks:
In balances: + = export
- = import

Nitrogen balance
for different alternatives

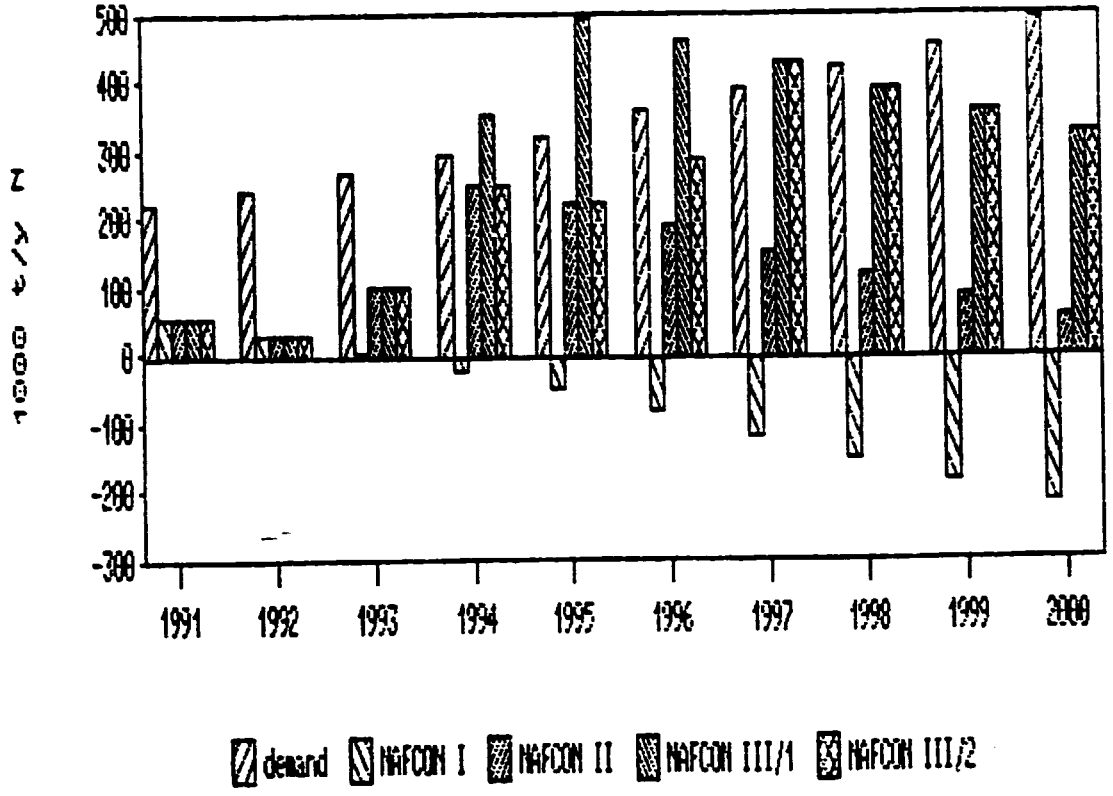


Fig.4

Table No. 7.
Foreign currency demand
of
nitrogen development alternatives
Million US$

Year	NAFCON I			NAFCON II			NAFCON III/1			NAFCON III/2		
	Prod	Inv	Total	Prod	Inv	Total	Prod	Inv	Total	Prod	Inv	Total
1991	17	0	17	17	-240	-223	17	-300	-283	17	-240	-223
1992	9	0	9	9	-250	-241	9	-450	-441	9	-250	-241
1993	1	0	1	33	0	33	33	-230	-197	33	0	33
1994	-10	0	-10	80	0	80	112	0	112	80	-50	30
1995	-21	0	-21	71	0	71	158	0	158	71	-200	-129
1996	-36	0	-36	60	0	60	148	0	148	92	-240	-148
1997	-51	0	-51	49	0	49	136	0	136	136	0	136
1998	-65	0	-65	38	0	38	125	0	125	125	0	125
1999	-79	0	-79	28	0	28	116	0	116	116	0	116
2000	-94	0	-94	17	0	17	104	0	104	104	0	104
Total	-329	0	-329	403	-490	-87	957	-980	-23	783	-980	-197
NPV(10%)			-143			-183			-295			-303
NPV(6%)			-198			-156			-219			-279

Remarks:

1./Constant prices (same as in Table No.4.)
2./Foreign currency earnings:positiv
3./Foreign currency expenses:negativ
4./prod = balance (production - domestic demand)(value)
5./inv = investment expenditure

More important is the foreign currency balance. This given in Table 7./, calculated with 320 US$/t N for export and 430 US$/t N for import. Both expenses for import and investment as well as incomes from export were considered. A graphic representation is given in Fig.5.

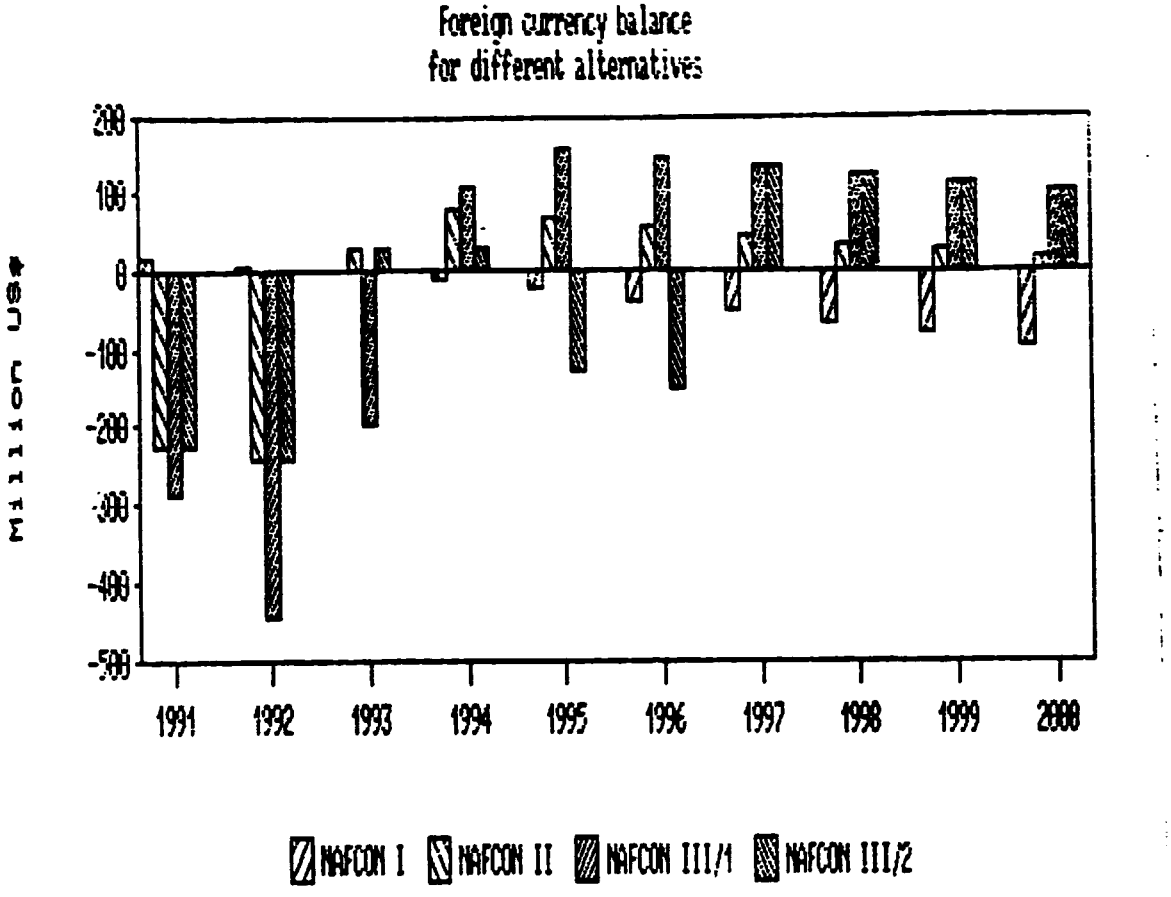


Fig. 5.

Alternative A. shows a negative balance of over 300 millions, wich will grow even further in the 2000's, since until 2000 no investment was considered.

Alternative B./presents a deficit of only around 50 millions.

Alternative C. is roughly in equilibrium; about 30 million deficit on a sum of one billion.

Alternative D. is less favourable, over 200 million deficit results.

These figures are taken without discounting and the early years heavily charged with investment burdens would modify this picture. But two factors must also be taken into consideration:

- in all cases, the whole sum of the foreign currency part of the investment was taken. Equity participation e.g. 30% would reduce accordingly the expenses.

- for loan repayment, in case of alternative C. more than sufficient export earnings are available. Maximum peak of repayement per year would not excede 80 millions and there are no years earning less than 100 millions from export.

- We have calculated the net present value for all alternatives, for two cases: 10 % and 6 % discount rate (with constant prices, 6 % would be more realistic, and 10 % rather high). The differences and trends are not conclusive and thus confirm our choice.

Conclusion: Alternative C. is proposed for implementation.

Financing.

With implementation of this proposition, market possibilities will not constitue neither major constraints nor serious problems. Technical realisation is also possible, given the favourable preconditions. The major problem seems to be the financing of these two investments.

It would be advantageous to raise to the maximum possible equities, both abroad and in the country.

For equity participation, besides the banks and contractors, fertilizer manufacturers could also be approached. Many nitrogen fertilizer manufacturers have problems with their actual plants, mainly for the rising cost of gas and even its short supply. They have tendencies to tranfer their activity in places with favourable conditions. Norsk-Hydro from Norvay (for other raisons) has aquired several plants in different parts of Europe and seems interested extending its operations to other continents. Japanese producers, with no gas and oil resources, have shown a net tendency to stop operation of their petrochemical plants in the country and transfer operation to favourable sites. Others may be also interested in such ventures. It would be worthwhile to approach such companies for equity participation and eventually participation in the operation too.

Nigerian companies interested in fertilizer import, transport and other activities should be involved too, for two reasons. First equity capital is of outmost importance. Second, as example of NAFCON I shows, vested interest can form major stumbling-blocks in the way of investments, if not involved in the new venture.

Diversification.

Development projects of NAFCON show a tendency to diversification which must be welcome. Especially one project is of particular interest. In order to create the basis of their urea-formaldehyde plant, wich was the first step in diversification, a methanol plant with 36,000 t/y capacity is envisaged. At first sight the capacity itself would exclude any serious further examination, when confronted with the usual plant in the 300,00 - 1,000,000 t/y range. The concept elaborated by NAFCON however merits deeper analysis. Intention to use purge gas, implying a cryogenic plant (and giving possibility to produce argon for welding and other purposes) and the idea to use second hand equipment from some idle small ammonia plant could make this project rewarding. It is worth while to devote a feasibility study to this project.

4.3.2./Phosphorous.

Data from Table 4. show, that importation of phosphate fertilizers is the heaviest burden in the coming years. This picture is due partly to the fact, that in consequence of investment in NAFCON nitrogen is domestically available, even for export. Policy for domestic production of phosphate fertilizers gen abundant resources are available, phosphate rockeandrsaiphor are not avaiiable from domestic sources.

Phosphate rock deposits were identified in the country, but geological surveys, wich alone could decide if they can be commercialized, are missing. So first task would be to comission these surveys as soon as possible in order to create a firm ground for any development plan.

Sulphur present an even worse picture. Although tar sand deposits were found, their exploitation is certainly not for this decade.

Commercial exploitation of even viable resources cannot be realised before 1995. So for the first part of the coming decade, no domestic raw material can be counted on.

Analysing the production cost, and first of all, the material costs related to the importation of raw marterials, it can be assumed, that the domestic production of phosphate fertilizers from imported raw material would save only about 100 US$/t P205. On the other hand, if only sulphur were imported, the savino would be about 400 US$/t P205.

In view of these figures it is quite obvious, that should the geological survey give positive results, there will be ample room for development in this sector and correspondingly a development plan should be worked out based on demand and source assessment as well as on economic viability. This work should be initiated immmediately after the results of geoiogical survey will be available.

in the meantime, the possibility of domestic production from imported raw materials exists, but has not very high priority. Without deeper investigation, big plants, based on phosphoric acid production (e.g.TSP) seem not justified. The example of FSFC however shows, that if the process is reliable, the equipment suitable, small superphosphate plants with a capacity of around 100,000-200,000 t product/year can be economic, even with imported raw materials. Since sulphur is very important for Nigerian soils and imported single superphosphate is very expensive to transport, local production could be viable and advantageous both for industrialisation and agricultural development.

Government therefore should encourage and assist local and private initiative in this field, but state involvement has only second priority.

The situation is different with FSFC, a state owned company. The reconstruction of the plant in order to reach its planned capacity is not only important, but economically most rewarding. since only the sulphuric acid plant needs major revamping and this will allow to exploite the full capacity existing already in the superphosphate line.

4.3.3./ Potash

There is no other action necessary as to comission the geological survey of the deposit found. In case of positive result, a feasibility study for mining and beneficiation will be the next step

4.3.4.Distribution.

The whole distribution system faces great challenge. Quantity will triple or more, requiring investments in transport, storage, handling, eventually blending facilities. Logistics, organisation, finance, farmer education and training of personnel, advicing services based on soil analysis etc, these are the most important facets of this challenge. The situation is also difficult; supply constraint will prevail for the whole period and state subsidies must be maintained to support the agriculture.

IFDC prepared a study in 1985 for the organisation of this task. Closer look however reveal that this study is not fully adequate to serve as a basis for govrnment decision,for the following reasons:

- only organization-building problems are tackled. No investigation was conducted on the necessary physical means, their availabilty, necessary investments, problem solutions, training, education and many other problems to solve.

- even in organisation-building, several most important factors were not fully considered. The impossibility to create competition due to supply constraint and the necessity of subsidy make questionnable the commercialization of this operation. Profit oriented monopolistic organizations tend to make profit by the easy way: trying to raise prices and asking for more subsidy. Cost cutting is a very hard exercise and only competition can force organizations in this difficult way.

- the approach is rather theoretic. It is not sure, that the proposed organization will function in the way it was conceived, mainly due to above considerations. A more down to earth approach would be necesary to arrive at practicable results.

It is therefore recommended, that a complex study should be made, considering all aspects of the question and involving all partners participating in the operation.

4.3.5./ Government policy.

Succes of any development, but especially of development of the fertilizer industry depends to a great extent on the policy adopted by the government. The Federal Government of Nigeria has followed a wise policy in the past development of this sector and this was a great contribution to its succes. For the future, more demanding tasks, the following recommendations can be made:

In general, for all investment projects involving foreign participation, the successive elimination of obstacles, wich was pursued already, should go on. Obstacles, as inexistence of double taxation accords, high interest rates, low tax holidays, different administrative rules and practices, should be gradually eased out, as the intention for such moves has been clearly observed.

Especially for the nitrogen industry, experience shows, that two great hazards could bring this sector to complete impossibility. Both are in the hands of governments and in some cases budgetary strains have led to measures jeopardising the economic viability of this industry.

One is the gas price. In every country with reasonnable price policy, gas is sold at very different prices for different consumers. In most industrialized countries, the big domestic and small-consumer market permits that the nitrogen industry, who uses this gas as raw material and not as fuel, should benefit from a very low price. In Nigeria, there are not so many small consumers, who can pay a price calculated on a calory basis, on the spot. Since, however, the cost of gas is very low, it would be not wise to raise the budget revenues by charging prices to this sector wich would render export incompetitive and domestic supply charged with even more subsidy.

The second question is that of subsidies. Horticulture is subsidised all over the world and the only way to supress it would be the coordinated action of all states. Wich seems for the foreseable future most improbable. So for all states and governments anxious to develop their agriculture, the subsidy cannot be ruled out.

ANNEXES.

ANNEX NO.1.

MISSION TIMETABLE

November, 12.	Departure from Budapest (Flight OS 802)	16h30
	Arrival Vienna	17h20
November, 13.	Briefing: Mr J. Volodin IO/T/CHEM	
	Ms.G. Patek DA/PS/REC	
	Mr.S. Ndam ODG/IDDA	
November, 14.	Departure from Vienna	09h30
	Arrival Lagos	20h25
November, 15.	Meeting at NAFCON	08H00
	MM. O.G. Agomate	
	Dr.O. Isokraki	
	Meeting at UNIDO office	14h00
	M. W. Mulagwe	
November, 16.	Departure from Lagos	07h30
	Arrival Port Harcourt	08h40
	Arrival ONNE (NAFCON Plant)	09h45
	Meeting Dr. C. E. Waboso	
	Plant visit	
November, 17.	Departure	07h00
	Arrival Lagos	10h40
	Processing material collected	
November, 18.	Material processing	
	Meeting Mr. A. Ella	
	Mr. O.G. Agomate	
November, 19.	Report writing	
November, 20.	Nafcon office. Information gathering	
November, 21.	Meetings:	
	Ministry of Agriculture (FPDD)	
	MR.A.M.Fawu	
	UNIDO (Mr. Mulagwe)	
	Nafcon (MR. Agomate)	

November, 22.	Departure Lagos	10h20
	Arrival Abuja	12h45
	On flight:meeting:Dr.Jimeta (Min.Ind)	
	Mr.Kansagra (F&C)	
	Departure for Kaduna (car)	13h00
	Arrival Kaduna	15h00
	Meeting at NAFCON office	
	Plant visit FSFC	
	Plant visit (F&C)	
November, 23.	Departure (car)	06h00
	Arrival Abuja	08h30
	Meeting, Fed. Min. Ind.	
	Dr. Jimeta	
	Mr. Ella	
	Departure from Abuja	13h30
	Arrival Lagos	14h50
	Meeting with Prof Yayock (Hot. Med.)	20h00
November, 24.	Report writing	
November, 25.	Report writing (UNIDO office)	
November, 27.	Meetings: UNIDO, SIDFA	
	NAFCON	
	Report writing	
Novenber, 28.	Departure (car)	07h00
	Arrival to Benin City	12h00
	Meeting NNPC (gas)	
	Departure from Benin City	14h00
	Arrival Lagos	18h30
November, 29.	Report writing	
November, 30.	Departure from Lagos	07h30
	Arrival Port Harcourt	08h40
	Onne	10h00
	Presentation interim report	
	MM. G.L.Polley	
	C.E. Waboso	
	Dr.G.A.Okpobiri	
	A. Ella	
	Departure from Onne	17h00
	Arrival Lagos	24h00
December, 1.	Meeting Unido office	
December, 2.	Departure from Lagos	00h30
	Arrival Budapest	14h30
December, 17.	Departure Budapest	16h00
	Arrival Vienna	20h00
December, 18-22	Final report presentation, debriefing	

ANNEX No.2.

ORGANISATIONS AND PERSONS CONSULTED.

Federal Ministry of Industries
- Dr.M.I. Jimeta, Director, Industrial Investments
- M. A. Ella, Assistant Director

Federal Ministry of Agriculture, Water Resources and Rural Development, Fertilizer Procurement & Distribution Division (FPDD)
- Mr. Alhassan Mohammed Fawu, Deputy Director

National Fertilizer Company of Nigeria LTD (NAFCON)
- Mr. George L. Polley, Managing Director
- Dr. Ombo Isokraki. Deputy Managing Director
- Dr.C.E. Waboso, Manager, Corporate Planning & Joint Venture
- Dr.G.A.Okpobiri, Head, Corporate Planning/Analysis
- Mr. O.G. Agomate, Corporate Liaison Manager

Federal Superphosphate Fertilizer Co. LTD.
- Mr.Japhia B. Ghumdia, Ag. Managing Director
- Mr.Abdulmumini A. Yusuf, Ag. Director of Production

Institute for Agricultural Research, Ahmadu Bello University
- Prof. J.Y. Yayock, Director

Fertilizers and Chemicals LTD
- R.S. Kansagra, owner

United Nations Development Programme
- Mrs. M.H. Mathey-Boo, SIDFA
- Mr. William Mulagwe, assistant to SIDFA

Nigerian Gas Company, Benin City (Nigerian Natinal Petroleum Co) (NNPC)
- Mr. Badamosi, Director
- Mr Isa Izza,Dep.Dir.
  - (in their place two other deputy directors were present.)