OCCASION

This publication has been made available to the public on the occasion of the 50th anniversary of the United Nations Industrial Development Organisation.

DISCLAIMER

FAIR USE POLICY

CONTACT

Please contact publications@unido.org for further information concerning UNIDO publications.

For more information about UNIDO, please visit us at www.unido.org

UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION
Vienna International Centre, P.O. Box 300, 1400 Vienna, Austria
Tel: (+43-1) 26026-0 · www.unido.org · unido@unido.org

17166

Distr.
LIMITED

ID/WG.475/9(SPEC.)
19 October 1988

ENGLISH
ORIGINAL: FRENCH

United Nations Industrial Development Organization

Regional Consultation on the
Phosphatic Fertilizers and
Pesticides Industries in Africa

Yamoussoukro, Côte d'Ivoire
12-16 December 1988

PROBLEMS ARISING OUT OF THE FINANCING OF PHOSPHATE FERTILIZER PLANTS IN THE AFRICAN COUNTRIES*

Prepared by

UNIDO Secretariat

2/5

* This document is a translation of an unedited original.

V.88-30146

TABLE OF CONTENTS

		PAGE
	Introduction	3
1.	Criteria governing the Profitability of Fertilizer Plants in Developing Countries	6
1.1	Factors determining the earnings of plants	6
1.1.1	Rate of utilization of capacity (UC)	6
1.1.2	Level of diversification of production	7
1.1.3	Marketing methods	8
1.1.4	Conditions governing price-fixing	9
1.2	Cost components and type of investments	12
1.2.1	Direct investments	12
1.2.2	Investment in related infrastructures	13
1.2.3	Running costs	15
1.2.4	The case of low-dose fertilizer production units	18
1.2.5	Mini-plants adapted to the African context	19
2.	Possibilities for the Financing of Fertilizer Plants	20
2.1	Parameters influencing methods of financing	20
2.1.1	Decisions in relation to investment	20
2.1.2	Levels of investment	22
2.1.3	Delays in arranging financing and over-running of costs	22
2.1.4	Evolution of the situation of the fertilizer sector in developed countries	23
2.2	Methods of financing	24
2.2.1	Capital inputs	24
2.2.2	Financing by means of loans	25
3.	Major Trends Arising out of Financial Arrangements for Fertilizer Plant Projects in Developing Countries	28
3.1	Examples of recent financing schemes	28
3.2	Participants in the co-financing of fertilizer plants	29
3.2.1	Local sources of financing	29
3.2.2	External sources of financing	31
3.3	Development of the joint venture	32
3.4	Rehabilitation of plants	35
3.5	Integration of operations	38
3.5.1	Peculiarities relating to the functioning of fertilizer plants	38
3.5.2	Financial consequences	39
3.5.3	The role of the State	40
3.6	New ways and means of financing that can be envisaged	41
3.6.1	Temporary concession of financing and management	41
3.6.2	Equalization agreements	41
3.6.3	Aid in agricultural inputs	43
3.6.4	Debt conversion agreements	44
4.	Concluding Remarks	45

INTRODUCTION

Agricultural development depending on the use of fertilizers

Sub-Saharan Africa consists of a group of countries characterized by high population growth and an economy based largely on agriculture with a dual purpose: the satisfaction of demand for foodstuffs and the export of agricultural products for industrial or food use. The shortage of arable land, scarcity of rain and the recurrence of droughts have led the authorities in charge of econonic development to seek ways and means of increasing agricultural production by methods other than the extension of arable land or costly irrigation programmes. Thus it seemed to make sense to lay special stress on the intensive use of fertilizers.

Low level of consumption of fertilizers in Africa

In 1985, Africa consumed 1,200 million tons of phosphate fertiziler (3.4 per cent of world consumption) and 1.9 million t of nitrogenous fertilizer (2.7 per cent of world consumption). It produced 1.6 million t of phosphate fertilizer (4.5 per cent of world production) and 1.8 million t of nitrogenous fertilizer (2.4 per cent of world production). These data show the marginal nature of consumption and production of fertilizers in Africa, which is particularly striking if we relate it to the numbers and food needs of the population.

The average rate of consumption of fertilizers per hectare of arable land is very low in Africa: 3.5kg/ha, including 1kg of phosphates, as against 27kg on average in the world generally; but Egypt, Mauritius and La Réunion are very large users of fertilizers (364, 238 and 271kg/ha respectively), essentially because of the small area of arable land they contain and their considerable agricultural development. In Sub-Saharan Africa, only Zimbabwe (21kg/ha), Kenya (14kg/ha) and one or two small countries of southern Africa like Swaziland are large users of fertilizers.

Consumption of fertilizers by countries

For practical purposes, the African countries can be divided into the following groups according to their consumption or their need by way of fertilizers:

North Africa (Morocco, Algeria, Tunisia, Libya, Egypt) consumes 400,000 t of phosphate fertilizers (one third of Africa's total consumption) and 1.1 million t of nitrogenous fertilizers (58 per cent of African consumption). This same region produces respectively 1.1 million t of phosphate fertilizers (especially Morocco and Tunisia - 69 per cent of the total for Africa) and 1.1 million t of nitrogenous fertilizers (Libya, Algeria and Tunisia - 61 per cent of African production).

South Africa consumes 400,000 tons of phosphate fertilizer (one third of the total for Africa) and 400,000 tons of nitrogenous fertilizer (22 per cent of the African total). It produces 500,000 tons of

phosphate fertilizer (31 per cent of the total for Africa) and 500,000 tons of nitrogenous fertilizer (28 per cent of the African total). In the southern African zone, Lesotho and particularly Swaziland, have an appreciable consumption of fertilizer.

Nigeria consumes 100,000 tons of phosphate fertilizer and 130,000 tons of nitrogenous fertilizer, with a production which started out only in 1986, in the latter case.

Zimbabwe consumes 45,000 t of phosphate fertilizers and 70,000 t of nitrogenous fertilizer, in which it is virtually self-sufficient.

Nine countries are considerable consumers of fertilizers - more than 20,000 t per year. These are Zambia (25,000 t of phosphate fertilizers and 40,000 t of nitrogenous fertilizers), Tanzania (10,000 t of phosphate fertilizers and 25,000 t of nitrogenous fertilizers), Sudan (2,000 t of phosphate fertilizers but 40,000 t of nitrogenous fertilizers), Senegal (15,000 t of each type), Malawi (16,000 and 28,000t), Kenya (50,000 and 36,000 t), Ethiopia (3,000 and 15,000 t), Ivory Coast (10,000 t of each type), and Cameroon (10,000 and 30,000 t). Some of these countries are also fertilizer producers. In the case of nitrogen, we have Zambia, Ivory Coast and Senegal, and for phosphate Tanzania, Senegal and the Ivory Coast.

The other Sub-Saharan countries, about 30 in number, are very small consumers of fertilizer (less than 20,000 t/y) in spite of the fact that in most of them, agriculture is the occupation of nearly 80 per cent of the population and represents the main component of the GDP and exports.

Consumption projections made currently by FAO point to a very marked foreseeable growth in the fertilizer consumption. These, excluding South Africa, start out from a present consumption of approximately 1,500 million t with the prospect of 2,000 million t from 1990 onwards. By the year 2000, a forward-looking analysis made by UNIDO estimates that Africa's consumption of phosphate fertilizers would have to reach 5.7 million t merely to correct the deficiencies of the African soil. Phosphate fertilizers represent approximately one third of the projected consumption of fertilizers in Africa. The average rates of growth of fertilizer consumption in Africa have been low over the last few years, apparently because of the countries' financial difficulties, which have led them to reduce their imports drastically, and because of the low purchasing power of the active consumer population. It may be noted that for practical purposes the trend in the consumption of fertilizers in many African countries will depend largely in the future on the volume of fertilizer aid provided. In 1984, 28 African countries out of 44 covered at least part of their needs through fertilizer aid received from developed countries. This was true mainly of the countries of Central Africa and the Sahel. With regard to the type of fertilizer consumed, there was 1/ a slight overall drop in the consumption of phosphate fertilizers (of the P_2O_5 type) in favour of a rise of the consumption of nitrogenous fertilizers (NH_3 and urea), while the consumption of potassium amounted to little more than 10 per cent of the total fertilizer consumption.

Outlook for the production of phosphate fertilizer in Africa

To confine ourselves to phosphate fertilizer, Africa has deposits, potential or exploited, which are fairly numerous and rich, and could on the face of it

---

1/ Pieri, UNIDO, 1987, p.15.

form the basis of a process of industrialization in a large number of countries. This applies particularly to countries on the Sahel fringe, but the availability of the raw materials which are no doubt an indispensable prerequisite for any scheme for producing fertilizers, particularly of the phosphate kind, is not sufficient to bring about the drive for conversion into finished products required by a potential regular local market and the availability of sources of financing calculated to meet the need of plants for substantial investments and revolving funds. Since the raw material in question and the finished product are heavy substances and subject to deterioration, the need for wholesale and reliable infrastructures - transport, marketing and storage - also constitute serious constraints in regard to the decision to invest. These constraints (inadequate infrastructure, poor local markets, high investment costs, lack of sources of financing, etc.) together with a situation on the world market characterized by apparent over-production of fertilizers and sluggish international trade prices explain why all in all, new fertilizer manufacturing schemes have been few and far between in sub-Saharan Africa over the last five years. However, the forecasts in regard to the strengthening of world prices and growth in consumption of fertilizers, the closing-down of certain productive units in the developed countries, the emergence of new technologies, etc., offer prospects to small units which are less demanding in capital than the existing projects, and they favour the rehabilitation of units already set up in Africa but functioning inefficiently. Finally, the new interest shown by external financing (private or multilateral public sources) in projects for fertilizer manufacturing in developing countries suggests a more diversified future for the local fertilizer industry.

The present report sets out to examine the problems of financing encountered by phosphate fertilizer plants in the developing countries, and more precisely in Africa. First of all we shall look at the financial characteristics of fertilizer plants in these countries as emerging from a comparison between income and outgoings. Then we shall examine the conditions governing the financing of fertilizer plants prevailing in developing countries, presenting the main methods and characteristics of financing found at present. A third section will be devoted, following a reference to recent financial schemes for fertilizer plants, to an account of certain major trends worth noting in regard to the financing of fertilizer plants, including a suggestion for new systems and techniques of financing.

1. CRITERIA GOVERNING THE PROFITABILITY OF FERTILIZER PLANTS IN DEVELOPING COUNTRIES

The certainty of financial profitability is an essential condition for attracting the necessary capital, local or foreign, to projects aimed at rehabilitating or increasing fertilizer manufacturing units today or setting up new production units in developing countries. This profitability depends upon the relative level of income and expenditure (products and outgoings) of fertilizer manufacture.

1.1 Factors determining the earnings of plants

These are essentially:

- The rate of utilization of production capacity;
- The level of diversification of production;
- The marketing systems used;
- The conditions governing price-fixing.

1.1.1 Rate of utilization of capacity (UC)

An analysis of feasibility studies for new plants or rehabilitation projects (and analysis of the balance sheets and accounts of existing fertilizer plants) shows that their earning capacity is largely dependant on the degree of utilization of production capacity 2/. UC rates below 70 per cent do not guarantee real profitability and are only acceptable in extreme cases for the first year of existence of new units. More important still, the rates between 30 and 60 per cent found in certain African countries are a sure sign of badly run businesses. This is explained by the burden of fixed costs in the functioning of fertilizer plants, which are particularly capital intensive, with maintenance and repair costs first of all, and also depreciation charges, very high. The following three conclusions can be drawn from this statement:

- Production units must be operated round the clock at not less than 80 - 90 per cent UC, providing a supply of inputs without fail (and hence having facilities available for import licences and the allocation of foreign currencies) as well as vigorous maintenance of productive investment;

2/ Analysis of a number of sensibility tests shows that on average, the rate of profitability is highly sensitive to:

(a) Delays in carrying out projects (due to inflation, variations in the price of equipment, and interest rates);

(b) The degree of utilization of technical capacity;

(c) Variations in the prices of equipment and inputs.

- It may be indispensable and economical to keep as a rule not two but three productive technical units (boilers and so on) in a state of operation, which does of course imply an increase in basic investments but which makes for continuous output and the attainment of optimum UC rates;

- At the same time, however, it is advisable to avoid over-investment, which is always possible, and which while increasing the theoretical basic capacity produces no return. Hence one must be sure of the quantities to be produced, and of the relationship between internal (or external) storage capacity and sound organization of the circuit and of marketing methods.

1.1.2 Level of diversification of production

The use of fertilizers is only effective in so far as:

- There is perfect nutritional synergy implying more often than not the use of NPK fertilizer compounds;

- A prior examination is made of the soil so as to determine the particular type of fertilizer needed, which will vary according to the nature of the soil.

Industrialization policies in the fertilizer sector must no doubt be based on the availability of raw materials locally, but also on the qualitative and quantitative needs of local agriculture.

It seems likely that the developing countries would be well advised systematically to launch their industrial development in the fertilizer sector with a pre-industrial phase consisting of a "formulation unit" requiring relatively little by way of investment but capable of producing rapid returns. This unit could operate at the outset on the basis of imported raw materials (various N, P and K compounds). Its role would be both to decide on and to produce the compound fertilizers best suited to the characteristics of the local crops and soils, to test them, and to include at once a "value added" element. Working on materials imported in bulk, subject to the conditions of the international market, and without requiring any sophisticated technology or exorbitant energy costs, such a unit would seem, in view of its low investment level, to be capable of producing a sound rate of profitability.

Only later, in the light of the local availability of phosphate ore or natural gas, or the possibility of agreements with producers of raw materials or chemical companies, will countries be able to define their policy for the production of basic fertilizers - a second stage which is much more demanding in the way of investments, energy, know-how and skilled personnel.

Bearing in mind the respective investment costs (see below), the size of the potential markets, and the depressed state of prices internationally, developing countries might be well advised to proceed thus progressively rather than to launch themselves at once into grandiose schemes.

By way of example, a "formulation" type of plant like the one which has just been set up in Paraguay will produce 100,000 t/y of compound fertilizers at an investment figure of $6 million and employ a not inconsiderable team of 180 persons.

In comparison, the investment for a plant producing 900 t/d of ammonia and 1500 t/d of urea appears to have been $470 million (e.g. a plant set up in India in 1985) while a small plant producing 170 t/d of ammonia and 300 t/d of urea (absorbing the ammonia produced) required an investment of $69 million (a project in Brazil in 1983).

The choice of the formulation technique is important; and here, a distinction must be made between:

- Workshops for the blending of basic products, e.g. the granulation system (each granulated unit is itself a compound of the three nominal components of soil nutrition - N, P, and K). This is fairly costly from the point of view of investment and running costs;

- "Bulk blending" units, much less sophisticated, where the principle is the simple mixing of granulated components without special physical or chemical processing. It would appear that this method, though far more simple, can nevertheless give excellent nutritional results on certain soils. The ease of the chemical blending techniques also makes it possible to adapt the proportions of the mix permanently according to the basic nature of the soils and the crops. An examination of the functioning and results of bulk blending units in operation in developed countries, when situated close to the coast and in the neighbourhood of a port, shows that these units are generally run by agricultural co-operatives, that they require very little investment and personnel, and that the seasonal nature of production actually enables the personnel of the unit to test the various blends obtained on the co-operating farmers' land during the growing season, and thus to modify the make-up of the various components in due course. This simple, pre-industrial method, still very little used in Africa, would seem to be worth recommending as a way of launching an industrialization movement in the fertilizer sector.

1.1.3 Marketing methods

Fertilizers are intended for a clientele which is geographically highly decentralized and often situated a long way from the place of production or importation. They are also products subject to heavy quantitative and qualitative loss in course of transport and handling, and products which have to be available at the place where they will be used at very specific times. All these constraints have important financial implications. Some developing countries - India and China, for example, - have succeeded in overcoming the constraints by setting up smooth-running marketing circuits, decentralized, autonomous and supervised, based on a takeover by the users (co-operatives) and a satisfactory infrastructure of means of transport and storage facilities. Most of the African countries have unfortunately not reached this stage.

The investments needed for the efficient marketing of fertilizers (road and rail networks, warehouses, hangars for wholesaling and shops for retailing, and means of transport) as well as the cost of the staff needed to provide the logistics of ordering, delivering, invoicing, credit and cash handling, are enormous, and cannot be borne by the manufacturer. Thus it seems likely that certain investment items necessary for fertilizer distribution will have to be contributed by the State in many African countries, where the co-operative movement has not yet reached the appropriate level. This does not in any way

mean that the State must itself systematically take over the marketing of fertilizers. The objective is that the fertilizer should reach the farmer at the right time, in the right quantities and qualities, and that the purchase price to the user should be acceptable. In some instances the agricultural promotion organs can undertake this task; in others the traditional merchants can perform the task acceptably, as part of a system of free or even State-controlled prices, and in the light of local conditions.

1.1.4 Conditions governing price-fixing

Fertilizers can be regarded by developing countries as saleable goods of a strategic nature. Consequently, the prices of fertilizers are as a rule closely supervised, controlled or fixed by the authorities.

Three series of fertilizer prices are normally taken into account in developing countries:

- The prices on the international market;
- The selling price to the farmer who uses them;
- The cost price of the local output.

The present situation in regard to these three series of prices in the developing countries is as follows:

- International prices

  The relative world over-production of fertilizers has led to a slump in international trade prices. This trend is aggravated by the possibility open to certain producers specializing in exports, and working on very narrow price margins for the substances used for energy and as raw materials (e.g. coal and natural gas for ammonia), to accept cut prices for their exports.

- Price for sale to the farmers

  But at the same time the freight and insurance costs, and the particularly heavy weight of the product, may mean a considerable increase in the costs of imported fertilizers unloaded at the port of importation or delivered straight to the user.

Thus, if the price of urea FOB is for example only $120 per ton (as in 1986), we need to add at least $70/t to make the CIF delivery price $180/t and another $50 to take care of transport as far as the user, so that the price by the time the shipment reaches the consumer can amount to $230/t 3/. We have even seen many cases where the handling and transport costs can represent one and a half times the cost of purchasing the fertilizer at international prices. The general trend must be to maintain a stable relationship between the price of the fertilizer to the farmer and the selling price of agricultural products. This should be easier today, and less costly for the State, because of the combined

---

3/ Average price for products imported by India from Europe, but also valid for products intended for land-locked African countries.

effect of:

- The slump in the international price of fertilizers;

- Improvements in the structures and methods of price-fixing for agricultural products. These improvements are the logical consequence of a more liberal option for agricultural prices and of the priority now given to agricultural development by the developing countries. Thus in Zambia, the relationship between the price to the farmer of 1 kg of the nitrogen content of urea and the price per kg of maize has fallen back to 4.5 in 1986 as against 5.2 in 1983-84. 4/

The fact remains that at present, the inadequacy of the purchasing power of farmers in the light of the prices for fertilizers "delivered at the farm", the level of which is explained largely by a poor transport infrastructure and marketing, forces the State to subsidize the purchase of fertilizers by the farmer at very great cost, thus placing a further burden on already tight budgets. In a way these subsidies can be regarded as investment expenditure, since they result in an increase in the value added by the agricultural sector. But the question arises whether they could not be better used elsewhere, for example to finance small agricultural production plants, or to improve the transport or distribution infrastructures and thus reduce the real cost of fertilizers "delivered at the farm".

Local production prices

The cost of fertilizers produced locally - at times higher than the price of the imported product - is not likely to decline appreciably in the present economic situation. The method of fixing prices ex-works is generally determined by the economic authorities of producer developing countries, the aim being to enable a plant operating normally at 80 per cent capacity to make a profit of 12-17 per cent (the case of India and China, although certain African producer countries are hoping to adopt a similar method of calculating ex-works prices for fertilizers produced locally). It is impossible in fixing the selling price of the output of a local plant to cite the international prices, which are too variable and too chancy to have any significance from the point of view of production costs.

Thus it is clear why reference is made, in calculating ex-works prices, to the real cost price to the industrial enterprise, but it is well to keep an eye on the future of undertakings by fixing a fair ex-works price embracing all the real costs of manufacture plus a reasonable profit margin. In a general way, fertilizer manufacturing plants must not be regarded as mere administrative offices set up to provide a public production service; they should act like businesses, and hence be concerned about making a profit and developing technically. Earnings (and hence selling prices) should be sufficient to cover not only the variable costs but also the fixed costs, including financial charges, and to produce a cash flow (cash internal generation) including the real depreciation charges and a net profit after tax on the turnover. If this constraint implies an ex-works selling price, and a selling price to the user, higher than that determined in accordance with the objectives of the national rural development policy, the State should make up the difference. All in all,

---

4/ Similar calculations made in Asia, sometimes with reference to other agricultural products, are of the same general order of magnitude: (India: 4.3; Pakistan: 2.7; Bangladesh: 3.4 for paddy).

it is less costly for the State to have to subsidize retail prices than to have to salvage a badly managed plant.

Here we find the problem which habitually faces developing countries wishing to place high quality products at the disposal of local consumers at a reasonable price while ensuring profitability for the local plants which manufacture them. It is a common occurrence in the industrial sector of developing countries for the prices of products manufactured locally to be higher than those of products sold on the international market. The gap between the prices is explained not merely by the keener competition on the international market in this period of depression when over-production is the rule, but also by the logic of industrial development, which allows old-established producers to enjoy a sort of bonus because of the length of time their technologies have been practised, the fact that their equipment has often been written off, and the competence of their research and development team. The price to be paid by the Governments of developing countries for the installation of an industrial structure frequently consists of temporarily making up by way of subsidies the leeway between the price of local products and the price of imported products, and actually transferring the burden of the policy of support for local manufacturing industry from the consumer to the taxpayer.

The method used in calculating this price is highly dependent on the way of assessing the inputs into thie product. It is in fact possible to reduce the total selling price considerably by manipulating the prices charged for gas, fuel oil, naphtha or coal, as well as the energy used in the manufacture of the fertilizers. This is what is done by the new fertilizer exporting countries, like the oil-producing countries or the controlled economy countries. On the other hand, countries which do not have raw materials in such large quantities, countries which apply a liberal method of determining prices, show higher local production prices.

A rational price policy for fertilizers should therefore pass through a stage of action taken simultaneously with a view to obtaining an increase in agricultural productivity and an increase in the productivity of local fertilizer manufacture. Improvements made in agricultural productivity will make for a rise in retail selling prices, and higher productivity in the factories will bring about a reduction in ex-works prices. These inverse movements should make it possible gradually to bring the series of prices closer together, thus creating conditions for an ultimate liberalization of fertilizer prices.

With regard to the evolution of imports, the World Bank foresees a trend towards a gradual increase in the price of basic inputs in the manufacturing process which should lead to a certain increase in the international prices of manufactured fertilizers. Similarly, the foreseeable increase in the cost of transport and insurance should in the long run lead to an increase in CIF prices for imported fertilizers delivered. It therefore seems likely that the gap between the selling prices of local products and those of imported products will gradually narrow. The economic authorities of the developing countries should continue to use this gap to encourage local producers in their search for improved productivity, alternatively using measures of import taxation, temporary physical control (import quotas) and liberalization designed to induce local producers to make systematic efforts towards technological progress, savings in energy, and other procedures for improving productivity.

1.2 Cost components and type of investments

Financial profitability for an industrial enterprise dealing in fertilizers depends not only on the amount and methods of collecting earnings, but also, of course, on the method of calculating and the amount of costs, whether investment costs or running costs.

1.2.1 Direct investments

Investment costs vary according to the objectives of production. In this connection it may be well to point out the rapid evolution of optimum levels of production goals over the last 30 years, which has brought about a new pattern of plant sizes.

In the 1950s, a plant with a production capacity of 100 t/d of fertilizer was a large-scale project; in fact the first submission for a plant of 270 t/d dates from 1957. Today, large units range from 1000 to 1500 t/d of the finished product, more often than not including an intermediate production line of products feeding the line of finished products. Medium-sized units range from 500 to 1000 t/d. Mini-plants, with a production target of 30 to 300 t/d, are a modest alternative at present being thoroughly studied both by UNIDO and by the individual countries, the reason being that these production capacities suit the foreseeable needs of many small and medium-sized African countries.

According to the studies made so far both by FAO and by UNIDO and the International Association of Producers, it would appear that the investment necessary for one ton per year of a finished product were as follows in 1986:

-	Production of urea	$500 - $1000/t
-	Production of ammonium nitrate	$900/t
-	Production of phosphoric acid	$1,200 - $1,700/t
-	Production of DAP	$100 - $230/t
-	NPK formulation	$60/t

Investment costs in mini-plants producing urea (300 t/d) are in the medium range, involving an investment of approximately $800-$900 t/y of urea.

With regard to plants converting phosphates or working from phosphoric acid, the detail of investment costs looks as follows in the case of DAP: 5/

5/ FAO, Commission on Fertilizers (10th session), 1987.

	Percentage	Average	Values in $ millions: Plant 1,200 t/d	Plant 2,400 t/d
Licences, acquisition of technology, engineering and project management	5 - 9	7	4	31
Equipment and materials	45 - 50	48	62	161
Construction, civil engineering	26 - 27	27		95
Revolving fund	5.5	5.5	4.3	19
Interest during construction	5 - 10	7.5	9	15
Prior expenditure	1 - 5	3	4.2	2.6
Unforeseen items, physical and financial	1 - 4	2	0.7	12.4
		100	84.2	336.0

The proportion representing the cost of buildings is relatively high. On the other hand, the initial revolving cost fund requirements, the amount of interest accruing in the course of the project, and provision for unforeseen items are lower than in projects for nitrogenous fertilizer plants, but they still remain at a high level, especially in the case of the largest unit, which is expected at a second stage to cover its own needs in phosphoric acid.

1.2.2 Investment in related infrastructures

This type of investment is particularly high in the case of fertilizer plants, since these are first of all plants producing heavy goods intended for a geographically dispersed clientele, using large quantities of a heavy raw material of which the productive sites are few and far between, and working with a type of technology admittedly familiar but demanding from the point of view of regularity of functioning and precision of application, and hence requiring a good deal of skilled and diversified manpower and highly dependent on proper maintenance and regular supplies of energy, various inputs and spare parts. For all these reasons, whatever the location chosen for the plant (proximity of a populated agricultural region or a source of energy or raw materials), we must reckon with heavy investments in infrastructure, not of course calculated to meet the needs of the plant alone but often carried out or undertaken because the plant is there.

A list, not restrictive, of this investment in related infrastructures at once indicates the enormous volume of indispensable ancillary financing; port installations; road or rail networks to ensure supplies of inputs or to transport the finished product to its various destinations; water mains, power supplies, electric plants or high voltage lines; gas or oil pipelines, the establishment or working of coal mines, the construction of workers'

dormitory quarters, administrative infrastructures - urban, scholastic or hospital-type to cope with the needs of a large population of workers; centres of research and professional training; storage facilities at the level of the trade poles, etc.

The main problem is that of ascertaining whether these ancillary investments must be included or not in the industrial project.

The inclusion of infrastructural costs in the industrial project may result in total investment costs amounting to twice or even three times the industrial investment costs in the strict sense. We need only mention the cost of a kilometre of asphalted road in a developing country, or even better, a kilometre of railway permanent way, which can easily cost more than $1 million. On the other hand, to take into account only the investment within the plant itself and to imagine that once the plant is set up "the infrastructure will follow suit", would be dangerously optimistic. For after all, how is the plant to function if there are no gas mains, if imports cannot be unloaded at the port, if the raw materials cannot reach the plant for lack of roads or railways, if electricity supplies are irregular, if storage facilities are inadequate, or if sufficient manpower cannot be recruited on the spot?

Generally speaking, financial experts specializing in fertilizer plants are agreed that:

- The prior existence or simultaneous construction of ancillary infrastructures constitutes a necessary prerequisite for setting up an industrial project;

- The enumeration and calculation, with figures, of indispensable but still non-existent ancillary infrastructures, must be part of the industrial project;

- The problems of making allowance for investments and financing the cost of carrying them out must be solved outside the framework of the financing of the project in the strict sense, and cannot enter into the forecast calculation of the profitability of the fertilizer plant;

- The financing of the ancillary infrastructures must be explicitly organized on the basis of funds other than those reserved for the industrial project.

In this connection, reference may be made to some recent examples where the distinction between these two categories of investment is manifest:

(a) A recent East Asian project provides for the construction in Indonesia of a urea plant with a capacity of 570,000 t/y for regional purposes (the States members of the Association of South-East Asian Nations - ASEAN). The cost of local manpower, the level attained by Indonesian technological expertise, the resources of the zone selected (Northern Sumatra) in natural gas and its proximity to the consumption centres of the member countries, explain the choice made by the ASEAN Conference. The plant is financed by share capital taken out by the member States concerned, and by long-term Japanese loans. However, the still poorly industrialized and ill-equipped nature of the plant site has forced the promoters of the project to take part also in the

financing of certain specific ancillary infrastructures: the equipment of a port to cope with imports of input materials and exports of urea to the member States, the installation of water mains and the construction of workers' dormitory city.

(b) In its feasibility studies, IBRD does not include the cost of the infrastructural investment requirements in its calculation of the profitability of an industrial project. But it does bear these in mind in determining the technical feasibility of the project, and it makes sure that the Government or the region has undertaken or is prepared to undertake the necessary infrastructural investments. It may itself participate in the financing of these infrastructures, but in the framework of other projects (for example, the promotion of energy equipment for oil or gas pipelines in which account is taken of the needs of industrial projects depending on these infrastructures). One paragraph of the feasibility report on a project for a fertilizer plant specifies, for example, that "....the completion by the stipulated date of the following infrastructural arrangements is vital to ensure that the project takes off: the completion of the gas pipelines up to the site, the construction of a dam and a canal, and the installation of a railway link up to the site for the transfer of heavy equipment and the dispatch of the urea produced. The Bank has received assurances that ...".

In a word, fertilizer producing plants make particularly heavy demands in the way of ancillary infrastructures. In the developing countries, the inclusion of infrastructural schemes or improvements in an industrial project can easily double or treble the financing requirements and reduce or wipe out completely the profitability of the industrial unit. It is recommended that developing countries take account of such structural matters before launching into a project to install a plant which will be unable to function without this back-up. But they must be provided with specific financing, from public sources, on easy terms (State budget, bilateral or multilateral aid) and not charge the investment expenditure or running costs in question to the industrial project.

It may be true to say that the new infrastructures will be written off subsequently as part of the whole of the industrial fabric initiated by the fertilizer plant and given a boost by the existence of the infrastructures.

1.2.3 Running costs

The level, nature and trend of running costs set the conditions for the financial profitability of the manufacture of fertilizers. If we compare the total costs with the selling prices chargeable on the market, and with prices on the international market, we get some indication of:

- The level of ex-works prices to be charged;
- The capacity of the local plant to face international competition;
- The level of the financial effort to be made by the State in order to cover the gap between fair selling prices and real costs.

In the case of plants producing phosphate fertilizers with a high dose of P_2O_5, such as phosphoric acid, TSP or DAP, the cost of the raw materials is much higher than that for depreciation and the servicing of the investment; it can amount to more than 70 per cent of the "realization cost". The remaining 30 per

cent represents fixed costs and the margin for capital amortization. The countries which produce raw materials (phosphate ores) have a decided advantage. Furthermore, virtually all the new plants working on active phosphate substances or fertilizers which have come into being recently have been set up in countries which have phosphate mines. However, because of the advent on the manufacturing scene of sulphur and sulphuric acid, it seems possible to envisage the installation of a plant on a site producing these substances and close to a port, the phosphate ore being imported.

The energy requirements of plants on the phosphate side are much lower than in the case of plants on the nitrogen side. The manufacture of a ton of triple superphosphate calls for an expenditure of energy of 4.5 million BTUs 6/, whereas the manufacture of a ton of urea involves more than 39 million BTUs. In these circumstances, the availability of cheap energy, or investments in energy infrastructures, may seem less decisive than in the case of nitrogenous fertilizers. On the other hand, ancillary infrastructures relating to availability of water and treatment of waste matter are relatively more important than in the case of plants on the nitrogen side. The equipment needed for the plant, and the running costs, remain heavy. The great variety of types of phosphates treated makes it impossible to present costed data valid for all situations. But if we refer to a study by FAO 7/, we can cite the outline table shown below, giving the cost structure of three types of units manufacturing products of the phosphate type: phosphoric acid, triple superphosphate and ammonium phosphate (for this last-named product, the ammonia is as a rule imported). The data relate to a plant situated in an "industrial development zone", so that certain additional infrastructural investments are required (1982).

	Phosphoric acid	TSP	DAP
1. Basic data			
Output	1,000 t/d	1,200 t/d	1,200 t/d
Utilization of capacity	90%	90%	90%
Amount of investment (millions of $US)			
Immobilization	210	45	53
Revolving fund	23	12	17
Total investment	233	57	70

6/ BTU = British Thermal Unit.

7/ FERT/87/5, January 1987. Fertilizer Investment and Production Costs in Developing Countries, FAO, Rome.

	Values $/t	%	Values $/t	%	Values $/t	%
2. Production costs ($US/t)						
Raw materials						
Phosphates	119	23.5	16	7)	-	-
Sulphur	159	30.8	-	-)80	-	-
Phosphoric acid	-	-	172	73)	238	70)
Ammonia	-	-	-	-	45	13)
Other variable costs	15	3	7	3	7	2
Fixed costs	98	19.3	18	8	21	6
Production costs/t	389	-	213	-	311	-
Financial margin	118	23.3	24	10	29	9
Realization price/t	507	100	23	100	340	100

An updating of these data in 1986 for a DAP plant gives distinctly lower figures, largely because of the fall in the costs of raw materials (the plant produces 900 t/d with a 90 per cent utilization of capacity and an initial investment of $28 million):

	Cost per ton of DAP in $US		%
Phosphoric acid	190)		
Ammonia	26)	233	
Urea	17)		
Other variable costs	12		4
Fixed costs	16		6
Production costs	259		-
Financial margin	16		6
Realization price/t	275		100

The percentage remain approximately the same, but the "capital charge" diminishes because of the lower cost of the inital investment.

In conclusion, the running costs of phosphate fertilizer plants are essentially dependent on the cost of the raw materials or basic subtances used. However, there is diversification, since the inital process (the manufacture of phosphoric acid) is the one where the investment costs are heaviest (19 per cent for depreciation, 23 per cent for capital charges). The cost of the more elaborate stages consists, in a proportion of 80 to 85 per cent, of the cost of the inputs (active substances), while the charges relating to investment amount to about 16 to 18 per cent. It should be noted that the variable costs other than inputs play a relatively small part in the determination of the cost price, which leads one to conclude that the comparative advantage due to the lower cost of labour in the developing countries would have relatively little impact on this type of industry. On the other hand, the number of productive or potential mining sites in Africa is significant and calculated to encourage the development of plants manufacturing phosphoric acid. However, this type of plant is very heavy on investments, whereas plants producing other sorts of fertilizers, where the equipment is less costly, are also less dependent on the proximity of phosphate ore. We find very little influence of economies of scale in phosphate fertilizer plants, including those producing phosphoric acid, since a rise of production from 200 t/d to 900 t/d would only reduce total costs by less than 10 per cent.

Economies of scale are more in evidence, on the other hand, if the P_2O_5 unit is included in a complex also manufacturing sulphuric acid and other forms of fertilizer. The consequencesof this are as follows:

- The installation of mini-plants is feasible in the phosphate fertilizer industry, since the potential gain from a higher production level remains modest(which is not the case for nitrogenous fertilizers);

- The installation of integrated complexes is desirable once the project has attained a certain magnitude.

1.2.4 The case of low-dose fertilizer production units

In the African context, where financing, whether for investment or for running costs, is hard to come by, it may be well to ask whether there are not branches of industry which could produce phosphate fertilizers, perhaps less efficiently but with production costs and capital requirements lower and within the means of the African economies.

- Natural phosphates can be regarded as a fertilizer in themselves in certain cases where the pedological conditions lend themselves to this. An application of powdered phosphate alone can produce an enriching effect which is valuable, since it can be done at a cost generally 50 per cent lower than the cost of TSP. Pulverization installations represent a modest investment; they are generally attached to the natural phosphate quarry. Obviously it is desirable to observe at the outset the level of response of powdered natural phosphate which depends very much on the nature of the crop and the soil. If the cost is half, and the effect equivalent to 80/90 per cent of that of TSP, then this choice of powdered phosphate is an excellent one. However, we mustbear in mind the conditions governing transport from the production site to the consumer.

- The production of SSP20 with a low P_2O_5 dosage can be interesting because of the capital requirements and the smallness of economies of scale, which justify setting up large numbers of small producing units. In combination with the possibility of installing such units close to consumption sites, these features justify seasonal operation for the unit. SSP treatment also makes it possible to produce two interesting sub-products: sulphur and calcium.

- An SSP installation, with a capacity of 800 t/d would call for an investment of approximately $11 million (1986), and the product would come out at a price estimated, in P_2O_5 rating, at slightly lower than that of TSP. On the other hand, the lower P_2O_5 content of SSP involves supplementary costs for bagging, transport and storage which at times more than offset the gains made at the level of the bulk product.

To sum up, it will be preferable to manufacture products with a high dosage of P_2O_5 close to the source of the raw materials and in large plants, and those with a low dosage close to the consumption zones and in plants which in that case can be more modest in size. Furthermore, the idea that the minimum profitability level in the case of plants manufacturing high dosage products is 1000 t/d, as argued by many planners who want to keep down production costs, is not necessarily valid in the case of countries which have poor transport infrastructures. In this case small plants would become more interesting provided there was a standardized plan for this type of production unit and spare parts were easily obtainable.

1.2.5 Mini-plants adapted to the African context

Apart from the possibility of miniaturizing the classic type of fertilizer plant, technological and organizational research over the past 10 years has been harnessed to devising systems designed specifically to reduce the level of investments needed for creating national fertilizer production and making an optimum alternative response to the problems of the African countries, namely the scarcity of funds available for industrial investment; the need to furnish an increasing volume of efficient fertilizers to the agricultural sector; the need to use local phosphatic ore resources where the nutrient content is sometimes low; the necessity for a simple technology and easy management; modest infrastructural requirements, etc. By way of example, results of these researches worth mentioning include 8/ a patented system based on using the process for making local phosphates soluble with the help of imported ammonia to produce a binary fertilizer (containing the two main fertilizing principles P_2O_5 and N). This is certainly more efficient than powdered phosphate or SSP, and the manufacturing cost in terms of nutrient would be lower than that of the nutrient in DAP (even imported DAP).

Units can be small in dimension, since the capacity of the plants varies from 10 to 250 t/d, or an annual production of between 3,000 t and 75,000 t of fertilizer with 19 per cent of nutrient: 5 per cent of N and 14 per cent of P_2O_5.

8/ The Humifert process, a binary fertilizer developed by SOPRECHIM.

Tests carried out for a plant with a daily capacity of 50 t/d (15,000 t/y) in geo-economic conditions valid for many African countries 9/ would seem to indicate perfect adaptation to the potentialities of most fairly small countries. The requirements by way of investment would seem to be easily accessible: between $2.7 and $3.1 million, or 800 to 900 million CFA francs.

The manufacturing costs comprise variable costs (69 per cent) and fixed costs (31 per cent) and 70 per cent of them consist of expenditure in local currency, the only foreign currency being essentially that for imports of ammonia, catalysers and bags. The ex-works cost of the nutrient, estimated at between $380 and $420/t, is to be compared with $460/t, the cost price of the nutrient contained in a ton of imported DAP delivered to the consumption site and $770 per ton for nutrient (nitrogenous) contained in imported urea delivered at the consumption site.

The cast cited is only one of a number of examples of patents or research in progress based on devising original but simple technologies designed to exploit the local raw materials and adapted to the local context in regard to the availability of manpower and financing. Thus there may be mini-plants for local markets of under 2,000 t which would call for an investment of only $3 million (annual production cost $200/t) and would be competitive in costs.

2. POSSIBILITIES FOR THE FINANCING OF FERTILIZER PLANTS

Introduction

In present conditions, new plants or rehabilitation operations frequently involve large-scale projects, too costly to be financed exclusively from national budget funds and calling for financial arrangements which are often complex. The search for simpler elements (powdered phosphate and SSP), and research carried out in the field of mini-plants, can however affect the data and the nature of the financial constraints. Apart from this, the creation of a new unit, the establishment of parallel infrastructures, and the different forms of rehabilitation of old plants or functioning, call for different financing formulas.

2.1 Parameters influencing methods of financing

The following parameters greatly influence the choice of methods of financing which can be envisaged in the case of a fertilizer plant project:

2.1.1 Decisions in relation to investment

The manufacturing problems of the African countries are as follows:

- A particular country has a potential local market for phosphate fertilizers or may even consider that there are export possibilities;
- The country possesses natural phosphates;

9/ Phosphate rock, 26 per cent P_2O_5, situated at 200 km from the plant, imported ammonia, local organic material of the "agricultural waste" type available, conservative estimate of the cost of most of the inputs, etc.

- The country would like to make the most of its financing capacities (local or external) in the light of the profitability of the various processing methods. The size of the local market and the export potential are factors which will be decisive in decision-making.

  a) Launching into the export of fertilizers (the finished article) is today rather difficult inasmuch as there is a situation of relative over-production and a depressed international market. This statement is however, subject to qualification, since American plants have been able to increase their exports in 1987, thus offsetting the effects of a reduction in local consumption.

  b) As regards meeting the requirements of the local markets, expressed or desirable, the experts (UNIDO, Fertilizer Manual, p. 429) reckon that:

     Level 1: for a market of under 5,000 t/y, the best form of investment consists in improving the reception and distribution structures. Many African countries are in this situation.

     Level 2: for a market ranging between 1,000 and 25,000 t/y, it is possible to envisage a fertilizer bagging shop, and possibly a formulation unit. This again is the case of most African countries.

     Level 3: for local markets covering between 25,000 and 100,000 tons (a level reached by eight sub-Saharan African countries) it is possible to envisage bulk blending and granulation. If the country in question also has substantial deposits of natural phosphates, it can envisage testing out the spreading of powdered natural phosphate (very small additional investment by the mining installations) or even the manufacture of SSP.

     Level 4: at between 100,000 and 300,000 t/y, the manufacture of certain types of fertilizer can be envisaged if the situation is favourable from the point of view of raw materials. This situation at present applies only to the North African countries and to Nigeria and Zimbabwe.

     Level 5: above 300,000 t/y, conditions are favourable for envisaging diversified local production provided the environmental conditions (financing, trained personnel, infrastructures, raw materials) confirm the profitability of the various projects. Egypt and South Africa alone are in this bracket.

     Whatever the nature of the investment envisaged, it will of course be necessary to verify and plan in advance the nature and the quantity of fertilizers needed, in the light of the qualitative and quantitative forecasts of agricultural production.

2.1.2 Levels of investment

The size of the investment needed for new fertilizer plants is fairly substantial, although the technology is not particularly sophisticated. In approximate terms, the needs by way of initial direct investment according to the size of the manufacturing units could be summarized as follows:

Manufacture of ammonia and urea

Very large plants	-	$US550 to $750 million
Large plants	-	$US450 to $550 million
Mini-plants	-	$US75 to $100 million

Phosphate processing

Large plants	-	$US250 million to $500 million
Medium-sized plants	-	$US100 million to $250 million
Mini-plants		under $US100 million and sometimes under $US10 million

Formulation units (NPK blend)

Medium-sized units	-	under $US10 million

The size of the investments required, even in the case of mini-plants, is generally speaking beyond the means of the local private sector alone, or even of the local public financing authorities alone, because of the smallness of the local financial markets, the latent inadequacy of the financial resources available for industrial investment, and the very special conditions governing the calculation of rates of profitability.

2.1.3 Delays in arranging financing, and over-running of costs

In the fertilizer sector of the developing countries, the time that elapses between studies on the soundness of the project, evaluation, completion of the financial arrangements, tendering and starting up production, is often very long. In certain cases it has exceeded 10 years, and in most cases observed in the developing countries it is seldom less than six years. It should be added that the transition from test phase to cruising phase, corresponding to the optimum utilization of capacity (a rate of 85 per cent, i.e. at the profitability threshold) can take two further years. The delays frequently observed, in the financing arrangements particularly, give rise to considerable financial charges and the risk of an increase in investment costs. As an example, for a project of $313 million (a plant producing 1,000 t/d ammonia and 720 t/d urea), it is reckoned that there are expenses of $73 million (or 24 per cent of the total cost) bound up with the length of time taken to set up the project: $53 million to provide for inflation in the course of construction (42 months), $13 million for interest during this same period 10/, and $7 million for miscellaneous expenditure before the project is under way.

10/ The rate of interest allowed for in this example is nevertheless very low: 4 per cent.

This very long pre-operational period is one of the reasons for the difference in the amount of investment required for one and the same fertilizer plant according to whether it is located in a developed or a developing country. Thus Sheldrick (FAO: Investment and Production Costs for Fertilizers, 1979) estimated that one and the same ammonia-urea complex of 1,650 t/d would cost $150 million in a developed country (where it would be constructed in 18 months), but $230 million in a developing country with good infrastructures, and $320 million in a developing country with poor infrastructures (where the construction time could be as much as four years). Furthermore, the experts regularly and systematically add a surcharge of more than 25 per cent in making a preliminary rough evaluation of the cost of the project in a developing country using the technological bases valid in developed countries.

2.1.4 Evolution of the situation of the fertilizer sector in developed countries

The arrival on the international market of many new producers of fertilizers having cheap raw materials available; the bitter competition; and the slump in selling prices on the international market, have brought about a real crisis among the main Western producers. Regrouping, repurchasing, the constitution of multinationals, restructuring, closure of plants, staff cuts, and the definition of a new strategy - all this is characteristic of the way in which Western fertilizer firms respond to the crisis affecting them. The re-definition of producer group strategies would in fact seem promising for the developing countries, since it makes for an increase in the number of relocations of plants in developing countries.

Actually, the new strategy of Western enterprises producing fertilizers consists more often than not in withdrawing progressively from non-viable productive units but continuing to remain active in the fertilizer sector and preserving and even increasing their clientele. Indeed they would like to turn themselves into large marketing groups on a world-wide scale, in regard both to the orientation and extension of markets and to the origin of the goods sold. To cite an example, this would appear to be the case of the French EMC Group, where the production of its potassium deposits seems likely to end in the year 2025, but which has just invested heavily in the ICS project in Senegal and is contemplating participating in the Togolese project. This situation is all the more favourable to investors in the developing countries, in that the closure of plants in Europe implies their dismantling and the salvaging of second-hand equipment - in general well maintained - thus facilitating the purchase of investment goods at bargain prices by the developing countries. Naturally, it is desirable in every instance to make quite sure that the equipment in question is not obsolescent or technically outmoded, and it is well to check the quality and proper state of maintenance of this equipment, and the possibility of continuing to obtain spare parts. Another advantage for the developing countries of this situation among the Western multinational companies dealing in fertilizers is that the undertakings themselves are often still in a satisfactory financial situation, and only their plants really pose any problem. Furthermore, these firms are mostly producers not merely of fertilizers but also of a whole series of chemical or parachemical products (e.g. pharmaceuticals) which do not give rise to the same difficulties.

Finally, the agricultural sectors of the Western economies continue to be large consumers of fertilizers, and it may be assumed that their future supplies will come more readily from products manufactured by plants in which multinationals are participating, rather than from new producers in the Middle East or

countries with centralized economies. Hence it seems likely that flows of direct investment from the Western world to the developing countries prepared to accept financial and industrial intervention from abroad will be more and more numerous and important. The definition of France's policy on phosphates 11/ is symptomatic of this tendency:

It is stated that there is a growing trend towards relying on imports from the associated countries and accepting strategic withdrawals from certain production lines. The desirability of relocating some phosphate processing units in the countries producing the raw material is recognized. In particular, it is felt appropriate to let these countries bear the economic burden of the first stage in the processing of phosphate rock.

2.2 Methods of financing

From the point of view of undertakings in developing countries, the conditions governing the choice between the two main financing systems (capital contributions or loans) have undergone some change. For a long time, there was a decided preference in favour of financing in the form of loans for the following reasons:

- Loans do not imply any foreign participation in management, and this is particularly attractive to local entrepreneurs, who are often proud and anxious not to be beholden to multinationals, while Governments indicate their preference for a system of national development, independent of foreign sources, and self-centred;

- The influx of petro-dollars and savings from individuals in the international financial markets swelled more than was necessary the funds of commercial banks, which sought every form of placement and competed for their clientele of foreign borrowers by offering discounts and various other bonuses;

- Rates of interest were generally determined by LIBOR (the mean London rate), a variable rate which was for a long time less than, equal to or slightly higher than a very high world inflation rate. The practical consequence was that the real interest rate (the cost of the loan) could often seem very low, and in fact negative, and in any case lower than the average industrial profitability rate.

However, all this was only temporary, and the trend began to be reversed with the external debt crisis of the developing countries and later the decline in oil prices.

Today, the international financial market has less resources at its disposal and is less inclined to involve itself in countries caught up in the interminable round of seeking funds to pay off their previous debts. In addition, interest rates have risen, and in conjunction with the fall in world inflation have become largely positive, expressed in terms of real interest rates.

2.2.1 Capital inputs

Contributions by the local private sector or from abroad are only possible in the case of plants set up by private or mixed economy companies. The trend is to limit the number of State companies, and the opening-up of the capital of companies which were formerly public to the private sector with a view to mixed-economy companies is more and more common. Co-financing by diversified capital

---

11/ Fertilizer International, October 1987.

inputs is often sought for the following reasons:

- It curbs the call for loans and hence financial charges which can represent a heavy burden;
- It encourages undertakings to seek financial profitability;
- It includes on the board of directors officers other than officials delegated by the State as the only shareholder;
- It offers the guarantee that co-shareholders from the same industrial sector (whether the foreign are not), or kindred sectors, will be encouraged to seek sound management and to maintain the production machinery.

On the other hand, participation by private or foreign shareholders in the capital presents certain drawbacks or risk elements:

- It raises the profit margin regarded as necessary and included in the calculation of the retention price, and it is calculated in proportion to the capital (rate of fixed capital recovery between 12 and 15 per cent in general);
- It risks being an impediment to a national fertilizer policy which can sometimes be justified by criteria other than strict profitability vis-a-vis the manufacturers;
- It forces undertakings to pay out dividends and the State to offer more liberal regulations governing the transfer of foreign currencies, if the co-shareholders are foreign.

2.2.2 Financing by means of loans

First of all, fertilizer plants should envisage only long-term or at best medium-term loans to finance their investments. Since equipment has a depreciation period of approximately 12 years on average, in theory it is not recommended to borrow for less than 10 years - which has not always been the case in financing operations during the 1970s.

One particular problem arises in regard to the initial establishment of revolving funds. These, rightly regarded as investment, should be renewed during the operational period and more particularly during the "cruising period". Hence it can be estimated that a short or medium-term loan (3 to 5 years) should suffice to cover a large part of the initial requirements for a revolving fund. It will also be noted that in many recent projects, there has been provision for loans from abroad to be used to cover, as a priority, the project investment costs payable in foreign currencies, local development bank loans and capital being used only to take care of the other investments. This distribution of the use of financial resources enables subsequent outlays of foreign currency for servicing foreign debts to be kept down.

In the case of fertilizer plants, the rate of production growth is slow (2 to 4 years), following a fairly long period for the physical setting up of the project (in many instances there is a period of 3 to 4 years after the

decision to carry out the project, once the feasibility study and the financial arrangements have been completed). In these circumstances it is essential to obtain grace periods for the settlement of debt servicing, with if necessary a longer grace period for the repayment of the capital than for the settlement of the interest. Periods of five years and three years respectively would seem reasonable.

To sum up, financing by means of loans is subject to a number of constraints:

- A fairly long loan writing-off period, close to the depreciation period;
- Maximum limitation of the proportion of the loans payable in foreign currencies;
- Special treatment of the initial endowment for a revolving fund;
- Easy terms in regard to loan charges;
- Grace periods for the initial financial charges.

Recent examples indicate the ideal approach. IBRD, in particular, envisages the following procedure:

Example of a direct loan to a fertilizer undertaking: 12/

- A loan covering 15 years at the normal rate (at present 7.92 per cent), but variable according to generous criteria applicable by IBRD, with a grace period of five years;
- A ratio of long-term debt to capital action which can be 60/40 but should then decline from the cruising period and the introduction of servicing of the debt;
- Utilization of funds borrowed from abroad exclusively for the coverage of expenditure in foreign currency, part of the latter remaining to be covered by a portion of the State capital contribution;
- The internal cash generated by the project should cover the renewal and subsequent augmentations of the revolving fund.

On the other hand, IBRD requires of the company to which aid is given:

- That the ratio of long-term debt to capital shall never be higher than 60/40;
- That the observance of certain management ratios shall be respected by the undertaking, e.g. the "current" ratio (short-term net assets to short-term debts) which shall not be less than one or two, and a ratio of coverage of debt servicing higher than one to three;
- That the raising of new short-term loans shall not lead to a worsening of the ratio of coverage of debt servicing;
- That the settlement in advance of interest or dividends shall not adversely affect the above ratios;

12/ IFFCO Project - Agricultural Co-operatives, IBRD, 1986.

- That financial auditing shall be carried out regularly.

The case of the reversionary loan (a loan granted to the State and subsequently passed on to a company).

The example is that of a project for setting up a large fertilizer plant 13/, where the financing needs amount to $635 million, the State and self-financing by the undertaking constituting 48 per cent of this. Long-term loans amount to 48.3 per cent. IBRD, on its side, contributes only 32 per cent of the financing required. But the loan is granted to the Government, over a 20-year period with five years deferred payment, subject to IBRD's present interest and commission conditions (variable interest rates, equal in 1987 to 7.92 per cent).

The Government will take the exchange risk and the various relative tasks normal to a government loan. It will subsequently pass on the loan to the State company at an annual rate of interest of not less than 12.75 per cent, with a maturity period of 15 years and a grace period of five years. The principle is that the loan to the company should be in conformity with the usual conditions of long-term loans by the Government to enterprises in the private sector.

Likewise envisaged in this project is co-financing with bilateral agencies, and a call for short-term credit by local commercial banks to cover 65 per cent of the initial endowment of the revolving fund, the remainder being regarded as an investment covered by the funds themselves or long-term loans.

Another case, this time in Africa and of more modest proportions 14/, involves a rehabilitation project, but an analysis of the financing conditions is interesting. It is a co-financing venture combining self-financing by the State producing company, two financing ventures by bilateral agencies, and one supplementary loan from the International Development Agency (AID - a subsidiary of IBRD). This loan is granted to the Government on AID's extremely soft terms (30 years, 2.5 per cent, 10 years' grace).

The Government passes on the loan to the undertaking at a rate of 9.7 per cent (the regular IBRD rate plus 10 per cent) over 15 years with five years' grace, the usual condition for long-term loans in the case of commercial or industrial undertakings.

Similarly, the other contributors of funds, bilateral agencies from Western countries, make loans direct to the Government on extremely easy terms:

30 years at 3.5 per cent with 10 years' grace in one case;

30 years at 2 per cent with 10 years' grace in the other case.

The Government will convert one of these loans into an increase in the undertaking's capital and will pass the other on at a rate of 10 per cent over 15 years, with five years' grace.

In the case of the two loans passed on, what we actually witness is that the Government which hands over the exchange risk to the undertaking may in certain instances virtually regard the credit grant as "revolving", thus enabling it to envisage financing a further second project at a later date on the basis of the repayments made over 15 years by the undertaking at a normal rate of interest, whereas it will only make its own repayments to external

---

13/ The "Madhya Pradesh" Project, IBRD, 1984.
14/ Zambia, NCZ Project, IBRD, 1986.

sources of funds over 30 years at a nominal rate of interest.

With regard to the case of conversion of a government loan into an increase in the company's capital, clearly the main interest is to augment the capital component of the undertaking, whereas the State can easily pay the amount in question over 30 years at 3.5 per cent with 10 years' grace, the likely rate of inflation making such a loan virtually the equivalent of a donation, which it is then fairly easy to convert into capital.

3. MAJOR TRENDS ARISING OUT OF FINANCIAL ARRANGEMENTS FOR FERTILIZER PLANT PROJECTS IN DEVELOPING COUNTRIES

Over the last 10 years or so, many financial arrangements for fertilizer plants have been carried out or are in the process of negotiation. A few will be mentioned in the paragraph below. The first point to be made is that these arrangements have taken a long time to set up and that in most cases they have involved co-financing, regarded as "participation by several sources of financing in a single industrial operation".

3.1 Examples of recent financing schemes

The following list is by no means exhaustive. Its purpose is simply to indicate the diversity of types of co-financing and of those involved according to different methods used:

A plant in India 15/

An agricultural co-operative production company. Financing needs: $633 million: co-financing by IBRD (18 per cent), OECF - Japan (20 per cent), Italian Aid (3 per cent), Danish Aid (1 per cent), Indian Government (14 - 24 per cent), the owner co-operatives (6 per cent) and self-financing by the company (15 per cent).

In Zambia 16/

A project (rehabilitation) will be co-financed in an amount of $69 million by IBRD-AID, German Aid, Japanese Aid and self-financing by the State company.

In India

A project for a fertilizer plant involving the Federation of Agricultural Co-operatives and two other private Indian capitalist groups, intervening regularly in the petrochemical and metallurgical industries. Another combines the financing by a private Indian company with an American oil company and a chemical multinational.

15/ IFFCO Project - Agricultural Co-operatives, 1986.

16/ NCZ Project - Rehabilitation, 1986.

In Senegal

The ICS project for the production of sulphuric and phosphoric acid, TSP and DAP, combines in a sum amounting to $240 million funds originating from the Senegalese Government itself, a French chemical group, a private Indian group, public funds from India, Nigeria, Cameroon and the Ivory Coast, with loans from IFC, EIB, CCCE, BAD, the OPEC Fund and ABEDA. This is probably the financial arrangement embracing the largest number of participants in recent activities connected with the setting-up of fertilizer plants, and it no doubt explains the time needed for the project to take off - it was begun 10 years ago. The original arrangements for the financing scheme constitute a pilot experiment which will be referred to again in the second part of this chapter.

In Pakistan

A recent project was co-financed by a multilateral oil company and the State, and another by the State together with a private American chemicals group. A third project brings together the National Fertilizer Company, the Government of Abu Dhabi, the OPEC Fund, IBRD, and commercial loans from American banks.

In Qatar

A local fertilizer company receives co-financing from a private Norwegian company.

In Abu Dhabi

A French oil group co-finances a fertilizer plant set up by the local petroleum company.

In Nigeria

In the case of a project now being set up, the co-financing is being taken care of by the Nigerian Government, a British corporation which is constructing the plants, and private chemical companies.

3.2 Participants in the co-financing of fertilizer plants

3.2.1 Local sources of financing

The State Budgets

This major source of financing for fertilizer plants in the past, namely the utilization of capital equipment budgets, now greatly reduced since the cash flow crisis of the early 1980s, is highly dependent on:

- The trend in custom dues and other tax revenue. The contraction of the GNP and of imports has reduced the State budget capacity;

- The strategic choice between investment budgeting and operational budgeting, the maintenance of the level of the latter often taking precedence over new equipment.

- Priorities between the sectors of activity where the State has to intervene financially, in keeping with its development plans.

Nevertheless, the State is still frequently called upon to take part in new industrial projects, even though the trend is towards reducing the direct financial role of the State. The bias of participation is in favour of share-holding (through the intermediary of a public financial investment company, a State holding company, or a national development bank), or medium or long-term Treasury advances.

Public financial institutions at local level mobilizing public or private savings take action on the basis either of their own resources (capital, reserve funds or marginal financing), or of capital advanced by the State or by foreign financing institutions. Direct financial participation by this type of institution depends on the success or otherwise of its past investments, its capacity for autonomous finance management, its sound assessment of projects submitted to it, and the confidence placed in it by other holders of internal or foreign financial resources interested in working through it.

Local industrial undertakings can generate a margin of self-financing enabling them to participate in new investments. More frequently in rehabilitation projects, the utilization of the financing capacity of undertakings producing fertilizers as backing for new schemes or the extension of existing capacity is largely dependent on past performance in regard to self-financing and accumulation of capital. For a long time, however, undertakings producing raw materials (oil companies or coal mines) or companies manufacturing intermediate basic chemicals, have been the ones most frequently investing in fertilizer plants.

Agricultural co-operatives, where they are well managed, may take part in the financing of fertilizer plants, and often do so most effectively, as in the case of India.

Insurance companies or local provident funds and sickness insurance funds are potential financial investors, placing their capital provided that the feasibility studies are sufficiently persuasive, that a profit is assured, and that the value of the capital invested is guaranteed, e.g. by the State.

The local commercial banking system tends, because of the narrowness of its financial base, to confine its participation to operations involving short-term mobilization of its capital - commercial activities, or short-term loans for running a business.

The national financial market. This source is mentioned only by way of indication, in view of the virtual non-existence of organized financial markets in Africa.

3.2.2 External sources of financing

The range of external financing is wider and seemingly more accessible in the case of fertilizer plant projects; it embraces the following:

Financial participation by multinational corporations or other foreign undertakings contributing capital to ensure exclusivity for products not manufactured in the receiving country - for example EMC (France) in the Senegalese ICS - in order to provide regular supplies of certain fertilizers, or more simply, to diversify their activities and risks abroad, or to have the certainty that they will be able to export their technology or gain a foothold in the fertilizer sector of the receiving country.

Undertakings producing capital equipment, raw materials (feedstocks), know-how and training, can either become participants or at least obtain credit conditions, which frequently can be mobilized in their own countries, from specialist banking institutions (export credit, purchaser credit, supplier credit), in order to be sure of capturing a particular market. The grant of generous export credit conditions is often one of the main criteria inducing the receiving country to place an order with this or that supplier rather than another.

The large international commercial banks play a less world-wide role than previously in industries in the developing countries and are more inclined to lend to States or to specialized financial institutions, which then pass on the funds to the fertilizer sector. The administrative bodies concerned with bilateral aid take action frequently, financing identification, pre-feasibility and feasibility studies, and also diagnosing and auditing undertakings or ensuring the financing of the technical assistance needed to launch a project.

The specialist public financial institutions of the developed countries, such as CCCE in France, KFW in Germany, etc., are large-scale purveyors of financial resources on easy terms in the form of medium or long-term loans. These institutions are a priori more concerned with economic profitability (favourable impact of the project on development in the receiving country) than on financial profitability in the strict sense, since the loans are normally guaranteed by the receiving State, or even granted direct to the State to be passed on subsequently to the industrial undertaking.

These foreign public financial institutions have as a rule set up branches specializing in capital participation in industrial undertakings in developing countries (Proparco in France, OPIC in the United States, OECF in Japan, etc.) which participate as minority shareholders in private or mixed enterprises and hence are more concerned about financial returns than their parent companies.

Multinational public financing institutions, world-wide (IBRD), European (EDF) or regional (BIAD, BAD - Africa, BAD - Asia), etc., are the main providers of funds on soft or normal terms at present. Medium or long-term loans are generally made to the State to be passed on subsequently to the industrial undertaking.

The stress in studies on loans is placed both on the financial aspect (profit pure and simple) and on economic profitability (the development aspect).

It should be noted that like bilateral financial aid institutions, multinational and regional financial aid institutions have set up branches specializing in holdings in the capital of private or mixed industrial corporations such as IFC, a subsidiary of IBRD, the Development Corporation, a subsidiary of BIAD, and EIB (European Investment Bank).

Two series of non-traditional financial bodies might well increase their interest in the financing of fertilizer plants in the developing countries. These are:

- SICAV 17/ and venture capital companies. These can play a role in developing countries, in particular SICAVs specializing in holdings in the capital of industrial corporations operating in developing countries and recently set up in certain Western countries. It may also be felt that venture capital companies in the Western world could well, following the recent stock market crisis, be encouraged to specialize less in Western high technology and accept a diversification of their risk by turning towards financial support to developing countries.

- Islamic Development Banks (BID), where intervention techniques of the "mudarabah" type (somewhat similar to mixed laibility or risk venture), "ijazar" (leasing) or "shirkah" (equivalent to limited companies) are particularly attractive for developing countries, but have so far only made their appearance on a small scale in the fertilizer sectors of developing countries. But since these techniques are actually based on the principle of the "shared risk" and profits from interest-bearing loans are forbidden by the application of the "Shariah", this means waiting until projects at present under way have made profits (or the member countries reconstitute the capital of the BIDs) before large-scale intervention by the Islamic banks can affect the fertilizer industry. At present, shares in this industry represent only 5 to 10 per cent of interventions by the BIDs.

3.3 Development of the joint venture

The spread of the joint venture (JV) in the fertilizer plant sector as a method of co-financing which can be adapted to all types of undertakings, from the small and medium-sized to the very large project, is no doubt the system followed most regularly by the Governments of developing countries anxious to look into any possibilities of financing, but it implies the acceptance of input, of foreign capital and a certain measure of foreign

---

17/ SICAV: variable capital investment companies. These "Open End Investment Trusts" have a portfolio of shares and bonds of varying kinds, the capital varying according to the purchase or sale of securities by the company.

managerial intervention in the running of national undertakings.

The various forms of joint venture

These are types of co-financing of particular interest to very small projects, since they involve a priori less delay in gestation, especially when they are based on financial arrangements with few participants.

The JV does not always necessitate intervention by the State, though it should be pointed out in some countries government authorization is necessary in order to comply with the regulations governing intervention by foreign capital or physical and juridical persons in the national economy. There are also examples of JVs between Governments, or between a Government and a local, regional or multinational financial institution, or again between a foreign private firm and the shareholding State, thus constituting mixed economy companies. JVs can similarly take the specific form of agreements relating to the assignment or transfer of technology and patents, or contracts covering training and management, or they can provide solely for contributions in kind on the part of the foreign partner, the financial inputs being made by the local partner or the shareholding State. Moreover, intervention by a foreigner in the capital of a national company producing fertilizer does not necessarily imply any rights in the undertaking's decision-making, since the shares issued against the capital contributed may in some cases, according to the legislation of the individual country, take the form of shares with limited voting rights. 18/

Usually the distinction made between the several types of JV is based mainly on the objectives aimed at by each of the partners. Thus commercial JVs are motivated by the concern of the foreign partner to find a place in a new market, to gain access to a new source of raw materials, to obtain a return on its technology, or more simply to make a profit. In some instances the foreign partner, limited by restrictive measures in the host country in regard to foreign influences affecting the economy, will have a share in the capital of less than 50 per cent, but he can improve this minority situation, if need be, by a series of separate agreements with the undertaking relating to his intervention in the direction, management, commercial and training activities, use of his technology (management contracts, training contracts, technical assistance contract), etc.

Cases of JVs of this type in the fertilizer industry are numerous. A recent case in Nigeria has been analysed by UNCTC, 19/. It concerns a nitrogenous fertilizer complex in which an American transnational holds 51 per cent of the capital, the remaining 49 per cent being contributed by an industrial partner and various local financiers. The American partner provides the technology, technical assistance and a large proportion of the management team. It also takes responsibility for production, financial, marketing and organizational management, and undertakes the training of the Nigerian executive personnel

---

18/ In this respect, it may be noted, for example, that Brazilian legislation (26/1/87, Circular 1554 of the Central Bank of Brazil) specifies that "direct or indirect participation by foreign capital is limited to 50 per cent of the capital and 33.33 per cent of the voting rights..."

19/ UNCTC Advisory Studies - Arrangements between JV Partners in Developing Countries, United Nations, New York, pp. 24 and 25, 1987.

over the medium and long term. The local technical partner and the major investors on the Governing Board make it their business to provide information relating to the local economic environment and regulations, and also to maintain relations with the government authorities and take part in local marketing with the Nigerian farmers. On the other hand, they are not interested at the moment in playing an important part in formulating the general policy or organizing the day-to-day running of the undertaking, and in this matter they place their trust in the foreign partner and appear to be satisfied. They are happy with this type of co-operation, and the Nigerian Government, which had to approve the foreign participation in advance, considers that the gradual nigerianization of the staff, and then of the capital, is sufficiently well programmed chronologically to enable it to accept provisionally an effective direction of the enterprise by a prestigious multinational, whose management, incidentally, provides excellent profitability and satisfactory dividends. The Government also appreciates the effort made to make the best possible use of local inputs (thus saving foreign currency) as well as the fact that the first agricultural economy reports show an effective increase in agricultural production - a priority factor in the Nigerian development plan.

Other JVs of this type may be cited in the fertilizer sector, some of then incidentally involving foreign partners from already industrialized developing countries. For example, we find an Iranian oil company taking part in a JV in India, or again a Mexican fertilizer producer, an autonomous subsidiary of an American group, involved in another Indian project.

JVs geared to development aid imply foreign partners consisting of State enterprises or Governments anxious to participate in the development plan of the developing country initiating the fertilizer plant project.

In particular, many Arab countries, new producers of fertilizers and possessing technological know-how in the field of petrochemicals, are taking part in the financing of fertilizer plants in developing countries, sometimes bringing along with them not only Western bilateral or multilateral aid, but also specific sources of financing such as the OPEC Fund, ABEDA, the Islamic Development Bank, all of the bodies entitled to take out minority shares in the enterprises of the countries receiving aid.

Some JVs are characterized by the concern of each partner to achieve a certain measure of complementarity of their various material resources.

For the moment, most of the agreements have been between undertakings in the countries of the Maghreb (phosphate processing) and intermediary production firms or nitrogenous fertilizer undertakings situated in the Persian Gulf. The undertakings thus set up in the form of joint ventures may extend their range of production of fertilizers by using imported ammonia from the Gulf.

Other countries which do not possess either phosphate or ammonia have set up plants co-financed by undertakings operating in producing countries to manufacture their own fertilizers from raw or intermediate materials imported from these same countries, as part of supply agreements annexed to the JV contract (e.g. Turkey with Tunisian and Kuwaiti firms). Such agreements also exist with producers from developed countries such as the United States of America, a large producer of phosphates, some of whose mining and intermediate chemical companies co-finance projects in Tanzania, Korea, Trinidad and Tobago and Sri Lanka, within the framework of joint ventures.

Among the many recent JV agreements, the large schemes involving participation by the Government of Nauru and the National Phosphate Company of Nauru in joint ventures with the Philippines and India are noteworthy.

Finally, there are examples of JV projects of a regional nature, the best known and no doubt the most complex from the point of view of financial arrengements being the ICS project in Senegal. This JV is, incidentally, not only regional in nature (since the Governments of Cameroon, the Ivory Coast and Nigeria take part in it financially as potential consumers of the products which will be manufactured by it); it is also an aid-type JV (with participation by French and Indian undertakings) as well as a JV motivated by the availability of supplementary raw materials (the Indian Government will receive, as a counterpart to its 19 per cent share of the capital funding, 50 per cent of the annual programmed production of phosphoric acid).

Since, by the way, as a counterpart to its own financing of this project, Senegal has received support in the form of participation or loans from SFI, BEI, CCCE (France), as well as BAD, the OPEC Fund or ABEDA, clearly this is a typical example of a JV with several irons in the fire and several partners embracing all the types of co-financing mentioned above.

3.4 Rehabilitation of plants

The rehabilitation of plants is in principle more attractive than a completely new project, inasmuch as this operation is regarded as less costly and economically more rational than setting up new productive units. It affects, of course, only countries which are already equipped and are anxious to improve the management of their production facilities, as well as, in general, undertakings in the public or semi-public sector. Examples up to now are to be found mainly in Asia, but also in a few countries in Africa.

The rehabilitation measures can be directed towards the implementation of measures designed to increase the use of installed capacity, to reduce the intermediate consumption of inputs, raw materials or energy, through the development of new technologies, the alternative use of new catalysers, or the replacement of naphtha by natural gas. Rehabilitation of a system of fertilizer production units can also consist in reviewing management methods (decentralization of productive units, reductions in staff and staff training, improvements in processes and methods of marketing, etc.). Finally, rehabilitation of the fertilizer supply system can also be done through improvements in methods of distribution and delivery of the finished products to the user, through a better agricultural credit system which determines the user's purchasing power, and through rationalization of the method of fixing prices ex-works, particularly with a view to establishing a fixed price which will make it possible to keep books for bills receivable and payable, profits, and forecast tables of financing and liquid assets.

Rehabilitation programmes are thus more often than not highly diversified and call for adjustments in financing. They imply the simultaneous or separate financing of:

- Diagnostic studies and recommendations or preliminay financial and managerial audits of the plants to be rehabilitated;

- General studies relating to the definition of the market, ways and means of calculating ex-works prices, etc.;

- Technical modifications, necessary repairs, installation of new equipment, making it possible to effect economies in costs: savings in energy, cuts in outgoings, new technologies, etc;

- Managerial reforms, staff reduction costs, and restructuring of organizational charts;

- Programmes for training or recycling plant personnel;

- Possible programmes of technical assistance and on-the-job training to be entrusted to leading world specialists;

- Programmes and tools of permanent ancillary research, etc.

This list of components of a rehabilitation policy is not complete. Some call for long-term financing, others can do with short-term financing. Some are better financed from the undertaking's own funds, others can accept financing on the basis of loans. In spite of what one might think, the cost of such operations is not negligible, and it seldom comes within the self-financing capacity of an undertaking or even of a not too prosperous country. The order of magnitude of exhaustive rehabilitation programmes met with depends obviously on the rehabilitation schemes envisaged, and the size of the plants. By way of example, the programme for the complete rehabilitation of a complex of two plants situated in Africa cost in 1985-86 the sum of $84 million 20/. Another rehabilitation programme for five plants, situated in a country in Asia, cost approximately $187 million, with slightly different components, and a situation at the outset less catastrophic than the African example. A second Asian rehabilitation scheme will cost $135 million.

From these figures it is impossible to calculate an average: the African example consists of rehabilitating plants with a production capacity of 53,000 tons of nutrients (of the nitrate of ammonium type) used at only 20 per cent capacity, whereas the first Asian example consists of rehabilitating and bettering five plants (already using between 65 per cent and 85 per cent of their productive capacity), and allowing for an increase in production of nearly 200,000 t/y of fertilizer. The second Asian example includes, moreover, some additional storage equipment.

In the three cases, however, the rate of economic profitability amounts to over 30 per cent, whereas for setting up plants the rate in the best of circumstances is not more than 18 to 20 per cent. From the point of view of financing methods, it may be noted that these projects also need co-financing, implying: a multilateral aid agency providing support in the form of government loans (80 per cent of the total financing needs) over the long term (15 to 20 years) with five years' grace. The funds, handed back to the undertakings, cover essentially equipment and material costs, but also the acquisition of patents, licences and technological support services, as well as the cost of training and technical assistance, the principle being to ensure through these loans the availability of foreign currency to meet the needs in question. The rest of the financing

---

20/ Zambia Project, 1986, World Bank.

comes from:

- The undertakings themselves as regards the financing of investments payable in local currencies: civil engineering and buildings, part of the equipment, the costs involved for consultants, taxation, cost of reorganization and local manpower, etc;

- The local commercial bank network, through short-term loans to increase the revolving fund and to round off the internal resources of the undertakings to cover expenditure in local currencies.

In certain instances, external financing also includes other bilateral aid agencies which furnish loans frequently on easier terms than the large development banks, multilateral or regional. The rest of the internal financing is provided by the State or local development financing institutions which normally the State controls. The local commercial banks are not systematically asked for more than possible short-term loans (carry-over or modest supplementary loans).

It should be noted that in these rehabilitation operations the State intervenes most of the time by increasing capital rather than by making loans. Actually, plants due for rehabilitation have as a rule already had poor management, which has led to a net loss of capital, and the task is to reconstitute the capital so as to re-establish an acceptable ratio between its own funds and indebtedness. In this respect, the State, in addition to its own new financing contributions, may also convert into capital part of the soft loans already made to it, essentially in the case of very long-term loans at nominal rates of interest such as those frequently granted to the "least advanced countries" by specialized multilateral or bilateral agencies. Governments can also take advantage of the administrative and financial reorganization accompanying rehabilitation to force the directors of firms to convert into capital certain debts abandoned by the creditors or certain donations in kind 21/ obtained in the past, so as to improve the structure of the firms' balance sheets and enable them to straighten out past difficulties.

Private financing, national or foreign, is on the face of it reluctant to intervene in the rehabilitation of plants not controlled by the financiers themselves, because of the risks involved. Nevertheless, the repurchase of plants losing momentum or going through difficult periods by undertakings competing in the same sector, multinationals, or national or transnational holdings in particular, within the framework of privatization policies, may be regarded as a form of financial participation in a rehabilitation operation. This repurchase will in general be followed by a drastic restructuring of the plant, the objective being no doubt concentrated far more on a strictly financial profitability goal than in the case of rehabilitation carried out on the basis of public financing or financing by foreign aid institutions.

In conclusion, it is not certain that rehabilitation operations are always either feasible or desirable. The financial gaps created can be such that the cost of restructuring may be higher than the cost of setting up an entirely new productive unit; and in this case there will often be a liquidation operation pure and simple, followed by a sale or a handing over of the net assets to a hypothetical taker. This operation, which is always the most costly for the

---

21/ Gifts by humanitarian organizations in the form of fertilizer, for example, received by a fertilizer company and resold by it to the farmers, thus increasing the turnover of the firm.

State, is actually the reflection of industrial failure. Liquidation followed by a fresh start is nevertheless often preferred by private financiers, inasmuch as they do not have to encumber themselves with heavy liabilities or technical and social difficulties brought about by the necessity for reconstruction.

The rehabilitation "option" is thus not justified in all cases that arise, and for this reason we often find prior studies, described as "studies of restructuring of the industrial sector, public and semi-public", where for each sector the various options envisaged are analysed: abandonment of public debts, takeover of debts by the State, increase of capital, liquidation, conversion into mixed companies, privatization, creation of new undertakings or manufacturing units, etc. These studies round off the industrial development plans very neatly by enabling a thorough analysis to be made of each technical unit constituting the industrial fabric.

3.5 Integration of operations

Usually, analytical reports on the financing of industrial units do not go into this matter; they tend to consider that the only real financing problem is the difficulty in finding sufficient local savings and motivation for investment in industry. Yet as regards fertilizer plants, where the operating conditions and the clientele are quite special, it should be noted that specific difficulties arise in connection with the financing of operations.

3.5.1 Peculiarities relating to the functioning of fertilizer plants

Such problems arise in this sector for the following reasons:

The plant must operate the whole year round and make maximum use of its productive capacity;

The finished products are consumed only at certain times of the year, and users must be supplied subject to severe quality, quantity and delivery date constraints;

This means that one is faced with an industry which has to work continuously to meet an imperative seasonal need.

The final clientele is widely scattered geographically, consisting as it does of those who work in the agricultural sector, namely small and medium farmers. These users, existing or potential, are not properly accustomed in the developing countries to realizing fully what the notion of investment is and implies; and fertilizing the soil is after all in itself a sort of investment.

Fertilizer plants do not generally have to take charge of marketing right up to the final user, but the difficulties exist already at the level of transactions with middlemen. A plant is often designed for a production capacity which goes beyond the level of present consumption, and in keeping with the wishes of the national planners it counts on an increase in national consumption. One of the problems is to convert potential demand into real demand that can be met, in other words to adapt production and demand and to avoid over-production.

A second potential clientele is that of foreign markets; but in general this is a second stage in the lifetime of the project, and it occurs only when the needs of the local end-users are met. It is all the more necessary to be cautious in this direction, because international competition is keen and the economic situation is characterized by a bitter struggle between producers facing a certain degree of over-production and having to cope with markets which are more and more protected and to accept depressed prices. In this connection, and to end the discussion of exports, the rare cases of industrial projects designed largely for export have been so from the outset, inasmuch as setting up the project included more often than not financial participation by potential future foreign purchasers and agreements on regular supplies specifying quantity, quality, prices and delivery dates.

3.5.2 Financial consequences

The consequences of this situation in regard to financing are as follows:

The economic situation, the way of life and the traditional financial behaviour of peasant farmers make it impossible for them to have at their disposal at the right time the considerable sums of money needed for the purchase of fertilizer. Those who are in the habit of using fertilizers turn to traditional sources of credit (go-between lenders, tradesmen, etc.) or the institutionalized sources in the most satisfactory of cases, when banks or agricultural credit institutions have set up local agencies. The ideal is a situation where the farmers have reached a stage of economic and social evolution which warrants their embarking on a system of co-operatives able to play the part of a supplier of credit and at times that of an organ for the diffusion and marketing of inputs (including fertilizers).

In short, fertilizer plants are highly dependent on the existence of a sound system of agricultural credit, which they cannot organize themselves. Intermediate marketing organs are necessary. They can be firms in the private sector specializing in the supply of inputs or purchasing agricultural products of various kinds, public corporations or peasant co-operatives, this last option being by far the least costly for the farming community and the one most likely to meet the real needs of its members.

With this small number of clients, the plant can then negotiate possible commercial-type settlement dates (30-60 days' grace) together with counterpart arrangements of the "deliveries staggered over the year" type, the use of other storage facilities, etc.

The national banking system must be aware of the need to take account of the constraints affecting fertilizer plants, which have the same characteristics as other seasonal activities, and to this end the banks must provide adequate support by way of operational financing. In particular, the financing of the revolving fund, which is particularly crucial in the case of an activity where inputs can represent more than 60 per cent of the costs, necessitates recourse to financial innovations which must set up not only local banks but national or foreign suppliers of inputs or spare parts. This is one of the reasons why a comfortable level of initial endowment of revolving funds is as a rule financed right from the launching of the project under the heading of investment.

3.5.3 The role of the State

The State has to try to encourage the setting up of an overall organization, which from the financing point of view must comprise:

- A viable agricultural credit system;
- An autonomous operational system of fertilizer marketing;
- Instructions to the banks relative to the financing conditions specifically affecting fertilizer plants, together with suitable encouragement and interest bonuses if need be;
- A coherent system of fertilizer price fixing;
- Selective protection of local fertilizers vis-a-vis international competition;
- Adaptation to what for fertilizer plants can afford in the way of amounts, and conditions of settlement, of taxes, charges and obligatory subscriptions, and adaptation of the investment code to meet the specific problems of manufactures with a seasonal clientele.

On the other hand, it no longer seems realistic to try to make a general rule of direct intervention by the State in the financing of fertilizer plant operation. Admittedly, in many developing countries the manufacture of fertilizers is characterized by considerable participation by the State or public or semi-public financing institutions. It is only recently that joint ventures with the private sector, domestic or foreign, have begun to see the light of day. Whatever the financial structure of the capital, it is always well to realize what is the model most likely to make for greater efforts towards productivity, growth and vitality in the producing firm. Even in State plants, the trend - in China for example - is for the responsibility to fall on the producing units. The concern to bring about a spirit of enterprise (and hence a search for profit) has led, for example, to the replacement of "offset subsidies" by repayable loans or advances, thus forcing manufacturers to make provision for financial charges and to take account of the cost of investments in their accounting. State enterprises, like others, must provide for and follow their depreciation schedule. In fact they must remain in control of the use of a larger and larger part, if not the whole, of their net profits in the interest of giving a financial boost to their personnel, making new investments, or writing off capital. The time when the public manufacture of fertilizers could afford inefficient management, poor organization of work, a permanently over-large staff, operations running at a loss, and uneconomic selling prices, while remaining confident in the assurance that the State would subsidize the losses (offset subsidies) or would automatically finance any additional investment by increasing the capital from the State budget, is definitely at an end. The submission of balanced accounts and the realization of genuine profits are necessary to attract and maintain foreign capital, private or public, and liberalization of where the profits go is essential in the eyes of non-public shareholders.

3.6 New ways and means of financing that can be envisaged

3.6.1 Temporary concession of financing and management

In dealing with large-scale projects, certain recent initiatives to attract entrepreneurs and financiers from abroad need to be analysed and followed closely. These include the establishment of a type of joint venture known as B.O.T. (Build, operate and transfer) which is similar to the "concession" technique. The B.O.T. technique is an agreement made under the aegis of the Government between a local undertaking and a foreign enterprise or group with a view not only to carrying out but also to financing and managing ("provisionally for a long time") a large-scale economic project, generally industrial. The agreement, which is very similar to a temporary public service concession applied to the industrial sector, envisages in particular that the foreign partner shall seek the financing and put together the financing arrangements, take care of the management for its own benefit over 15 years, and subsequently sell to the local minority partner the whole of the industrial complex after is has given evidence of its viability. Such a system is only conceivable in the framework of a liberal and open economy, and it obliges the foreign partner to operate very efficiently and profitably, since in practice the investment outlay will be recouped only after 15 years, and if he still wants to make a profit from his investment, his management must be first class.

Another good point is that the local minority partner has little to do by way of investing and will gain the advantage of real transfer of technology (including management skills) which will take place over a number of years. In addition, the local economy will benefit immediately, without excessive financing at the outset, from the production of the plant, and will reap back full ownership of the plant at a modest cost, since a large part of the equipment purchased will by that time have been written off. Up to the present, operations of this type have taken plan mainly in the energy sector (a thermal plant in Turkey, a nuclear plant in Indonesia) - large-scale projects involving more than a billion dollars. No doubt such schemes represent a gamble by the foreign partner, who lays odds on the observance by the local economy of undertakings given and the relative freedom of selling prices; and they also imply as a pre-condition a prior understanding on the price of the final handing over, etc. One immediate problem, which however seems to have been solved in the case of the Turkish project, is that of knowing what will be the attitude of export credit institutions in the industrializedcountries, since it seems likely that the foreign partner, investor and financier, will definitely need to refinance part of his investment. But this only becomes a real equipment export operation at the end of 15 years, a period too long on the face of it to be able to enjoy a benefit in the way of a normal operational credit.

3.6.2 Equalization agreements

Although they have been strongly criticized by GATT, IMF and IBRD, equalization or countervailing agreements have multiplied over the last few years until according to some sources they represent nearly 30 per cent of all commercial transactions throughout the world. This technique, begun in countries lacking convertible currencies and anxious to keep their trade balance and balance of payments in the clear as best they can, is beginning to be applied, following the lead of the planned economy countries and Asia, by many African countries.

These various countervailing techniques (barter, parallel import and export agreements, repurchase of finished products, etc.) can serve as methods of financing for industrial investment operations in developing countries. The principle is as follows: two parallel contracts are actually signed, the one providing for setting up a plant or purchasing equipment and/or technology, the other (the countervailing part) stipulating that the supplier of the equipment shall purchase at a fixed price a certain quantity of the products of the purchasing country, or in the case of repurchase of products, a certain percentage of the production of the future plant. The existence of two separate contracts allows the contracting parties to finance their contributions through national external trade financing systems. The notion of repurchase of the finished products is the most attractive and the one most practised to-date in the fertilizer sector, but it is also the most complex from the financial point of view. At first sight, it looks like long or medium-term credit granted by the equipment supplier, since a long period elapses between the time when the plant begins to be built and the date on which the amount of the investment will finally be covered by the last delivery of the finished product stipulated in the counterpart agreement as equalization.

In actual fact, the initial agreement (the establishment of the plant or the supply of equipment and/or technology) will be financed as an ordinary export operation based on the system of insurance and export credit existing in most of the industrialized countries and in some of the more industrialized developing countries. It can happen, however, that the supplier of equipment may prefer, for reasons of cost or because he has confidence in his client, to grant what is for practical purposes a real credit of 70 to 75 per cent of the amount of the investment repayable in kind by the importer, as provided in the counterpart contract, and have this credit financed by his bank or a one-time payment (for example, selling it on the basis of a discount to a financial institution which will become the possessor of the credit certificate and will make himself responsible for arranging settlement at the dates fixed in the contract).

Thus in practice, equalization by repurchase of the finished products amounts to financing, by means of credit and guarantees from the banking system or financiers in the industrialized country, a long-term credit to the entrepreneur in the developing country, this credit being guaranteed by the finished products which must be purchased by the exporter in accordance with price, quality and delivery conditions written into the counterpart agreement. In the fertilizer sector, the recent case of Tunisia is quite eloquent as to what can be done. A consortium of French firms (civil engineering and plant installation companies associated with an "assembler") has just signed a contract with Tunisia for $101 million to set up a phosphoric acid plant. As a counterpart to this contract, the consortium will purchase over a period of four years $134 million worth of Tunisian products (agricultural products, natural phosphates and textiles) which will be exported outside the EEC. Naturally, the French firms will have obtained credits from their banks and the support of export credit organizations to finance their own expenditure. As far as Tunisia is concerned, the advantages are obvious: guaranteed export of certain of its agricultural and industrial products, and no spending of foreign currencies. As for the firms in industrialized countries, the adoption of this financing technique will no doubt have enabled them to obtain the contract, but they run the risk of having difficulty in re-selling the products on an already congested market with which they are ill-acquainted. Moreover, export insurance companies in the developed countries do not generally cover risks relating to counterpart contracts. It can nevertheless be assumed that these firms will bring with them

international trading companies specializing in this field, and their number and competence have increased in the last few years. The counterpart to the main contract (in the case in point, the establishment of a fertilizer plant) might, incidentally, have been a commitment to repurchase part of the production over several years, and in this respect the agreement between the Indian Government and industrialists on the one side and the ICS in Senegal on the other partly resembles a system of investment financing by repurchase of the finished product.

The main obstacle to the system of equalization to cater for the financing of an industrial investment project lies in the negotiation of the price of the products accepted in compensation: should it be the international market price? (the trend here is very uneven over a long period) or a price adjusted according to the indices? (if so, which?). But the other problems have to be solved; what guarantee can the investor be given that the counterpart products will be duly delivered by the delivery dates, in the right quantities and in conformity with the quality standards laid down in the equalization agreement?

Equalization must be used with great care as a means of financing investment. The technique is complex, and while we usually find a certain reluctance on the part of exporters, we also find that they are prepared to avail themselves of this technique the moment they are anxious to win the contract. In the establishment of plants sector, where competition is very keen, acceptance of a counterpart arrangement may be sufficient to win the contract. But is must be clear that if exporters in the developed countries find themselves forced to accept this technique, they will be properly equipped for it and have specialist teams of negotiators. While the main risks appear to be on the side of the exporter, there are also risks on the side of those who receive capital goods. In particular, the knowledge of how to negotiate and to draw up clauses for the evaluation of prices of counterpart products is quite an art, which the negotiators of developing countries have not always mastered. It remains true, nevertheless, that equalization can be a useful tool in financing the fertilizer industry in developing countries, provided they have products acceptable as counterpart, which is not always the case. In the case of regional co-financing of fertilizer plants, it is nevertheless possible to conceive of the use of equalization involving a counterpart in the form of an undertaking to repurchase products. This technique is also usable as part of South-South co-financing, such as that in the process of being set up between East Asian countries already industrialized but poor in raw materials, and those which have raw materials and technological capacity but are not well off financially, such as the North African countries. In short, while product repurchase clauses between firms in industrialized countries and firms in developing countries are difficult to carry out in a situation of world over-production of fertilizers, which is particularly the case in the developed countries, on the other hand it is easier to imagine systems of complementarity between developing countries, some of which are well endowed in fertilizers of the nitrogenous kind and others better off in phosphates.

3.6.3 Aid in agricultural inputs

While food aid to the developing countries, particularly those in Africa, is a physical necessity, the conditions today for carrying it out must make it possible to promote the development of the receiving countries. Actually, food aid in the strict sense can turn out to be ill-suited to overcoming undernourishment in certain countries because of the diversity of the situations

found there. This is the reason why at international level the discussion today is concentrated on the possibilities for donor countries to furnish, side by side with food aid, agricultural inputs calculated to bring about genuine rural development in backward areas; and among these inputs are fertilizers. Substantial donations of this type have taken place in Africa (examples are gifts from USAID to Zambia of 60,000 tons of fertilizer in 1979, 61,000 t in 1980, and 30,000 t in 1982, and a gift by Japan of 300,000 t of fertilizer to the Ivory Coast in 1983). Such forms of aid can also be systematized, as is evident in the case of Zambia, which in 1985 decided to use all the food aid credits granted by USAID from then on for imports of phosphates and potassium to be converted into compound fertilizers in its fertilizer plant. The problem is merely that of selecting wisely the kind of fertilizer needed or the basic components for the manufacture of fertilizer, and organizing the distribution and utilization of these gifts in kind so as to ensure that they have a real impact on development. Thus it is desirable that they should not be handed over free of charge, but should be sold at the normal price, the effect intended by the donation system being mainly to ease the balance of payments (by reducing imports which have to be paid for in foreign currency) and to enable the distribution circuit to spread to new agricultural zones. When this aid is channelled through local fertilizer production plants which undertake their costly distribution and/or processing, it is desirable that these gifts should be dealt with on an accountancy basis. In the case of Zambia, the fertilizer donation scheme was reflected finally in an increase in the capital of the firm producing the fertilizer. Thus for practical purposes it amounted to financing national investment which led to an increase in agricultural output, following the conversion in the plant of basic feedstock into fertilizers.

It is possible to envisage an extension of this formula to other industrial inputs used by fertilizer plants, e.g. spare parts.

3.6.4 Debt conversion agreements

The external debt situation of the developing countries is alarming. Their recent difficulties in servicing their debts because of the rise in the exchange rate of the dollar, the increase in the London inter-bank rate (LIBOR - the reference rate for many loans), the general crisis, and protectionist measures taken by the Western countries, have led the foreign commercial credit banks to devise alternative solutions so as to salvage at least part of their funds. One of these solutions is the repurchase of certain external debts by a foreign investor, the funds obtained being used to invest in the debtor developing country. Some operations of this type have already been carried out, mainly in the deeply indebted South American countries. The principle is as follows: a foreign investor negotiates with a commercial credit bank for the repurchase, at a rebate, of a certain number of credit securities on a developing country. These securities, purchased at between 60 and 90 per cent of their value, are then discounted with the central bank of the developing country at a rate of exchange which is favourable in relation to the official rate. The foreign investor then has at his disposal funds in the national currency which he can invest on the spot for the purchase of capital stock in undertakings in which he wishes to participate. Each partner has something to gain: the developing country finds its external debt reduced; the foreign investor's investment can cost him 20 to 40 per cent less; the commercial bank disposes of a rather risky debt which is hard to support and to administer; and firms in the developing

country benefit from the advent of new partners. This method of absorbing the external debt as well as contributing to the financing of undertakings in developing countries is only possible in liberal economic situations, and in general it only affects large industrial firms. No case has been reported as yet that relates to fertilizer plants, but there is no reason why such operations should not take place in the near future if foreign investors are willing to intervene in this industrial sector of developing countries. The funds thus made available to the country are of course in local currency, but one can well imagine that if the investor has agreed to take all the fairly complex steps, from the purchase of securities to their discounting in the developing countries and negotiations which the undertakings in question, the reason is that he is counting on making an industrial profit 22/ and will do his utmost to make the management succeed. It therefore seems likely that he will if necessary supplement his investment in local currency by a contribution in convertible currency to round off or renew the investment, with a view to the purchase abroad, for example, of machinery, spare parts or new technology.

To sum up, the discount repurchase by a foreign investor of credits on a developing country held by an international commercial bank can be utilized for participation in the local financing of industrial undertakings in that country. This type of financing scheme, which can be envisaged only in countries which permit the intervention of foreign investors in the national economy, reflects a willingness on the part of the foreign investor to promote the balanced management of the plant, and can be followed up by the advent, if necessary, of supplementary financing in foreign currencies for purchase abroad of capital goods, spare parts and various types of industrial inputs.

4. CONCLUDING REMARKS

The conditions governing the financing of phosphate fertilizer plants in Africa are largely dictated by the nature of the manufactured product: it is a heavy product used worldwide, and the clientele is geographically scattered. The seasonal sale aspect and the considerable importance of the raw material in the cost price, also give rise to particular constraints in regard to the financing of the revolving fund. The concern to achieve a price to the consumer which is likely to promote the more frequent use of fertilizer by the rural community and thus help to speed up the development of African agriculture has led to the consideration of certain alternatives to the large, costly fertilizer plants which had become the general rule during the 1970s. The possibility, at least for certain types of fertilizer, of setting up small plants for processing natural phosphates should make it possible in certain instances to relocate productive units in land-locked countries or countries remote from the main production centres.

The number of mini-plants is tending to increase, and their financing will imply more and more frequently a system of regional or international co-operation in the form of joint ventures or financial participation by user co-operatives.

22/ Apart from the financial gain from investments made at an appreciable discount.

Meanwhile, large units installed close to sites where the raw materials are produced still have a future, but the burden of the initial investment means a search for diversified types of financing. Since the prospects for the consumption of fertilizers in Africa are based on the assumption of a rapid growth over the next 20 years, adequate financing, domestic or external, for the various categories of plants should be feasible.

Certain problems of a financial nature still remain to be solved, in particular relating to the industrial environment as such. First of all, it is essential to crystallize the potential demand for fertilizer by the farmers. The economic authorities must make sure that farmers will have the funds needed to purchase fertilizers. It is therefore imperative to define a rural development policy capable of ensuring a sustained growth of agricultural earnings, which means promoting better evaluation of agricultural products and taking the necessary steps to maintain a balance between agricultural production and the price of fertilizers. On the other hand, it is essential to set up a system of agricultural credit which is efficient and sufficiently automatic to induce farmers to purchase enough fertilizer, and of adequate quality, at the time when it is.

The second "environmental" problem it is imperative to solve is that of the implementation of a programme for setting up or rehabilitating various types of infrastructure calculated to promote the establishment of efficient production units and to ensure the smooth marketing of the manufactured products.

These two series of financial problems do not strictly form part of the financial constraints of the fertilizer industry, but they do have a decisive impact on its performance.

It will be noted that while financing to promote industrial projects may no longer call for direct action by the State on a large scale, this is not true of the financing required for ancillary infrastructures or improvements to be made to the performance of the agricultural sector. In both these areas, it seems likely that the public investment budgets will have to bear the lion's share of the expenditure.