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THE FERTILISER INDUSTRY OF ZAMBIA[1/]

by

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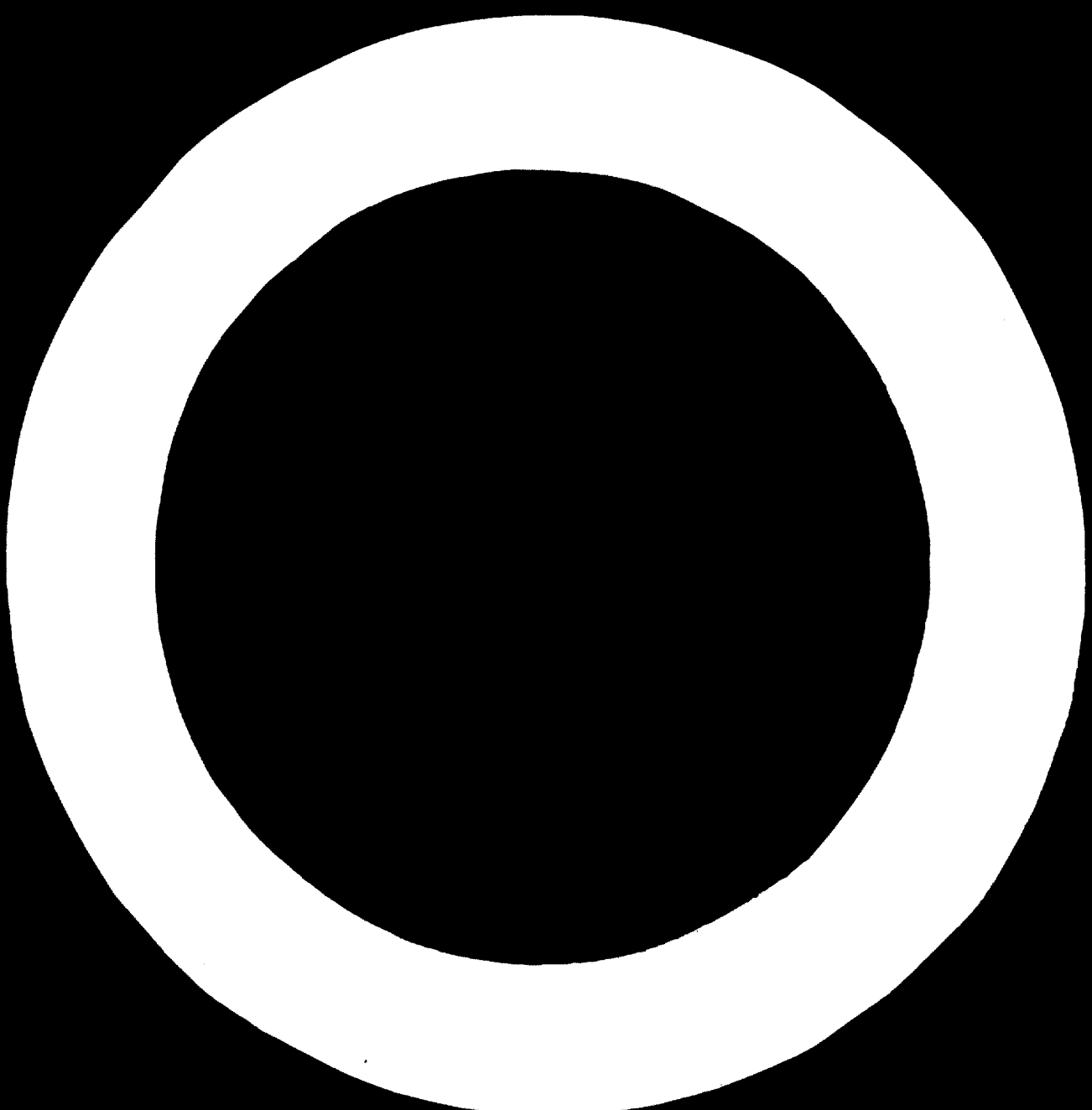

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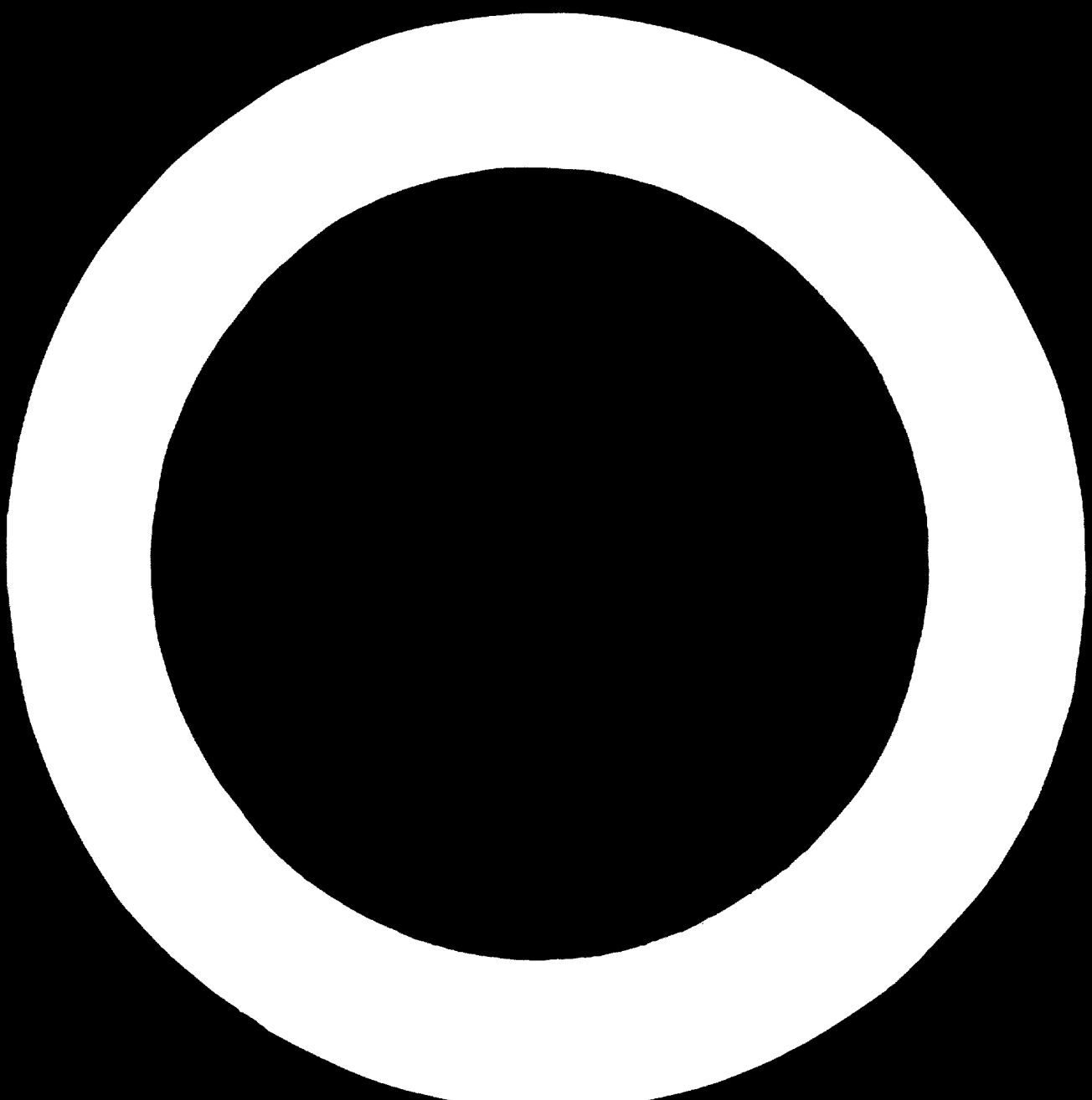


Introduction and nutrient requirement.

Zambia like any other country, needs food to feed its population. Food production is associated with soil fertility. It is known that Zambia belongs to the soil types that are classified as laterites and which are generally speaking described as infertile. Meaning that if any sizeable agricultural production is contemplated, it must be accompanied by heavy fertilisation. In fact for continuous production of food, fertilization is not only desirable but a necessity. This can be deduced from the old indigenous method of shifting cultivation which sought to surmount gradual depreciation of nutrients by use of virgin land after exhaustion of nutrients in a regular field. This method, we know now, can only be for temporary expedience. With the great increases in population and general drift to urban areas, such systems of migratory cultivation are not only inefficient, inadquate and obsolete but cause large tracks of land to be laid waste for considerable lengths of time. It is a proud thing therefore, that Zambia has recognised the need to fertilise in order that more food may be produced.

It is a scientific fact that you cannot fertilise efficiently without determing deficiencies otherwise your efforts are brought to nought. It was the work of the Agricultural Research Branch to determine what the Zambian soils needed by way of nutrients. Through Experimetion with the soil by Agronomist and Soil Chemists in various regional stetions a list of Elements was drawn up. It is now established by the Research Branch of Department of Agriculture that as far as the major nutrients are concerned, Zambia's soils need the following elements for improved agricultural production:- (1) Nitrogen (N); this element is required in big quantities. (2) Phosphorus (P) This is another important element required (3) Potassium (K) (4) and surprisingly enough Sulphur (S). Sulphur is surprising because in most other countries Sulphur is not so important, such that only N, P, K are referred to as opposed to N. P. K. S in Zambia. Sulphur makes alot of difference especially in the production of the stepple food maize (as much as 35:2 weight quantity ratio). When dealing with cotton, N. P. K. S. B. (B for Boron) was found to be the range since boron was important for boll formation. The same range was found for tobcoco because boron was a necessary trace element for the good growth of tobacco.

After deficiencies were established it was only a logical sequence that these should be rectified if Zambian agriculture was to prosper. Unfortunately for Zambia, it was discovered, that the country had few or no known natural mineral deposits for use in the manufacture of fertilizers. It became clear that <u>Fertilizers had to be imported</u>. The question now was who by and where from ?

Since we were part of the Federation of Rhodesia and Nyasaland, the questions asked above were easily answered because in Southern Rhodesia, there already existed companies which were incorporated in big European fertilizer Companies, producing this commodity. These companies were:- Pisons, Windmill, Kodia and Chinza. These companies did not waste any time to fill in the vacuum and establish trading posts in Zambia (then Northern Rhodesia).

Because of the nature of their business, the companies priorities were of course to sell Fertilizer at a profit. Other functions were secondary. Apart from selling and distributing fertilizer, the Companies however took upon themselves to provide commendable technical advice to the Farmers. They also delivered fertilizer to as near a point to the farmer as was possible.

Since these private commercial fertilizer companies only catered for commercial production farmers, their activities were restricted along the line of rail. These commercial farmers were mostly settlers from the south and Europe. i.e. mostly foreigners. The local people did not indulge in big commercial farming to any great extent until lately.

Because most commercial farmers were grouped in one general area it was easy for companies to conduct market Surveys, consumption trends and therefore import and distribute fertilizer accordingly.

From the above it is easy to see that someone had to look at the intrest of the farmer. Competition motivation among the companies alone could not ensure fair dealing with farmers. The then Federal Government of Rhodesia and Nyasaland stepped in by setting up an Advisory Committee through its Ministry of Agriculture. The Advisory Committee dealt with matters relating to fertilizers. These included Registration of Companies; Specification analytical data of product, both physical and Chemical; requirements in terms of what mixtures and compositions would be acceptable on the Federal market.

The composition of this committee included the Agricultural Research people, Department of Conservation and Extension, Tobacco Association, Farmers Union and Fertiliser company representatives. The implementation of their deliberations were set out in the 'Federal Fertiliser and Feed Act' which made into Law, recommendations from this committee. Prices were of course decided by economics.

In 1963 the Federation of Rhodesia and Nyasaland was dissolved. The three countries had to have separate organisations and therefore Zambia had to make her own arrangements.

For the period immediately after Independence in 1964, the Fertiliser situation remained more or less unchanged. The same companies imported, marketed and distributed the fertilisers. But one more factor emerged: the rural farmer hitherto not included, was now to be considered.

The interests of these rural farmers were going to be met by the newly formed Agricultural Rural Marketing Board, which among other things was to market and distribute Fertiliser to the rural farmer. The Company was faced with difficulty from the beginning. Sales records were not readily available, experienced staff were lacking, statistics on demand and consumption in the rural areas were absent. Also trends in the consumption were uncertain and generally misleading and therefore difficult to meet by way of imports. Transport and handling was neither adquate nor efficient. The total result was that the rural farmer either got no fertiliser or if he did, it was late coming and usually in bad condition.

The Government of Republic of Zambia wanted economic Independence (implied in this is of course Agricultural self sufficiency). The government made its intention known when it declared the famous 'Mulungushi Economic Reforms' in which it was sought to partially socialise ownership of means of production and distribution of certain commodities. This was contained in the 51% Governmental Shareholding in many of the bigger companies and a withrawal of import licences for some of the companies.

The fertiliser companies fell among those that had their import licences withdrawn. This meant that as far as <u>All</u> the fertiliser companies were concerned, business was at a close. The government took upon itself through its statutory bodies, the monopoly to import and sell fertiliser.

As a corollary to the economic independence in fertiliser industry, plans were underway for a Fertiliser factory. This factory was to be run by a statutory body, the Nitrogen Chemical Company of Zambia.

An identification of statutory bodies and their function in the production, marketing and distribution of fertiliser is perhaps appropriate at this point: (a) The National Agricultural Marketing Board (N.A.M.B.) which absorbed the Agricultural Rural Marketing Board, is charged with Marketing and distribution (b) The Nitrogen Chemical Company of Zambia (N.C.Z) is charged with production and importation. The two bodies work hand in hand with government departments and other organisations to meet fertiliser needs of Zambia.

PRODUCTION AND IMPORTATION.

(A) Production :

Local production of fertilisers is centred around the Kafue Nitrogen Factory which was commissioned in 1970 by His Excellency the President. The establishment of this factory is consistent with the government policy of economic independence, i.e. self sufficiency.

Historical Background:

As far back as 1966 negotiations were started between the Government of the Republic of Zambia and manufacturers from developed countries viz. Japan, to establish a Nitrogeneous fertiliser Factory in Zambia. By 1967 a feasibility report was presented to the Zambian Government by Kobe Steel Ltd of Japan. It was agreed that the factory was possible with minor variation in the product. The Ministry of Rural Development through its Agricultural fertiliser Advisory Committee had specified Ammonium Sulphate as the desired product but instead Ammonium Nitrate was found more suitable for economic reasons. This $NH_4 NO_3$ could also be adapted to the manufacture of explosives which contributed much to off setting operational costs and producing locally, raw materials for the much needed Explosives for mining and Civil Engineering projects.

The Fertilizer factory was originally intended for Livingstone where electricity supply was available, but after it was established that Kafue would have more abundant electricity and that other raw materials were within easy reach, the location was switched to Kafue. This place had further advantages of being strategically and centrally located, with good transport facilities (both road and railway) and a ready supply of water and space for expansion.

Companies involved in the building of the factory:

I. Kobe Steel Ltd of Japan - They built the Coal handling equipment, the air separation section, the gas compression and the effluent treatment plant.

II. The North Western Gas Board of England built the H_2S removal section (Stretford Process)

III. Heinrich Köppers GmbH. of Essen Germany. They built the coal gasification section.

IV. UBE Industries Ltd of Japan built the gas purification and Ammonia synthesis section.

V. Montecatini Edison of Italy built the Nitric acid plant.

VI. Sumitomo Chemical Engineering Co. Ltd of Japan built the Ammonium Nitrate plant.

VII. Shinko Pfaudler Co. Ltd of Japan built the water treatment plant.

VIII. While the Boiler plant was built by the Takuma Boiler Manufacturing Co. Ltd of Japan.

DESCRIPTION OF MANUFACTURE OF NH_4NO_3.

The basics of the process is that Hydrogen (H_2) is manufactured from Coal and water and then Nitrogen (N_2) is drawn and separated from air. The two gases are reacted in presence of a catalyst to form Ammonia (NH_3) which is then partially oxidised to nitrous oxide and Nitric Oxide then to Nitric acid, and reacted with more ammonia to form Ammonium Nitrate.

Details :

Coal preparation and coal - gasification:

Coal from Maamba mine is transported to factory site by rail and road where it is dried, mixed with a small quantity of calcium oxide (CaO) and then pulverised. The powder is fluidised and conveyed by compressed Nitrogen to gasification section.

The Koppers Totzek process is used for coal gasification. The Coal is partially oxidised with oxygen (O_2) in presence of steam to produce coal gas thus:

$$\underset{(s)}{2\ C} + \underset{(g)}{O_2} + \underset{(g)}{H_2O} \longrightarrow \underset{(g)}{CO} + \underset{(g)}{CO_2} + \underset{(g)}{H_2}$$

(also produced are small quantities of Nitrogen (N_2), Argon (A), Methane (CH_4) and Hydrogen Sulphide (H_2S)

Soluble gases are then absorbed in a stream of water and the raw gas is passed on the purification section.

Gas Purification:

H_2S (Hydrogen Sulphide) is an undesirable contaminant in the process because it poisons the catalysts in later stages. H_2S however, contains valuable sulphur which could be recovered. The Stretford Process uses a patented blend of Chemicals to remove the H_2S and to produce Sulphur as a by product (99.9% purity S) This Sulphur is not produced in great quantity to warrant use in fertiliser manufacture so it is sold to Sulphuric acid makers on the Copper mines.

The sequence of the extraction is as follows:- (a) Chemical absorption of H_2S from the raw gas (b) precipitation of Sulphur from the solution for physical extraction and (c) regeneration of the Stretford reagents by Oxidation with Oxygen from air.

The raw gas which now contains H_2 and CO is passed to Primary CO conversion section to produce more Hydrogen. High pressure steam is added to the mixture of raw gases and the product passed over a reduced iron catalyst to convert most of the Carbon Monoxide (CO) to Carbon dioxide (CO_2) and Hydrogen i.e.

$$CO + H_2O \xrightarrow{\text{Catalyst}} CO_2 + H_2 + \text{heat.}$$

The Carbon Dioxide is then removed by potassium carbonate (K_2CO_3) solution according to the following reaction :-

$$K_2CO_3 + CO_2 + H_2O \longrightarrow 2KHCO_3.$$

The Potassium Carbonate solution is a hot solution which is further heated for regeneration of the K_2CO_3.

The raw gas is recycled over the reduced iron for further CO conversion to H_2 and CO_2. More CO_2 is then removed by washing the raw gas countercurrently with MonoEthanol Amine solution. The remaining undesirable impurities are removed by passing through a 7% NaOH solution and then over a catalyst of Nickel (Ni) for the reaction

$$CO + CO_2 + 7H_2 \xrightarrow{\text{catalyst}} 2\ CH_4 + 3H_2O$$

At this point Hydrogen is left as the main raw gass which is passed on to the Haber - Bosch process for production of Ammonia.

Air is liquefied and fractionated to produce O_2 and Nitrogen (N_2). The Nitrogen is reacted with H_2 in 3:1 ratio according to the following reaction:

$$3H_2 + N_2 \xrightarrow[\text{Reduced Fe Catalyst}]{350\ kg/cm^2G\ \ 375^oC} 2\ NH_3 + \text{heat.}$$

The Ammonia is liquefied and stored in a Horton Sphere. Part of this ammonia is then oxidised to Nitrous oxide then to Nitric Oxides and this reacted with water produces Nitric acid according to the Ostwald's/Montecatsni's procedure, i.e.

(i) $4\ NH_3 + 5O_2 \xrightarrow[\text{catalyst}]{Pt/Rh} 4\ NO + 6H_2O + \text{heat.}$

(ii) $2\ NO + O_2 \longrightarrow 2\ NO_2 + \text{heat}$

(iii) $3\ NO_2 + H_2O \longrightarrow 2\ HNO_3 + NO + \text{heat.}$

<u>Production of Ammonium Nitrate</u> :

This is essentially a neutralisation process where ammonia as a base is reacted with nitric acid to produce a salt Ammonium Nitrate and water.

$$NH_3 + H_2O \longrightarrow NH_4OH$$

$$NH_4OH + HNO_3 \longrightarrow NH_4NO_3 + H_2O$$

The Ammonium nitrate solution is then concentrated by boiling off some of the water and sprayed from the top of the prilling tower. An upward current of air solidifies the nitrate in a prill bead form. The prills are then dried and coated with a fine clay (MUPLUTEM) for physical protection such as moisture leading to caking.

The factory is supposed to be a continuous process one. However, sectional malfunctions influence the whole production process.

Factory Capacity:

The projected capacity of the factory was originally put at 205 metric tons per day and for a 330 day year, this would come to 67,650 metric tons. The capacity at first operation was found to be 4,800 metric tons per month giving an average of roughly 57,600 metric tons per year. This capacity has however fallen since the first operation.

The factory has been plagued with technical problems such as corrosion of factory equipment and general deterioration of catalysts.

As a result, in 1971 the Nitrogen Chemical Company of Zambia have produced less than the 24,000 metric tons by end of September and 31,000 tons by end of December, targets.

Because of the anticipated small production the factory has to be supplemented with imports. An additional reason for supplements is that the factory's product is not a balanced fertilizer. Imports are therefore not only an insurance against factory malfunctions, but also a real necessity. The following figures show the discouraging situation at the factory since its commissioning :-

PRODUCTION AT KAFUE FERTILIZER FACTORY.

1970 PERIOD

	FERTILIZER	DENSE EXPLOSIVE	POROUS EXPLOSIVE
METRIC TONS	4,447	1,202	3,416

Production Commenced in April, 1970. The factory experienced breakdowns and had to close for 3 months. Total production time amounted to 5 months.

Sulphur is produced at the rate of 1 - 2 Metric tons per day

1971 PERIOD

	FERTILIZER	DENSE EXPLOSIVES	POROUS EXPLOSIVE
METRIC TONS.	7,215	6,945	5,160

The 1971 production commenced in January and the above figures are only up to July, 1971.

There was a one month break in production because of malfunctions. The actual production period was therefore 6 months. Assuming that a similar quantity would be produced by December it would be expected that about 15,000 metric tons would be produced for this year. This is about half the estimated 34,000 tons.

Efforts to improve the productivity of the factory include suggestions to import ammonia for incorporation into production system for great quantities of NH_4NO_3.

Since the deposits of coal at Maamba Mine are limited and estimated to last thirty years, the factory is contemplating adaptations to petroleum products for production of its hydrogen. This would come in handy since there is a ready source of this material through the pipeline from the Tanzanian coast to Ndola, Zambia. The petroleum would have to be transported to Kafue but this is a small matter.

(B) **IMPORTATION:**

Production and Importation are grouped together in this paper because the same Company N.C.A. (Nitrogen Chemical Company of Zambia) is responsible for both operations.

Among other things, importations are dictated by consumption. Since consumption is an elusive subject as far as fertilisers are concerned in Zambia, only estimates of consumption and hence imports are available. This is because of many interacting factors which will be discussed under the heading 'Problem in Planning for development'

Before the private fertiliser companies had left the Zambian scene, they had had already put out estimates for fertiliser imports up to 1978. This was assumed to coincide with consumption. These figures do not, therefore, include production from the new fertiliser factory.

The following are total seasonal estimates from 1968/69 season to 1977/78 season. The estimates do not show any analysis of component types of fertilisers, but it can be safely assumed that the bulk will be nitrogenous, phosphatic and sulphuric fertilisers - as the 1968 - 69 season figures will show below.

Year	Metric tons of Fertiliser.
1968-69	74,400
1969-70	82,600
1970-71	90,900
1971-72	99,100
1972-73	107,400
1973-74	115,600
1974-75	124,000
1975-76	132,200
1976-77	140,400
1977-78	148,700

The break down for the year 1968-69 seasonal imports was :
Compound Fertilisers 50% of total imports.
Nitrogenous, straights and phosphates 50%
(N.B. Compound Fertilisers contain N and S also.)

The actual amounts imported were 65,905 Metric Tons instead of the estimated 74,400.

In 1969-70 season imports were in the region of 80,000 Metric tons. In 1970-71 season the imports were 89,000 metric tons - and this season 1971-72 the imports will amount to 61,225 Metric tons. It is hoped that the balance of 34,000 tons would be covered from N.C.Z. production at Kafue. This would give a total of 95,225 Metric tons for this season.

A break down of the 1971-72 orders will help to form a clear picture of the types of fertilisers required in Zambia

ESTIMATES FOR 1971 - 72 SEASON

Mixtures	Metric tons	
'A', 'V' and 'C'	7,600	Meaning of letters A,C,D, R, V and X are explained below
'R', 'D' and 'X'	45,000	
STRAIGHTS		
Sulphate of Ammonia	3,600	
Potassium chloride	100	Composition
Single Super phosphate	300	explained
Triple " "	400	below.
Potassium sulphate	145	
Urea	4,000	
Ammonium Nitrate (from N.C.Z.)	34,000	
Total Imports + produce	95,225	Metric Tons

MEANING OF LETTERS AND COMPOSITION

COMPOUND FERTILIZER	% N	P_2O_5	K_2O	S	B.
'A' mixture	2	18	15	10	0.1
'C' "	6	18	12	10	0.1
'D' "	10	20	10	10	-
'R' "	20	20	-	10	-
'V' "	4	18	15	10	0.1
'X' "	20	10	5	10	-

Compounds A, C and V are used for tobacco fertilising and Compound R, X, and D are used for Maize fertilizing.

The Compositions of straights are as follows:-

1. **Nitrogenous** **%N**

Ammonium Nitrate	34.8
Sulphate of Amonia	21
Urea	44
Nitrate of Soda	16
C.A.N.	26

2. **Phosphatic** **% P_2O_5**

Single Superphosphate	19
Triple Superphosphate	44

3. **Potash** **% K_2O**

Potassium Chloride	60
Potassium Sulphate	50

CONSUMPTION AND DISTRIBUTION

It is a safe assumption to say that consumption of fertiliser is equivalent to import tion plus production as far as Zambia is concerned. This is so because the agricultural sector is constantly growing, because of the general awareness of local people as to the importance of producing food locally. The government has spared no effort in campagning for this and educating people to use fertiliser to meet this end.

In the past it was not difficult to follow up the distribution of fertilizer after it got into the country. The same companies imported, Marketed and distributed the fertilizer. Most of the fertilizer went to commercial farmers along the lone line of rail - a strip of land about 30 miles [illegible] either side of the railway line. The rest of the country used little or no artificial fertilizer at all.

To-day the situation has changed dramatically. The rural farmer has emerged and cannot be ignored. The new distributor (N.A.M.B.) National Agricultural Marketing Board has had to set up Country-wide Depots to this effect. The old commercial farmers can still buy their fertilizer from the same railway - station centres. Consumption of the commercial farmers is still easy to determine but that of the rural farmer still remains unknown. It is difficult to determine how many the rural farmers are and how much they will use. Access to these farmers is difficult. Verbal communication shows a credible gap but situation is not entirely hopeless because these farmers have begun using modern methods.

A new kind of farmer has emerged lately. This is the big para governmental estates run by the Rural Development Corporation, and the Estates financed by industrial giants like the Copper Companies. These will by their size consume alot of fertilizer. These companies are welcome but they present problems to those charged with fertilizer imports. These companies sometimes announce their intension to enter Agricultural production late. This means their quota of fertilizer is most likely not included in the order for the particular season. This is so because orders are made several months ahead of the season. This invariably created strains and confusion in the distribution of available stocks. An example of this would be the recently announced Chisamba Estates which will need at least 6,000 metric tons more fertilizer than was ordered for this year. Who is going to relinguish their quota to this estate which has volunteered to boost Maize production ?

The big Company estates will definitely grow more numerous in future just as will the rural farmers. But how does one predict their establishment or indeed their size and fertilizer requirement. This really poses a big problem to N.A.M.B. which projects consumption.

PROBLEMS, PLANNING AND DEVELOPMENT.

The Zambia Fertilizer Advisory Committee was set up in 1965 to replace the old Federal Fertilizer Advisory Committee. Its function was and is to deal with all aspects of fertilizer industry with the exception of financing imports and Political Policy - which are dealt with by appropriate bodies. Development and projections are therefore matters well within the realm of this committee.

The composition of this committee includes N.A.M.B. (National Agricultural Marketing Board), N.C.Z. (Nitrogen Chemical Company of Zambia), Members of the Ministry of Rural Development (Economist Politicians and other Civil Servants), Agricultural Research Branch. (Advisory Chemist with agronomic data), Members of commercial farming community and credit organizations.

This committee has also incorporated in it certain Specialised technical committees dealing with importations, specifications and legal matters.

Most of the areas requiring improvement have already been spelt out viz: Production, transportation, handling etc. These can be solved with a little ingenuity, care and money. But there are more difficult problems which present real obstacles to fertiliser industrial development. These include a mixing plant, storage, port facilities with their concomitant railway problems through hostile foreign countries, shipping and finally, finding tenders for specialised manufacture since we specify such high levels of sulphur.

Mixing (or formulating) plant.

The need for a mixing plant has been recognized. This is due to efforts being made to improve the range of products at the Kafue factory. A mixing plant is projected for establishment in 1972. This factory is going to use imported concentrates to produce balanced fertiliser mixtures locally. This has the advantage of acquiring stockpiles locally which would be psychologically encouraging to farmers who can literary buy their fertilizer off the shelf. This would also be a cheaper way of importing fertilizers since transport cost from a foreign Country would be less per Unit of nutrient, and would have the net result of more nutrient brought to Zambia for an equivalent transport cost.

Storage spaces:

As has been shown projected imports and production will increase with time. The present storage facilities cannot cope with even the present situation. When increased quantities are manufactured and imported more and bigger depots will be required. These, by the look of things, will be required soon. Technical people and materials will be required to build these depots. This is one area where the United Nations Industrial Development Organisation can really help. In short term, they could send technicians and materials for building these depots and for long term purposes, they could find training facilities for local people in structral engineering. If this is not so possible, immediate finance would have the same effect.

If storage facilities were improved, alot of other problems could be solved because concentrates could be stock piled for further processing. These could also be imported any time of the year - meaning that congestion at the ports would be alleviated and the overworked transport lines would cope with such an arrangement.

The present situation is so pathetic that fertilizer has to be stored in the same general area as pesticides and produce. In fact the same sheds are used for maize storage and fertiliser storage creting a vicious cycle where fertilizer chases maize and maize chases fertiliser. The dangers of such a system cannot be over emphasised. Most pesticides are poisonous. These could very easily be incorporated into fertilizer or food and could result in serous temporary sterilization of soil or even death of humans and domestic animals or both.

Because of the nature of credit system, the farmer has to buy his fertilizer with the money obtained for his produce. Therefore he has to sell first before he can buy. This means that for a period, fertilizer and produce (Maize grain) are in the same depot since the buyer of produce and seller of fertilizer is one and the same body N.A.M.B. This puts a further squeeze on space.

It is very clear that storage facilities will have to come up high on priorities for the development of the Zambian fertilizer industry.

Port Facilities and Railways:

Because Zambia is land locked and surrounded by hostile territories, planning for improvements is made very difficult because of the latent vulnerability caused by unpredictable embargoes, strikes and priorities to traffic. All these factors have a shadow of uncertainty in the minds of any people trying to project plans for the future. This is accentuated by the fact that fertilizer is a bulky, cheap commodity only valued for putting in the soil.

Most of our fertilizer passes through Rhodesia which is plagued with problems associated with staffing, carriage trucks and Railway engines. This, in addition to political motives prompts that government to overcharge on Zambian goods. The charge has to be inevitably passed to the consumer or absorbed by government of Zambia. This has a dampening effect on the financing of imports since foreign exchange is a touchy subject in the world nowadays.

The Government subsidizes up to 30% of the selling price and up to 50% on world production prices. This is obviously limiting for a government with scanty funds to be stretched for many pressing developmental projects.

When the Tanzam railway line is completed the situation will be better on the railways but by the same token, the port of Dar-es-Salaam will have to be increased since it cannot cope with even the present situation. It is estimated that even with completion of the railway in 1975 it wont be until 1980 before the port can be cleared of congestion so that it can be used for bulky cargo like fertiliser.

The Benguela railway from Lobito bay is plagued with sabotage because it passes through a battle ground of Angola. The route is also expensive which prohibits fertilizer importation through it.

It would seem that another area needing outside help would be to improve port facilities at Dar-es-Salaam. This could be done in two ways. (a) To provide technical know-how and materials for this purpose and (b) to provide heavy vehicles to deplete the back-log that already exists at the port. This could also be solved by way of money.

Loans:

Loans to buy fertilizers for farmers are hard to get - because of inadquate funds.

If UNIDO would find ways to help in either administrative training or actual finance, this could help the situation tremendously. If the farmer got his seasonal loans early he would transport his produce to the N.A.M.B. and return with fertilizer on his back journey. This would be a great saving in time and money while it would also relieve the storage space problem at depots.

Holding of stocks of fertiliser at depots means that capital is being tied up and no intrest made on it. Most fertilisers are held up for months because there is no one to buy them in time.

Specialised Fertiliser Manufacture:

Zambia has alot of problems finding willing tenders for fertilisers because it has a Sulphur - content lower limit of 10%. Since most of the fertilizer is from overseas viz. Europe, Orders have to be made well in advance so that the Manufacturer can fit the specialised production in his programme. This is best done in the full period when the European demand is at its lowest.

This state of affairs, needless to say, poses alot of difficulty to the planners in Zambia. Overestimation and underestimation is very inherent in such a time-sensitive transaction. The solution to this is of course one that has already been cited namely, that of installing a Mixing plant which can use concentrates. Concentrates will require less storage space, less handling (since they will be in bulk) and will be less likely to deteriorate physically. This will obviously ensure fertilizer supply at the desired time.

These fore-going factors interact to the detriment of progress to our fertiliser industry - even with the best planning the task is an elusive one, because of the unpredictability of circumstances. For example, it was known this year that 70,000 tons of fertiliser was required to make Zambia self sufficient in maize, but only 95,225 Metric tons will be available for this season. This means that all the other crops put together will take 25,225 Metric tons. This is obviously an imbalance.

LEGISLATION.

The legal aspects governing fertiliser industry in Zambia are laid down in the terms of the 'Agricultural Fertiliser and Feed Act' of 1966 in which the fertiliser regulations were stipulated in 1969 to take effect in January, 1970.

These include Registration of fertilizer factories and their requirements; The production of analytical data of the composition of products; Method of sampling to be followed by an approved registered Chemical analyst. The analyst must have certain qualifications and should use an approved Laboratory; Methods of analysis are also spelt out in the 'Act'.

Further, the 'Act' states that a statement of analysis should be displayed on bags, containers or labels and where sales are in bulk, these should be accompanied by notes of analysis.

The Act also sets out permissible Limits of Variation as to the composition of fertilisers whether imported or locally produced, regarding the declared analytical figures. Th limits should fall within one or two percent of declared value for N, P, K and 5% for Chloride and 20% for Boron. No variation is alowed for sulphur. In Ammonium Sulphate the above apply but in addition Amount of Free Sulphuric acid must be within 1/5 of declared value.

It is very clear what the aim of Government was, when enacting such a tough demanding document. The Government wanted fair dealing for all parties concerned in the fertiliser transactions.

To protect Zambia, a further addition to this list has been the 10% insurance underpayment which is detained in Zambia until deliveries have proved satisfactory in time, quality and quantity. If all is well then this 10% is paid in full. The advantages have been improved quality, speedy delivery and Authenticity of analytical data.

In conclusion, it is hoped that what has been said in this paper will throw some light on the problems and short-comings of the Zambian Fertiliser Industry. It is hoped further, that aid will be forth coming so that the industry will progress for the betterment of Agricultural production which is obviously becoming a concern of the whole world.

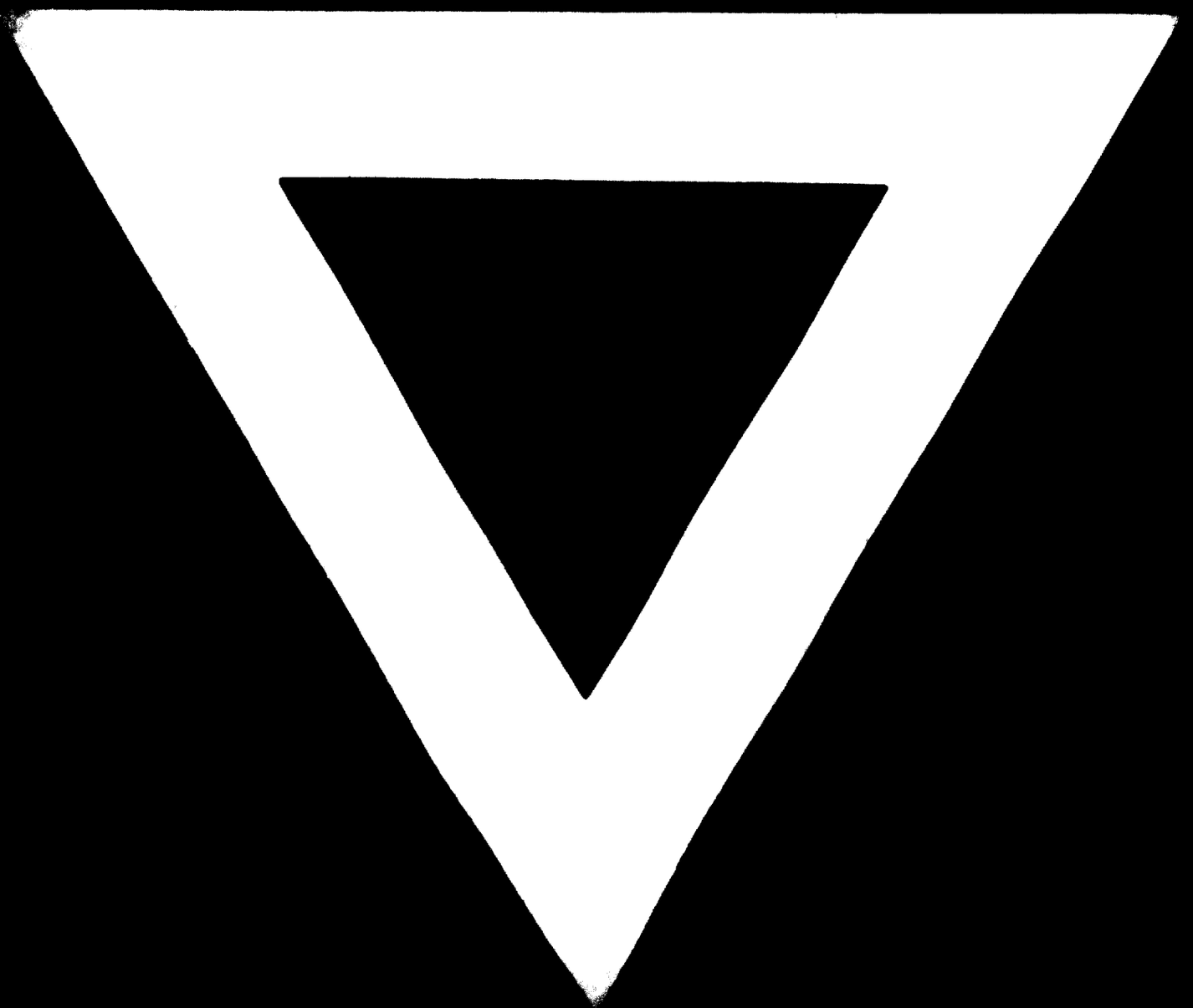
Acknowledgements go to:

(1) Nitrogen Chemical Company of Zambia at their Kafue factory.

(2) The National Agricultural Marketing Board at Kwacha House LUSAKA.

(3) The F.A.O. representative at Ministry of Rural Development

(4) Agricultural Research Branch at Mount Makulu.



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